

# Keeping and Breeding the Midwife Toad

(*Alytes obstetricans*)

by ROBERT BUSTARD

THE midwife toad is a small hardy species, common in many parts of Western Europe, which is frequently imported into this country. It measures about 1½ in. and, although somewhat drab in appearance, is of great interest owing to its unique breeding habits. In coloration it is olive-grey above and creamy-white below, the back having darker spots here and there. This little toad flourishes very well either in close confinement in a small vivarium or in the outdoor reptiliary, where it can be safely left to hibernate during the winter.

Midwife toads are strictly terrestrial and seldom enter the water, thus they have evolved strange breeding habits. Whilst most frogs and toads go to the water to mate and lay their eggs, the eggs of the midwife toad are laid on land. The eggs are laid in strings, each egg being joined to the next by a gelatinous material, and there may be about 60 to 100 eggs in a string. They are immediately taken by the male, which wraps them round his hind legs. The task of looking after the eggs until the tadpoles are ready to hatch falls entirely on him. Sometimes he may collect strings from several females and thus have a large collection of eggs.

One of the specimens in the photograph has only one string whilst the other has several strings of eggs. These toads are mainly nocturnal and the male hides with his precious eggs during the day, choosing a damp spot so as to keep the eggs moist. He may occasionally visit the water to moisten them further. He is, however, not much hampered by this apparent burden and can still make his evening feeding excursions. In all he looks after the eggs

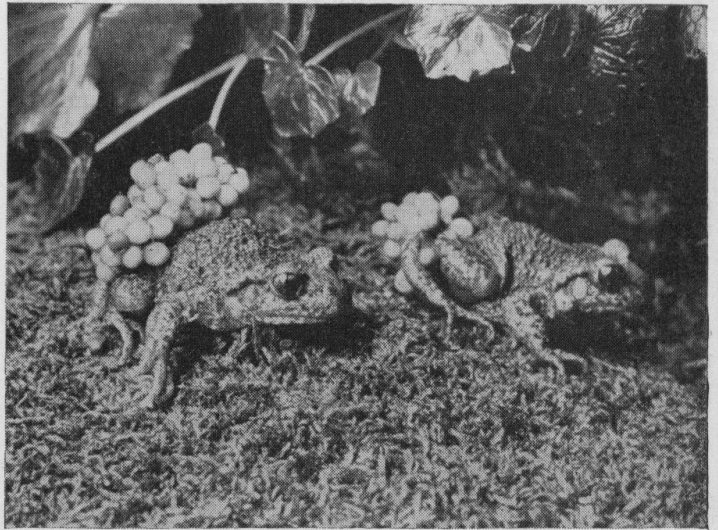


Photo:

Robert Bustard

Two male midwife toads, with clusters of eggs, photographed as they set out to look for food at dusk

for 3 to 4 weeks, by which time the eggs are ready to hatch and he goes to the water, where the tadpoles hatch immediately. The tadpoles then develop in the usual way and metamorphose in about 4 months.

It is quite possible to watch all this by keeping these charming little toads in captivity, where they become very tame and will often breed. The best conditions are undoubtedly the outdoor reptiliary or cool greenhouse where they will be under natural conditions. However, this toad does well in a small vivarium, which should have a layer of moist earth and moss growing in it and other damp-loving plants such as ferns. Some flat stones or pieces of bark

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This semi-formal pond and rock garden will be recognised by members of aquarists' societies who have visited the fish hatcheries of Shirley Aquatics Ltd., at Shirley, near Birmingham. It is situated at the entrance to the hatcheries, in front of the home of the proprietor Mr. Roe

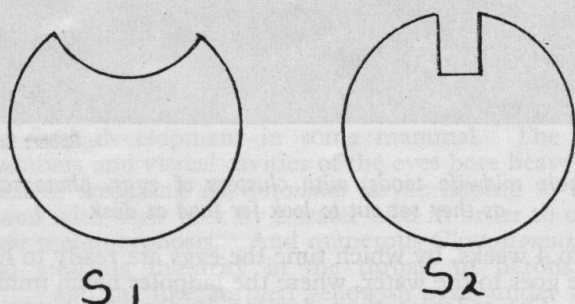
Photo: J. L. Anderton

# Microscopy for the Aquarist—33 *by C. E. C. COLE*

LAST month I said that I had told you all I could about transmitted light. I have since been reminded that so-called "oblique" and "annular" light are forms of transmitted light. They might be termed "selective-light" methods, inasmuch as they select certain transmitted rays from a cone and use only them. This leads to surprising results on occasion, and the conclusions drawn from the methods must be subject to a degree of suspicion. However, they *are* used and the tyro may use them without being aware of it on occasion, so it is as well for you to know about them and the way they work.

## Oblique Illumination

Let us take "oblique" illumination first. This may be obtained in one of two ways. Light may be directed upon the mirror in the normal way, but the position of the mirror



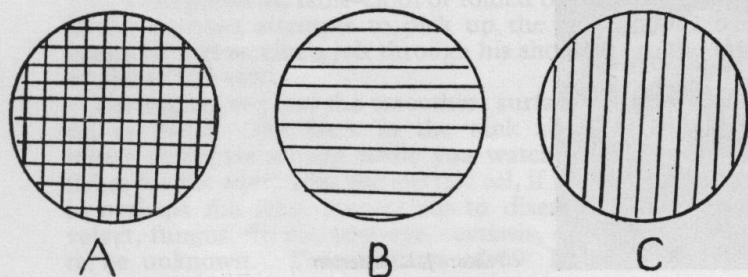
Stops for oblique illumination. With these a creature marked as in A (below) could appear as in B or in C

is changed so that the rays do not enter the objective and travel straight up it, but at an angle. Instead of the light being evenly disposed about the optical axis, only part of the back lens of the objective is illuminated.

An alternative method is to utilise a special stop in the filter carrier of the substage condenser which blocks out all except a portion of the solid cone of transmitted illumination normally used. It is with this stop that the peculiar and unreliable effects of oblique lighting can best be demonstrated. Should you have one in your miscellaneous equipment, get it out and have a look at it. I have illustrated one for those who have not got one.

The light beam is narrow and is only a very small portion of the illumination. It follows that it can produce an image of only those portions of an object which it encounters on its passage into the objective.

Supposing, for argument's sake, that the object focused on the stage possesses lines running longitudinally and laterally over its surface. If the light rays encountered only the horizontal striations it would reproduce them alone. If its position was changed by moving the disk so that the hole was in a different place it could pick up only the lateral markings. The image would thus give two entirely different



ideas of the subject illuminated. In addition the images would be clouded by diffraction effects.

With uneven surfaces, with low and medium powers, however, where very transparent objects are being examined the greater intensity of shadows obtained with oblique lighting enables more to be seen. The difficulty lies in knowing how far to trust what is seen. Unless it can be confirmed by true axial illumination it has little real value.

## Annular Illumination

Annular illumination is obtained by using another stop, as shown, which cuts out the central portion of the cone of illumination, leaving the image of the object to be formed only by the outer portion of the cone. The size of stop used should not be large enough to produce a black background.

Aquarists who wish to try these methods of illumination should not place too much reliance upon what they see by them.

## Keeping and Breeding the Midwife Toad

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should be added to provide cover and also a small pool of water (a pie dish will suffice), which is essential if breeding is to be contemplated.

My specimens live in an outdoor reptiliary where they breed naturally and find much of their own food. I introduce gentles and bluebottles for them and the other inhabitants. If kept indoors they will need to be fed regularly. Midwife toads do not really like worms, although the odd earthworm will be eaten. They much prefer flies and bluebottles, which will require to have their activities somewhat restricted if the toads are to be able to catch them. Most other insects, especially if active, will be readily acceptable.

The breeding habits of this little toad are so interesting that it is well worthwhile to take trouble to ensure success. Outside facilities, as mentioned above, being the key to success. Another point in its favour is its charming "bell-like" call which has earned this toad its alternative name of "bell toad." I strongly recommend this species to the beginner as it is very hardy and easy to keep.

## Here and There

THREE sucker fish, one of them 12 in. long, were attached to a blue shark landed at Looe, Cornwall, last month by an Edinburgh businessman, Mr. A. Menzies Simpson. The shark was the biggest to be caught this year and weighed 161½ lb.; it measured 8 ft. 3 in. (The British record blue shark was 180 lb.) The sucker fish were removed alive from the shark and were presented to the Plymouth Aquarium.

AN aircraft loaded with more than 20,000 tropical aquarium fishes flying from British Guiana to Miami had to be unloaded at Trinidad when it was forced to land there because of engine failure. The fishes were stored in plastic bags in batches of about 100, and many died during the wait for a new plane to finish their journey.

PRESERVED tropical fishes were displayed in a set-up aquarium in a New Zealand exhibition. The fishes had been caught in the Islands of N.Z. and were edible varieties used by the Islanders as food. They formed part of a display connected with life in the Islands.

# Toads in Captivity

by JOHN WALKER

**I**N this article it is proposed to discuss the requirements in captivity of some of the more easily obtainable toads. In general toads are one of the easiest vivarium inmates to cater for, as they need little attention and are easy to feed. A very good type of vivarium is a converted aquarium tank, with a wire-gauze ventilator fitted over the top.

Assuming that a vivarium is to be started, and an aquarium tank being used for this, about 1½ in. of gravel or grit should be put on the bottom of the tank first, as this helps the soil to drain. On top of this should be put 2-3 in. of soil. Sand should not be used, as it sticks to the food and causes discomfort. The earth should be kept friable, as toads like to bury themselves from time to time. A bowl or some other utensil should be sunk into the soil, up to the rim, and filled with water. The bowl should not be too deep, as sometimes toads find difficulty in getting out of deep containers and will drown.

For the furnishings, some pieces of curved bark or stones can be placed on the soil. These are for little shelters, as a toad will like to hide itself after meals, and sometimes during the day. A flower pot makes a very good hide-out, as when laid on its side it looks natural and I have found my toads to be very fond of one to sit in.

Planting is optional. Personally, I have found it to be a waste of time, as the toads will either knock the plants down when walking about, or uproot them when burying themselves in the earth. However, if mossy pieces of bark or stones are included in the set-up, a very pleasing effect can be obtained.

Some of the best inmates for a toad vivarium are: the common toad (*Bufo bufo*), 10 cm., which is too well known to need a detailed description, save to say that it can be found in almost any shade of red, brown or yellow.

The natterjack (*B. calamita*), 6-7 cm., which on top is greenish grey, with a bright-yellow dorsal stripe, and red on the warts; underneath it is off-white speckled with green.

The green toad (*B. viridis*), 7-8 cm., is similar to the



Common toad (*Bufo bufo*)



Photo:

W. S. Pitt

Male midwife toad (*Alytes obstetricans*)  
carrying eggs

natterjack in colour, being putty-coloured marbled with green, but without the dorsal stripe. It has red on some of the warts. Underneath it is grey white.

The first two toads named are native to Britain, but the green toad is not. It is distributed across Europe, Asia and North Africa. These three species are the only European members of the large and typical family Bufonidae.

All three will, if kept at room temperature, remain active throughout the winter, but if the temperature falls too low they will want to hibernate. If it is wished to hibernate them, they should be placed in a box full of dry leaves and moss, and put in a shed where it is cold, but where no frost can get at them, as frost can be fatal.

For food, toads will take almost anything that moves: ants, beetles, flies and worms. Different specimens have particular likings, but these will be found by experimenting.

Toads are fascinating to watch feeding, as they will stalk their prey, and then snap it up with their tongues. One gulp and it is gone, unless it is something like a worm. In this case, it is swallowed in a series of gulps, being helped down by the backs of the eyes, which are pulled into their sockets for this purpose. In the meantime the toad runs the worm through its fingers to clean it.

Food should be given once every 2 or 3 days, and should be placed where the toads can see it moving. In a very short time, and with patience, toads will tame easily and feed from one's fingers.

Another toad which is often seen in dealers' lists is *B. marinus* from South America, being sometimes known as the giant South American toad. This toad is a monster, and will grow to 5-6 in. long. In colour it is a variable shade of brown or yellow on top, speckled with red, yellow or black. It has very large parotid glands, which are sometimes marked with red lines. This toad can be treated in a similar fashion to the previous ones, but of course can be offered much larger food. Even mice will be taken. These can be killed and then placed in front of the toads, and agitated with a stick. Some toads, however, will not eat dead food, but most of mine will, provided it is moved about. *B. marinus* likes a warm temperature, 65-70° F., but this can be allowed to fall to 45-50° F. at night.

Most toads will live quite happily together, but it must be remembered to keep only those of a similar size in one cage. If this is not done, trouble is certain, as a large toad will often eat a smaller one.

# Frogs in Captivity—by JOHN WALKER

**T**OADS were dealt with in a previous article and it is proposed to deal with the requirements in captivity of frogs in this one.

As with toads, an aquarium tank will make a satisfactory home: it should be as large as possible, a fair ruling being 12 sq. in. to 1 in. body length.

As frogs are more aquatic than toads, a greater area of water is needed. This can be arranged by placing some small bricks on a log across the tank, dividing it in two. On one side of this barricade, which should be 2-3 in. high, the space should be filled with pebbles or grit, level with the top of it. On top of this should be put about 2-3 in. of earth. The vacant side can then be filled with water. Again as with toads, plants tend to be more nuisance than they are worth. Lack of colour can be overcome by putting some duckweed in the water, and putting lichen-covered pieces of bark on the earth for shelters.

By nature frogs are more nervy and more easily frightened than toads. For example, if placed on a table a toad will merely walk over the edge, whereas a frog will throw itself off in any direction, regardless of the consequences. Therefore when handling frogs, all movements should be slow and deliberate, and not grabbing. Also when handling frogs it is best to have one's hands moist, as dry hands will cause the creatures discomfort.

When selecting specimens for a collection, it is best to choose young ones, for these will nearly always feed, whereas old or adult ones will often refuse all food, some-

times until they die. It is also wise to keep only specimens of a similar size together, as many frogs will be prepared to stuff their smaller brethren down their throats.

For food, almost any insects will be taken, also molluscs and worms, food being caught on the tongue and, with worms, is cleaned with the front feet as it is swallowed. The front feet are also used to keep the worms in a central position if they start getting too low on one side or the other. As with toads, the eyes are used to help the frogs in swallowing. All the three British frogs belong to the typical frog genus *Rana*, and all make quite satisfactory pets.

The common frog (*Rana temporaria*), 8-9 cm., can be found in almost any shade of brown, yellow or grey, marked with brown or black. The colouring is variable and is changeable with temperature. Sometimes specimens will be found with hardly any markings, and others are nearly all blotches. In my collection I have one very attractive orange specimen with blood-red markings.

The edible frog (*R. esculenta*) is rather larger and more thickset than the common frog. On top it is generally a bright emerald green, marked with black, and below it is plain white. The edible frog can take its prey above or below water.

The marsh frog (*R. ridibunda*) is Europe's largest frog, sometimes growing to about 12-13 cm. It is similar to the edible frog in shape. In colour it is green, brown or bronze. Sometimes it is bright green in front and brown at the back. The legs are banded with black or dark brown,



Common frog  
(*Rana temporaria*)

Photo: W. S. Pitt



Europe's largest frog, the marsh frog (*Rana ridibunda*), has established a colony in England



Photo:

Douglas Fisher

and spots of black or brown are scattered over the body. Underneath *R. ridibunda* is generally white. This is very definitely a frog to get young, as freshly caught old specimens are very panicky, and I have rarely been able to get them to feed.

For the more exotically minded, there are sometimes on the market one or other of the varieties of bullfrog. Of these my favourite is *R. adspersa* from South Africa. This grows to about 8 in. long, and nearly as wide. On top it

is yellow-green or olive, with a dorsal stripe of yellow, and has several other yellow stripes running down the back and sides. Also on the back are several ridges, which give the frog an unusual appearance. Round the top of each front leg is a thick red-orange band, the red from this band spreading into the surrounding body. The rest of the underside is pinky white or grey-white. These frogs will eat almost anything that moves, and should be kept at around 75°F., falling to not less than 55°F. at night.

## Successful Breeding of Black Angel Fish

by H. C. PARSONS

ABOUT 18 months ago I was very much struck with the beauty of the first black angel fish I had seen, so much so that I spent the not inconsiderable sum of £7 apiece on four of them (about one-shilling body size) from a London dealer. I have been breeding normal angels for many years in considerable quantities. I might say that angels have always been my first love in my fish house, and I would feel lost without a few tanks of them around.

For a while the "blacks" thrived. They were kept and maintained with half a dozen or so "normals" I was growing on for breeding, and their diet was, as is usual with me for most fishes, *Daphnia* and chopped *Tubifex* (as long as *Tubifex* is well chopped I have never found fault with it as a food).

About 3 months after the purchase of the "blacks" I bought six "lace angels," close relatives—but fish in which the black lines of the common angels are diffused and spread over the intervening scales with cloudy black. The "lace" were very robust and grew apace; not so, regretfully, the

blacks. These became finicky eaters, and, with the exception of one which had the will to live and grow, were obviously deteriorating. I placed them in a tank alone and nursed them. With two I had a measure of success; the good one mentioned above continued to improve and another picked up and began to look hopeful, but within a few weeks the other two for no reason I could pin-point sickened and died. I was left with two blacks and six virile lace angels.

The fish were now approaching a size when I considered breeding would soon be possible, but I was in for more disappointment. First I was informed by a friend of mine who is infallible on this subject, Mrs. E. A. Allen, that both my blacks were males, and secondly, shortly afterwards I lost the smaller of the two.

A few weeks later, during a visit to me by a well-known fellow aquarist, I lost my last black. He had a black female and I lent him my male and wished him luck. Three months later, about 6 months ago, my fish was returned to me and my friend had had no good fortune.

Meanwhile, my lace angels had really developed; two were paired and breeding well and all were deeply coloured; the black diffusion had spread and settled to such a degree that the fish had to be seen in good light to be differentiated from their black cousin.

A little later, again with Mrs. Allen's assistance, I placed

# Behaviour and Reproduction of Various Newt Species

by DUNCAN SCULTHORPE

IN spite of their evil reputation in days of old, newts make charming pets and excellent subjects for scientific experiments. They can be kept quite easily in the ordinary aquarium. My observations, made 12 months ago, were carried out on three species of newts kept in an aquarium 15 in. by 10 in. by 10 in., there being six newts altogether in this small tank. The tank, in a greenhouse, received sunlight for nearly 12 hours, and the plants grew rapidly throughout the spring and summer.

The bottom of the tank was covered with sterilised peat to a depth of  $\frac{1}{4}$  in., above which gravel was spread to a total depth of 2 in. at the back of the tank and 1 in. at the front. River-washed stones were used, and a plant pot acted as a cave. The newts, throughout the period of observation (2 months), never showed any tendency to climb up the sides and escape. Sturdy plants are needed for newts because of the animals' clambering habits and egg-laying tactics. The following species were used: *Vallisneria*, *Elodea densa*, *Ranunculus*, *Lysimachia*, *Hottonia*, *Ceratophyllum* and *Myriophyllum*. All but *Vallisneria* were planted as cuttings, in bunches.

Table 1. Sizes of the newts

Species	Sex	Total length (in.)	Tail length (in.)
Alpine newt ( <i>Triturus alpinus</i> )	Male	3 $\frac{1}{4}$	1 $\frac{3}{8}$
	Female	3	1 $\frac{1}{8}$
Smooth newt ( <i>Triturus vulgaris</i> )	Male	3 $\frac{1}{2}$	1 $\frac{1}{2}$
	Female	3 $\frac{1}{4}$	1 $\frac{1}{4}$
Palmate newt ( <i>Triturus helveticus</i> )	Male	2 $\frac{1}{2}$	1 $\frac{1}{4}$
	Female	2 $\frac{1}{4}$	1 $\frac{1}{8}$

In colouring, the females of smooth and palmate newts are hardly separable, being a brownish-green dorsally, although the former's belly is usually more orange-red. Of the males of the two species, the smooth newt is unmistakable, with its high, undulating crest passing from between the eyes back to the tip of the tail. The male palmate newt has a fine, black filament extending from the end of its tail. The Alpine newts are very bright creatures: the male is brilliant blue dorsally, with a low black-and-white crest, and its belly is orange. Its tail has black, blue and yellow tints. The female is a delightful olive colour with black-and-mauve specklings; its belly is orange. Sizes of the specimens used are given in Table 1.

## First Reproductive Activity

On the morning of 11th April, 2 days after the newts had been introduced, I was extremely surprised to find ten newt eggs laid in their ovoid mucous envelopes in the folds of *Elodea densa* leaves. Just one egg had been laid quite bare on the ribbon leaf of *Vallisneria*. In the early evening the male Alpine newt became alert and springy in its movements, following the female of the species and barring her progress by jumping in front and displaying itself. The display ended with the male arching its back and curling its tail towards the female. This process was always interrupted by the very inquisitive female smooth newt!

Two days later, the male palmate newt was seen in the

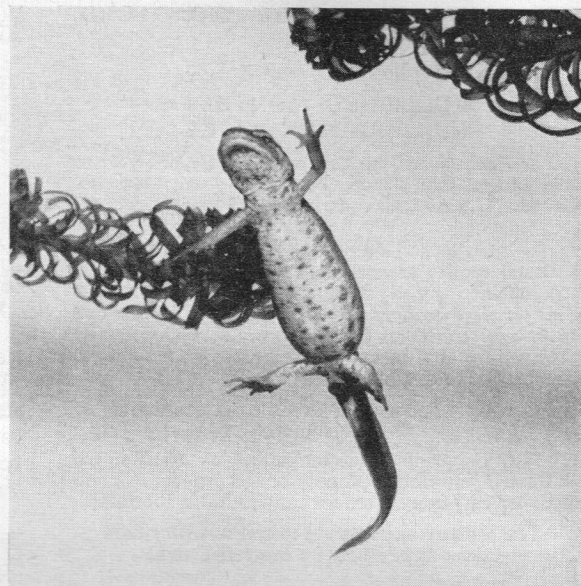


Photo:

Laurence E. Perkins

Female smooth newt (*Triturus vulgaris*)

afternoon vigorously displaying itself before the female palmate in a similar way, but its tail was set vibrating at great speed in a position parallel to its body. The following day, the male smooth newt became very active, at first displaying before the female palmate and then in front of the female smooth newt. This mistake occurred many times, and was probably due to the similarity in the colour of the females. Some experiment still needs to be done to see whether the male eventually perceives his mistake merely by sight, or by odour from the skin glands, of the respective females. I think we can dispense with the idea that something in the female's attitude tells the male that he is not wanted. Observation shows that there is very little, if any, difference between the attitudes of the females to the males' courting displays. If it is the wrong male, and frequently even if it is the right one, the female starts to walk away and seems to pay no further attention to the male.

While reading the various books on these animals, I came to the conclusion that the courtship of newts had caused more imaginative thinking than correct observation. To take just one example, some writers talk about the "dull hypnotic stare" of the female as she is confronted by the display of the male. Since the animals have scarcely movable eyes, they seem to be staring the whole time. They stare just the same at an inanimate object put about an inch in front of their heads. The writer's phrase, in this case, does lead the reader to believe that the female's reception of the male's display involves something different from the

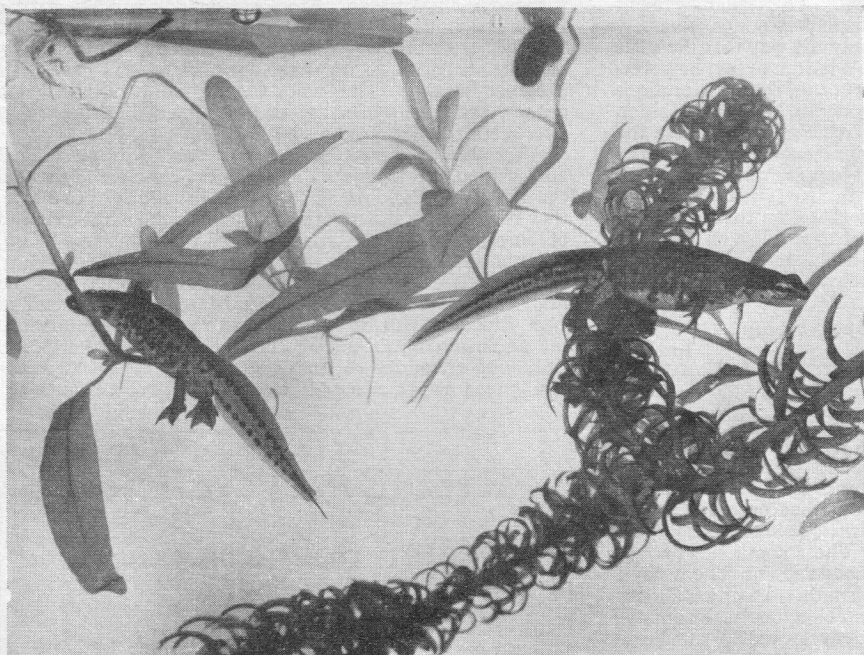


Photo:

Laurence E. Perkins

Palmate newts (*Triturus helveticus*). The tail of the male on the left shows the elongated filament characteristic of the species

animal's normal behaviour and facial appearance. It is always easy to see what your imagination would like you to see!

#### Egg-laying Observed

On 15th April the female Alpine newt was seen laying eggs for the first time. Standing on her hind legs, she smelled the finely dissected leaves of *Hottonia* (I can only assume that it was smelling and not just ascertaining the size of the leaves). Having found a suitable place, she climbed the plant and manoeuvred herself so that her cloaca was in contact with the leaves, after which she used her hind legs to fold or grasp the leaves into a "cup" round the cloaca. Keeping her tail out of the way, she then seemed to arch herself slightly while pointing her head upwards, remaining in this position for the process of depositing the egg. Each egg is laid separately, the process taking about 1½ to 2½ minutes from the time when the leaves are cupped under the cloaca.

Table 2. Plants selected for egg-laying  
Percentages of eggs carried

	<i>Hottonia</i>	<i>Elodea</i>	<i>Lysimachia</i>	<i>Ranunculus</i>	<i>Cerato- phyllum</i>
Newt					
Alpine	43	1.5	34	0.5	21
Smooth	5	40	38	9	8
Palmate	—	55	20	25	—

In the early evening, the male Alpine newt searched for and assiduously followed the female Alpine, pressing his snout to her lips, flanks and cloaca. Then he would scramble ahead and display his colours with spasms of tail undulating. At the end of one such spasm, the male dropped from his cloaca an elongated, spiral, white object—the spermatophore—after which he moved slowly away, with his tail waving slightly. Although the female had

witnessed this, she moved over the spermatophore and away, and did not take it up into her cloaca.

The spermatophore gradually changed shape, becoming spherical, and was removed to a microscope slide, where it was teased with needles in a drop of water. The mass of thousands of spermatozoa was seen under the low-power objective, and under the high power each spermatozoon could be examined. After a total of 25 minutes the tails of the spermatozoa had ceased to move, and their short, active life was over. Later that evening the male Alpine newt resumed his ardent displays before the female.

#### Activities and Egg-laying Habits

The details of the courtship displays are the same for all three species I observed. There was slight variation in the process of tail vibrating, both between the species and at

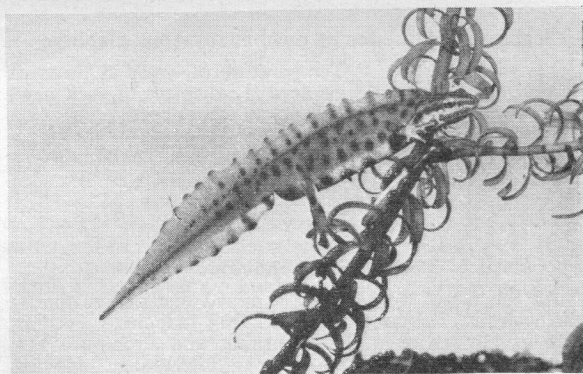


Photo:

Laurence E. Perkins

Male crested newt (*Triturus cristatus*)

# TREE FROGS *by* ROBERT BUSTARD

THESE beautiful little creatures have always been favourites of vivarium-keepers and thousands of the European green tree frog (*Hyla arborea*) are imported into this country each spring to supply the demand.

They are such dainty little creatures, and very attractively coloured—a beautiful leaf-green above, bordered with a black band edged in white which passes from the eye to the end of the body. Below it is white. The colour is variable, and changes with the surroundings. Many shades of green are encountered; some frogs are yellowish and sometimes they are brown. They have adhesive discs on their feet which enable them to cling on to leaves and gain an immediate foothold when jumping from leaf to leaf. So effective are these discs that the frogs can easily climb a vertical sheet of glass (compare many geckos) and in the vivarium tree frogs will often rest attached to the glass front.

Tree frogs do very well in the vivarium provided that feeding is no problem, as they (and this is very true of *Hyla arborea*) feed almost exclusively on flies, bluebottles and other active insects, including butterflies and moths. They are very active at feeding times and will jump great distances, landing safely elsewhere and often catching the food in mid-air.

The vivarium for these creatures should be reasonably roomy and high, as they spend all their time off the ground. It should also be very humid. A vivarium 18 in. by 12 in. by 18 in. high is suitable for at least half a dozen of these frogs. A plant with large leaves should be grown in the vivarium or, alternatively, cut stems of plants such as

rhododendrons and laurel can be set in water in the vivarium. In order to supply the frogs with plenty of food gentles should be purchased, or bred, and small tins of these can be placed in the vivarium so that they can eat the bluebottles when these hatch.

*Hyla arborea* is also an ideal specimen for the escape-proof greenhouse, and I keep many along with other tree frogs; they live in a small tree and in everlasting sweet-pea plants high above the ground. This is a good species for the beginner, but there are many others available which the enthusiast will want to try. Some of these are very beautiful indeed, as well as being long-lived in simple vivarium conditions as described above.

Tree frogs are particularly abundant in Australasia and the Americas. White's tree frog (*Hyla coerulea*) from Australia is very like *H. arborea* except that it lacks the dark lateral stripes and is about twice the length of its 2 inch European relation. This species has lived for many years in this country and is strongly recommended. Like another large Australian species, known as the golden tree frog (*Hyla aurea*), it should be kept indoors at a temperature of 65 to 70° F. and although these frogs are relatively hardy I do not recommend that they be allowed to hibernate.

North America is the home of a large number of tree frogs, many of which are sold by dealers in the U.S., but of these only a few reach the British market. The species usually available is the variable tree frog (*Hyla versicolor*). As the name suggests, the coloration of this small frog, which is about 2 inches, is very variable. Dorsally it may be brownish or greenish, with darker markings. This is a very



Photo:

Robert Bustard

This South American tree frog is an active species with unusual breeding habits. Tree frogs show great diversity in the ways in which their eggs are hatched





Photo :

Robert Bustard

Arum-lily frogs (*Hyperolius horstocki*) photographed inside the flower from which their name is derived

hardy species which requires exactly the same attention as *H. arborea*.

Other American species which I have seen offered for sale in recent years include the Pacific tree frog (*Hyla regilla*), which is quite an interesting although sombre species of smaller size than *H. arborea*, and also the tiny spring peeper (*Hyla crucifer*) which is yellowish green and only about an inch long. Both these species do well, and are best kept indoors owing to their small size.

From South Africa come the beautiful arum-lily frogs (*Hyperolius horstocki*). These small frogs, which are only 1-1½ inches long, are attractively coloured in creamy buff with cream lateral stripes, and the feet are bright orange. They are sometimes available and make unusual vivarium inmates, feeding on insects and requiring similar attention to the other species mentioned. I do not allow mine to hibernate.

Tree frogs are renowned for their diversity in breeding habits—some build little pools at the sides of ponds, others build cradles for the eggs in the trees by sticking large leaves together and yet others behave like marsupials in having a pouch (dorsally situated) into which the eggs are placed. An example of this is *Gastrotheca marsupiatum*, appropriately called the pouched tree frog. I imported this frog into Britain for the first time in 1955, and it has become remarkably popular among vivarium-keepers already. This is possibly because it does so well at about 65° F. and will breed readily in a small indoor vivarium.

The tadpoles hatch from the eggs in the pouch and are liberated by the female entering the water. A depth of 4 inches is necessary for the deposition of the tadpoles, which develop in the usual way. In allied species they remain in the pouch until metamorphosis. In *G. marsupiatum* a brood may comprise 100-150 tadpoles, and it is quite possible to raise at least half of this number to metamorphosis, whereupon they grow very quickly indeed.

*Gastrotheca*, unlike many other tree frogs, is not essentially arboreal, although in captivity they are often found well above the ground. This frog is brown or green, with longitudinal stripes which are usually brown or sometimes black. All-green specimens, superficially resembling *H. arborea*, also occur.

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#### AQUARIST'S CALENDAR

23rd August: **Romford Aquarists' Society** seventh annual open show.

21st-23rd August: **Rugby and District Aquarists' Society** annual show at Percival Guildhouse, Rugby.

4th-6th September: **Three Counties Show** at the Drill Hall, Penrith Road, Basingstoke.

11th-13th September: **Bath Aquarist Society** annual show.

13th September: **Blackpool and Fylde Aquatic Society** annual open show at the Waterloo Road Methodist Mission, South Shore, Blackpool.

27th-28th September: **Federation of Guppy Breeders' Societies** annual show at Basingstoke.

31st October and 1st November: **Bristol Aquarist Society** annual open show.

12th-15th November: **Scottish Aquarium Society** annual open show at the McLellan Galleries, Glasgow.

# GIANT TOADS

by ROBERT BUSTARD (*Photographs by the author*)

THERE are a number of toads which are covered by this title but the species which always comes to mind first is the marine toad (*Bufo marinus*), which is perhaps better known by its alternative name of South American giant toad. This large toad, with a snout to vent measurement of 6 in., is truly a giant, and until recently was considered to be the largest toad in the world. This title is now given to *Bufo blombergi*, which is very much larger and is also from South America.

The South American giant toad is always available in this country and has been popular among vivarium-keepers for several generations. This popularity shows no sign of waning. Provided that it is supplied with sufficient warmth—the South American giant toad should never on any account be allowed to hibernate—it lives well in captivity, requiring little attention.

Some people describe toads as ugly, but personally I have always looked on them as most attractive. The huge eyes of this species, with their golden iris, are really beautiful. The general coloration above is brown, this gives way to a lighter colour on the sides and below the colour is a dirty white. Like our common toad (*Bufo bufo*) this large relation has a warty skin, and in this species the parotid glands behind the eyes are well developed. These glands exude the whitish poisonous liquid which causes a dog or other animal to drop a toad quickly.

Another species which is quite frequently available is the

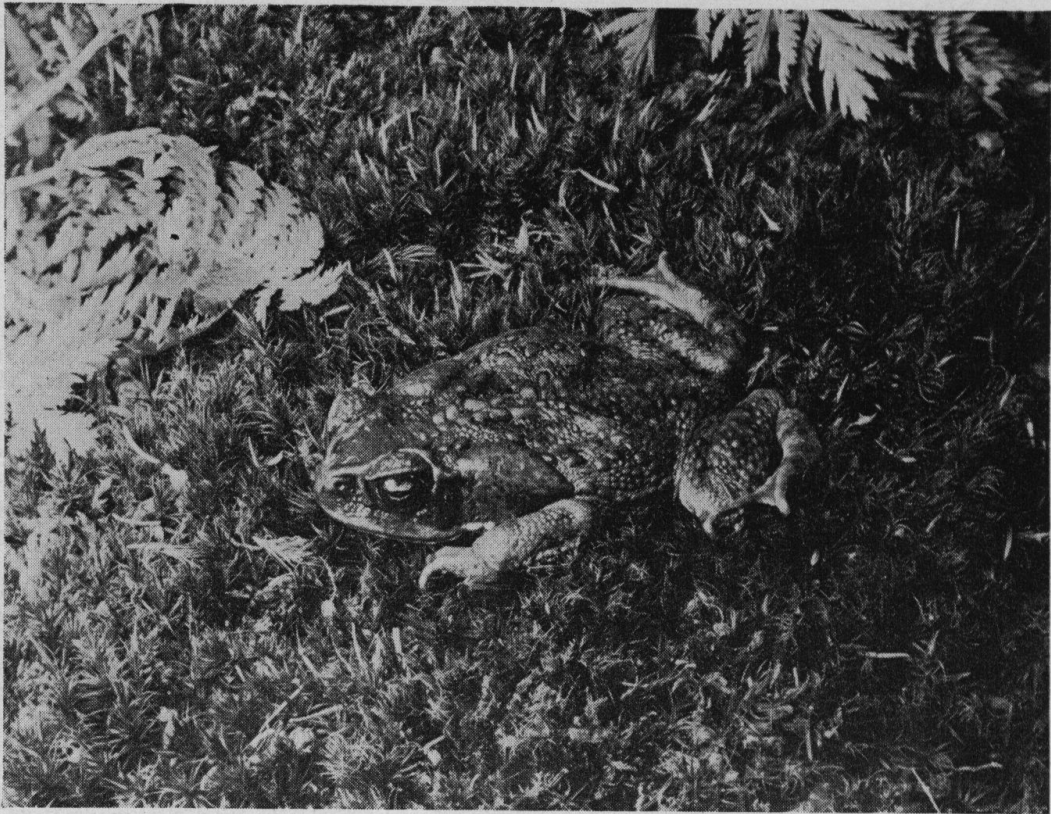
leopard toad (*Bufo regularis*). There are a number of races, of which the largest and most attractive is *Bufo regularis pardalis*, which is found in the Cape Peninsula in South Africa. The leopard toad has a very wide range, over nearly all tropical and South Africa, and has the distinction of being the largest African toad. *Bufo regularis pardalis* measures about 5 in. and frequently exhibits a dark chocolate ground colour. This is intersected by numerous golden-yellow markings which form a network on the back, sides and also the limbs, making it very handsome. As in *Bufo marinus*, the parotid glands are very noticeable. Below the colour is grey-white. It is accustomed to cold weather, at least in the more southerly parts of its range; however, I do not recommend that it be hibernated. A temperature of 60° F. is suitable throughout the year. The temperature for the South American giant toad should not fall below 60° F. and I recommend 65° F. as a suitable temperature for this species.

These two large toads can be kept together in the same vivarium. The vivarium for either of these toads must be roomy and certainly not less than 24 in. by 12 in. by 12 in. The ground covering can be of soil with moss in places. *Bufo marinus* will not require any additional hiding places as it will burrow down into the soil or hide under the moss. The leopard toad should be provided with a suitable hiding place behind a large stone or log.

The vivarium should contain a water dish, which should



A flashlight photograph of the leopard toad (*Bufo regularis pardalis*) as it forages for its food at dusk



South American giant toad (*Bufo marinus*). This giant does well in a vivarium

be large enough for them to submerge. Neither of these toads will spend long in the water, and the vivarium, although not too dry, should not be as damp as would be recommended for frogs.

Any insects will be accepted as food and also large earthworms. It is a good idea to sink a shallow dish into the soil, and in this gentles and mealworms can be placed. The dish prevents their escape before being eaten. Blue-bottle flies will also be accepted, as will larger insects such

as cockroaches. Like the bull frogs discussed last month, these toads have appetites comparable with their size and the basic diet of most captive specimens is large earthworms.

Both of the species mentioned are specially recommended, the South American giant on account of its truly enormous size and the leopard toad because of its very attractive coloration. I always have specimens of both in my own collection and they are firm favourites of mine.



## BOOK R E V I E W

*The Book of the Garden Pond* by G. F. Hervey and J. Hems. 192 pages; illustrated. Stanley Paul & Co. 16s.

THIS is the third book on aquatic subjects to appear by these two authors, who are both well known to aquarists. In their Preface they declare this book to be their "swan song," but it does not live up to what might be expected from the use of this phrase when it is compared with their earlier books. However, it is in fierce competition in such a comparison, and perhaps should be contrasted only with other published books on the garden pond to assess its true worth. It deals with pond construction and maintenance, fishes and plants for the pond, including

marginal plants, and an interesting history of the subject is given. Sound practical advice is offered in all of these matters, backed by some clear line illustrations and eight plates of fine photographs.

The authors' style of writing has spoiled this book for the reviewer, for although they have made obvious and successful efforts to enliven the text these have at times also laid them open to the charge of flippancy (pages 27, 34, 37, 151). A few Latin tags could have been omitted without loss, and authors who include in their Preface phrases in Greek without a translation deserve to have as readers only those few savants who can understand it; this more particularly so when they add a word to their own language as dreadful as "revivication" (page 49)!

It is to be hoped that the paragraph on evolution (page 126) will not be taken seriously by any reader. Man's chromosomes are usually said to number 48, although more recent work puts them at 46, and they are certainly not 42 as stated on page 157. Mis-spellings noted are of Urodela (page 150), vitelline (page 158) and mitochondria (page 159). Altogether it is perhaps not *the* book of the garden pond but one which pond-keepers will want to have and which will without doubt meet most of their needs.

ANTHONY EVANS.

# Keeping Sub-tropical Lizards

by ROBERT BUSTARD

**T**HE hobby of keeping reptiles, which is called herpetology, is now very popular in Britain. The purpose of this article is to give a guide to the housing and feeding of newly acquired specimens. The case, or cage, in which captive reptiles are kept is known as a vivarium.

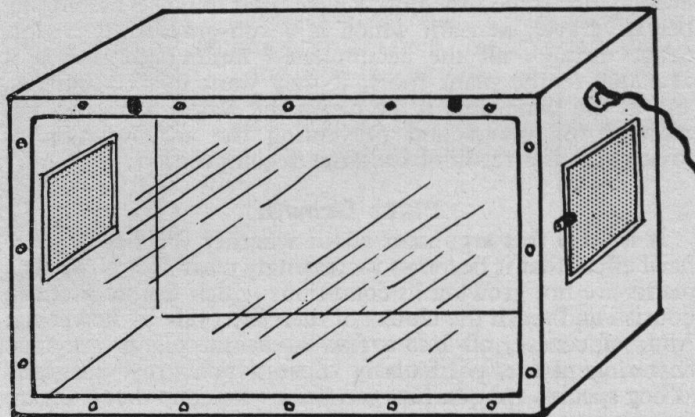
There are many designs of vivaria on the market and the collector intent on purchasing one will be able to make his choice. However, certain principles of design should be borne in mind. Many of those offered for sale are far too small for more than one or two very small lizards, and it is a good plan to buy a large one at the outset. My average-sized vivaria are 24 in. by 20 in. by 20 in.

## Types of Vivaria

One popular type is designed like a school writing desk. I am not attracted to this design personally, and do not recommend it for specimens requiring heat. I find that the other design illustrated, which is one of my own vivaria, is very convenient, and this finding is the result of years of experience. The lid opens for decoration of the vivarium or for easy cleaning out. The small doors at the side are used for adding or removing specimens and for feeding. The glass front is removable so that it can be easily replaced in case of breakage. This is an important practical point which one should look for when purchasing a vivarium.

All my vivaria are made of metal (galvanised iron). Although this is very expensive—I have them specially made to my specifications—it is the most satisfactory method. I have found that metal is definitely the best medium, since it does not warp like wood when subjected to humid conditions. The vivaria therefore remain fly-proof. I should add that it is quite possible to keep specimens in wooden vivaria and the beginner should not be deterred. Whether he ever progresses from these will depend on how particular he is.

When I first started keeping reptiles I had a very large number of boxes in the attic, most of which were between 3 and 4 ft. long, about 18 to 24 in. wide and about the same height. I sawed these in half, nailed in a 2 in. deep board across the front at the bottom to keep in the compost, and added a sliding glass front to each and had two vivaria suitable for pets. I cut out panels running for about half the width, and about 2 in. deep, near the top of the sides and



Vivarium made from galvanised-iron frame, as used by the author

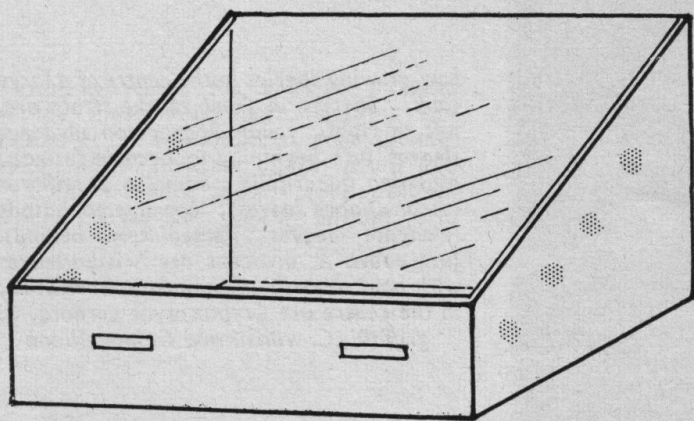
replaced them with perforated-zinc gauze for ventilation. Most boxes, provided that they are not made of wood slats or do not have bad cracks in the wood, can easily and quickly be turned into vivaria by the novice. The only cost is a sheet of glass for the front. It is a good idea to paint such wooden vivaria. I paint my metal ones yellow outside and a sun-cream inside. This gives a feeling of warmth to the human eye. I use ordinary gloss-enamel paint.

## Heating the Vivarium

Let us assume that we have either purchased or made a vivarium. We must now turn our attention to heating. This is most important, especially in the winter months, as our pets will not hibernate and will require a temperature of about 70 to 80° F. throughout the year. This is where, in my opinion, most collectors go wrong, owing to lack of guidance. They purchase a vivarium which has heating tubes installed, take it home and put in their reptile pets. The vivarium is then placed where it will receive little if any sunshine, the interior is constantly dull, and they wonder why the animals do not thrive.

It is important to grasp at the outset that most reptiles (with some notable exceptions) are diurnal. They require sunshine (bright light) to make them active, and it is only under such conditions that they will feed. To provide this light I use pearl electric-light bulbs as used in the home. When I first tried these I found that they gave off a lot of heat as well as light and, within the confines of the vivarium, thus raised the temperature considerably. The wattage of the light bulb can be adjusted according to the size of the vivarium to give the required temperature.

In large vivaria it is a good plan to have a light at each end. The lights should be placed in reflectors to reflect the light (and heat) downwards on to the inmates. This is where metal vivaria come into their own, as once they warm up, the sides reflect the heat and they can be kept warm with very little difficulty. I should stress that the light bulbs are the sole means of heating my vivaria! In the winter the whole reptile house is heated up to 55 to 60° F. by means of a stove, but the lights, which are switched on for about 10 hours daily, keep the individual vivaria at the correct temperatures. The bulbs in their reflectors are placed close



Writing-desk type of vivarium. The top glass sheet slides upwards to provide access to the case

to the roof of the vivarium. For wooden vivaria they should be several inches from the roof to prevent charring.

### Fluctuations of Heat and Light

To the above method of heating I attribute many of my successes through the years. In addition, much money is saved in electricity bills since light bulbs are much more economical than heating tubes, etc. Also they are switched off at night, thus effecting further economy.

A friend once asked me how I could switch off the lights at night, referring to some desert reptiles of mine basking under the light with the thermometer reading 115° F. I pointed out that I was only following the natural conditions in the desert, where at night, owing to the lack of cloud, the temperature falls fast, often to below 50° F. With desert reptiles and to a slightly lesser extent with specimens from tropical forests I think this day-night differential is important in the rhythm of life.

### Feeding Lizards

Feeding can be quite a problem. It can also be solved easily. When one has a number of pets it is hopeless to be dependent on catching all the food required and this should be purchased. Gentles (or maggots) are the larvae of the

bluebottle and can be purchased from bait stores. Many lizards relish them as gentles. If kept for a week or two they pupate and then hatch out as bluebottles, when they are again useful as food for many lizards and indeed form the basic diet of such lizards as chameleons or anoles.

The beginner may find that far too many hatch at one time. I found it a good idea to separate the gentles into three or four different tins. I placed one in a vivarium at 75 to 80° F., another at room temperature (55 to 60° F.) and yet another on the stone floor of the reptile house. I found that by this method, instead of having a mass of food for about a week and then nothing, I could make one pint of gentles last about a month.

Mealworms, which can also be purchased, are a good standby. They will remain as the larvae, which alone are used as food for the lizards, for a long time if kept at about 50 to 60° F. They are easily bred by adding a number to a biscuit tin filled with bran, pieces of stale brown bread, torn-up pieces of newspaper and half of a potato to provide moisture. If they are kept at about 75° F. development will proceed much faster. If several such culture tins are kept, then by using them in rotation there will be a constant supply of mealworms for feeding purposes.

In next month's article we will discuss the keeping of the American anole (or *Anolis* lizard).

## Exotic Water Plants

(continued from page 167)

to enable them to be imitated, and the light required in any aquarium can usually only be decided by trial-and-error methods. My final tip on this point, if you like the look of a plant you haven't grown before, is to try several specimens in various situations in a tank, and see if you can persuade them to grow. The last thing to do is start meddling with the water and using fancy potting composts, etc.

3. *Layout of plants.* Cuttings are best planted as bunches—most of them grow adventitious roots at each node and soon root when pressed into the gravel. Take care not to bury the crowns of other plants and make sure that all their roots are covered. It's a good idea to rinse all plants, even if they come from a dealer, in a dilute solution of potassium permanganate for several hours, but try not to leave a deposit of manganese dioxide on the leaves. Excellent effects may be obtained by the skilful use of plants of contrasting shades and leaf forms. Always put tall plants towards the sides and back of a tank, using them to hide the corners, but avoid "barrack-square" arrangements of linear-leaved plants like *Vallisneria*. Masses of certain species always look effective, and try to effect contrast by setting a broad-leaved plant in front of bunches of fine-leaved species, or similar arrangements. Depth can be accentuated to a certain extent by using predominantly dark species at the sides and lighter-coloured plants towards the back and centre; the whole picture may be effectively and naturally framed by planting a few cuttings of a fairly dark, tall-growing species such as *Elodea densa* or *Potamogeton japonicus* in the front corners of the tank. In the more formal arrangements a large and distinctive plant makes quite a pleasant centrepiece, but in the more natural designs, greater effect is obtained by using specimen plants and dwarf species in thoughtful groupings round rocks, whose frequent bareness and hardness of contour are thereby relieved. Perhaps the most useful character in an aquarist for this work is a fertile imagination.

(To be continued)

## Readers' Queries Answered

**I recently bought four moors for my outdoor pool. I have now heard that they do not like water under 50° F. Will you please confirm if this is correct; should I get the moors out of the pond before winter sets in?**

The moors can take the same temperatures as ordinary goldfish but as they generally have rather enlarged finnage this is subject to tail rot or fungus during the winter months. The fish may be all right in the pond but I think that they are never a very suitable fish for the pond as they cannot be any more decorative than common goldfish and are better kept in a tank.

**About 6 years ago I bought two coldwater catfish. One died and very occasionally I see the other which has grown considerably. I heard the other day that this fish is dangerous and could eat the small fish. I have not seen any small fish in my pond lately, although there is plenty of cover for them and so they might still be there. Would the catfish eat the fry?**

The catfish would certainly eat the small fish and anything large enough to get into its huge gape. I would never put a catfish into my pond, and I use green tench as scavengers. Mine have grown to a large size now and although they mix with my fantails I have never yet seen one of them interfere with the fantails in any way, although their mouths are large enough to swallow a 2 years-old fantail.

**One of my goldfish has developed a translucent jelly-like growth on the snout. It is slowly increasing in size. What is this and what shall I do to clear it up?**

It can be only a blister, caused by a knock, or a form of cyst. If the lump appears to be full of liquid, then it can be pricked with a sterilised needle and the fluid can be pressed out. The spot can then be painted with a mixture of equal parts of iodine and glycerine. If it is a cyst it may have to be cut out, or you can wait and it will later burst, when it can be treated as directed above. Lumps do form occasionally on goldfish and they do not seem to trouble them unduly. They often clear up on their own and require no treatment from the aquarist.



Photo :

Robert Bustard

Carolina anole or United States "chameleon" (*Anolis carolinensis*), a small active lizard with the ability to change colour from brown to green

## *Anolis* Lizards—by ROBERT BUSTARD

**T**HE *Anolis* lizards (or anoles) are commonly kept as pets in the United States, where they are known as the U.S. chameleon. Although in no way related to the true chameleons (*Chameleontidae*) they are able to change their colour to a marked degree, rivalling many types of true chameleons. In a matter of a minute they can change from bright green to dull brown.

Anoles are arboreal lizards which are remarkably difficult to see when at rest among foliage, so well do they match their surroundings. If an attempt is made to catch a specimen it darts off, jumping and running among the leaves. Anoles, of which there are about one hundred species, have adhesive pads on the toes which enable them to cling on to leaves, or in captivity to climb the side of the vivarium or even the glass front. The body is covered with granular scales.

### Carolina Anole

The species which is usually kept as a pet on both sides of the Atlantic is the Carolina anole (*Anolis carolinensis*). This lizard is adult when 5 or 6 in. long. It makes a very suitable vivarium inmate provided that the owner can keep up a supply of live flies and bluebottles on which these lizards feed. They will, from time to time, accept gentles and even mealworms, but flies must form the bulk of the diet. In season, moths and butterflies also are relished. Like many arboreal lizards the anoles may not drink from a dish, and it is a good plan to spray the foliage in the vivarium with water once daily. I always place a small water dish in the cage as many specimens will learn to use this, at least occasionally.

The vivarium for these lizards should be fairly roomy,

because although small in size, they are active lizards and I strongly urge that a number are kept—one specimen would have a very dull existence and would not be seen to advantage. Anoles are gregarious lizards, always "fighting", playing and chasing each other. Most of the fights are mock affairs but sometimes rival males attack each other and very occasionally one scores a notable victory in securing the tail of the opponent.

The case for these lizards should be fairly high, to enable growing plants to be kept in it. I recommend a minimum size of 20 in. by 20 in. by 20 in. and if possible slightly larger. Such a vivarium would provide accommodation for two pairs. A 36 in. by 20 in. by 20 in. vivarium on the other hand can comfortably hold up to a dozen specimens.

When these lizards are kept in indoor vivaria it is a good idea to limit the number of males to prevent excessive fighting. One or two males are sufficient. Average price of anoles is 10 shillings each.

### An Incubator for Eggs

These lizards often breed in the vivarium and the eggs (usually two in number but sometimes only one) are easily hatched. They should be placed in an "incubator"—a metal box about 6 in. by 6 in. by 4 in. deep with 2 in. of damp earth placed on the foot; this is then covered with damp (not wet) moss, and the eggs are placed on top and covered by more damp moss.

If the earth at the foot of the container is quite wet (the eggs being separated from it by a thickish layer of moss), and the heat source is below, then water evaporates from the earth layer, passes through the moss containing

the eggs and keep them moist and condenses on the cool lid. In time it drips back through the moss to the earth layer. To permit excess of moisture to escape, small holes are made in the metal lid. I should stress that the amount of moisture in circulation is very limited, but the eggs are always kept in a humid environment. From time to time it may be necessary to pour carefully a few tablespoons of water into the earth layer to make up for loss through evaporation. The temperature can fluctuate somewhat but I usually place the tin on top of one of my metal vivaria where the temperature is at least 75°F. This temperature I maintain day and night during the incubation period.

For the benefit of those who have never tried, or failed, to hatch lizards' eggs I have described my method above in some detail. The idea is to prevent excessive dampness, which causes fungoid growths on the eggs, or excessive dryness, which causes them to shrivel up. Either is, of course, fatal. During the incubation period, which is about 6 weeks at 75°F. for *Anolis carolinensis*, the eggs increase in size by absorbing moisture. This "incubator" can be used to hatch the eggs of other lizards to be described in later articles.

#### Anoles Outside

The anoles are also ideally suited to the outdoor vivarium, but only if this is fully enclosed, owing to their climbing

abilities. I have a greenhouse-type vivarium which keeps the anoles in and also prevents the bluebottles from escaping. My anole-chameleon greenhouse commonly houses about a hundred specimens of each group and is a constant source of activity in the summer months. Specimens kept out of doors should be brought in to the heated vivarium in the autumn and should not be returned to the outdoor enclosure until the temperature is at least 45°F. at night and all chance of frost has passed. Specimens indoors should be kept at about 75°F. (day), and this can safely fall to 50°F. at night.

Male anoles have an inflatable throat-pouch which they can erect at will. This is red in colour, owing to the blood inside showing through its walls. Like all iguanids they bob their heads at rivals and prospective mates, which usually reply. Males sit and inflate their throat-pouch when showing off to females before mating and also to warn off other males, which may return the challenge. In such cases they usually circle each other like two knights in armour, but in the majority of cases a female appears, or a choice insect lands nearby, and the fight is forgotten.

I spend hours watching my specimens in the garden. These active little lizards are ideal for the indoor or outdoor vivarium and their gregarious habits make them of especial interest.

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## The Mystery of the Zebra Fish

by A. BOARDER

AT a fish exhibition not long ago I was called to see some zebra fish (*Brachydanio rerio*), which, it was said, were all dying soon after they had been introduced into a newly set-up furnished tank. I examined the tank and found it to be the usual 24 in. by 12 in. by 12 in., well set-up with well-worn rockwork and matching compost. Adequate plants were present and the water appeared clear and pure. About 14 zebra fish had been placed in it and these were said to have been in perfect condition when put in. When I saw them they were all at the bottom of the tank instead of actively swimming in a shoal in the top 3 or 4 inches of water. They appeared to be making laboured efforts to swim but were unable to do so. Some were lying on their sides on the bottom and all appeared to be in great distress.

I started the usual detective work. They appeared to have been shocked; had they been placed in water much colder than the carrying can? No, the temperature of the can water was 68° F. and that of the tank 72° F. Certainly nothing there to have upset the fish. Had the rockwork been used before? Yes, several times, with no ill-effects after some days. Was the water from the same source as all the other tanks at the show (in which all the fishes were in perfect condition)? Yes, all water was the same and no feeding had been carried out.

The lady owner of the fish was very upset, and rightly so, as not only would it have been a loss if these fish had died but no others were available to take their place in the competition tank. I puzzled over the problem and suggested that the fish, which had been in a dark can, might have been upset by the bright light over the tank. Accordingly the

lights were switched off and, as if by magic, all the zebras started to swim naturally in a shoal near the surface. Within seconds they appeared none the worse for their previous symptoms.

We had apparently solved the mystery, but as I had never heard of such a happening before I was still very puzzled. Suddenly there was a great commotion; the husband of the lady aquarist had touched the electric lead to the tank and had received a very severe shock; he was slightly burnt on a finger and was thrown to the ground. The lead and tank were then tested and it was found that they were "live."

An electric-kettle flex had been used as a temporary measure and this was very wet and faulty. The concrete floor was also wet and the staging was metal. The faulty flex was removed and replaced with new. The lights were switched on and the fish swam about in grand condition as if nothing had been the matter a few minutes before. These fish had been getting an electric shock, and it is questionable how long they could have survived under such conditions. Under the effects of the shock they seemed to be paralysed, could hardly make any movements at all and could not even remain on an even keel in the water. When the mystery had been solved I could not help but wonder how many other such happenings had caused the deaths of fishes which were unexplained previously.

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## Cacti in the Fish House

ALTHOUGH the plants are resting now a little attention may still be necessary. Some plants may collect dust from the atmosphere and this can not only spoil the look of a plant but can interfere with its breathing. Dust may be blown from a plant but where there are many spines this may not be enough to clear it away. It is then necessary to spray the plant with warm water. This can be done out of doors on a bright mild day. To prevent too much water from reaching the soil some paper can be placed over the top of it and be removed as soon as spraying has finished.

# The Smaller Skinks are Easy to Keep

by ROBERT BUSTARD

THE skinks (family Scincidae) comprise one of the largest lizard families, some six hundred species being distributed throughout the warmer parts of the world. Many of these lizards prove interesting and easily kept vivarium inmates.

They can be divided into two groups. The smaller species are largely insectivorous and active lizards, usually with long slender tails. The larger types, on the other hand, are typified by such species as the blue-tongued and stump-tailed skinks, which are lethargic and feed on raw meat and fruit.

It is possible to mention only a few species by name and describe their treatment in detail. Others can be treated accordingly. The species described below are those which are most commonly available in Britain, excluding the European members of the group to be described later. Those available originate chiefly from Africa and America, and prices of them are usually between one and two pounds each.

The vivarium for these active little lizards should be as roomy as possible, and certainly not less than 24 in. by 18 in. by 18 in. for a couple of pairs. The lay-out should be arranged to fit in with their natural surroundings. Species coming from arid semi-desert regions should not be kept with others whose natural habitat is dampish regions.

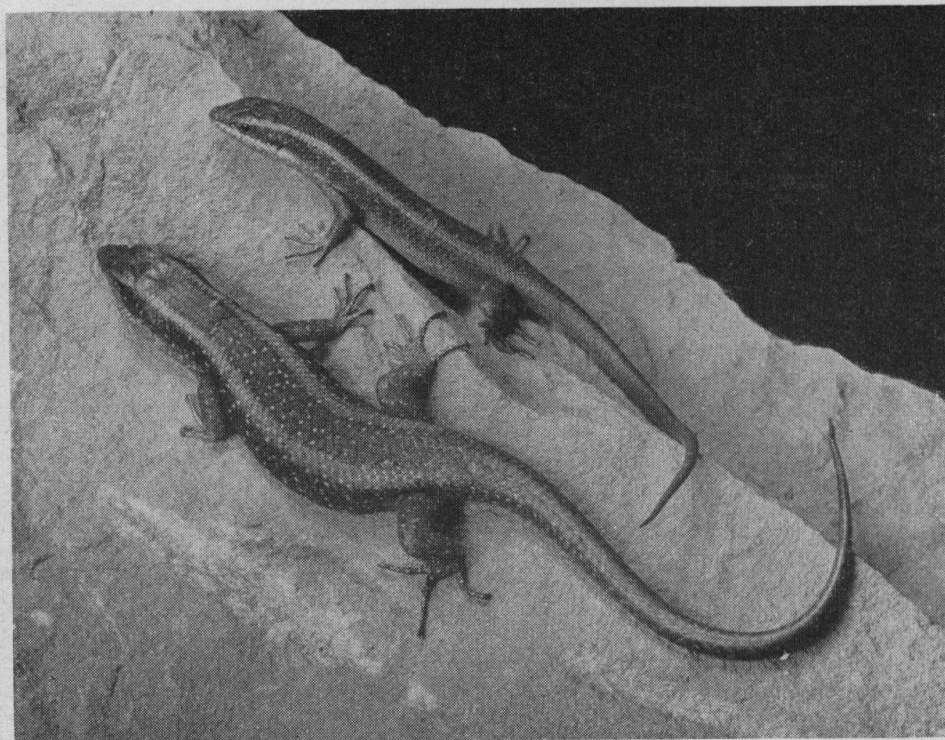
The South African three-striped skink (*Mabuya capensis*) can be taken as typical of those from rocky and sandy areas. This lizard measures from about 7 to 10 in., depending on the length of the tail. It is attractively marked in delicate shades of brown. Often the lines are absent, the pattern taking the form of speckles. I have found that this lizard

does very well in a vivarium of the size mentioned above. I keep mine in company with zonures. The vivarium should have a good layer of sand (3 in.); succulents and cacti can be planted in this (preferably in small flower pots for easy removal). If this is carefully done the result can be extremely pleasing. Against the sides and back of the vivarium I arrange large stones to provide plenty of hiding places, and towards the back I have a large flat stone forming a basking platform. Once again care in selecting attractive pieces of stone will greatly enhance the set-up.

I maintain the vivarium at about 75° F. during the day, by means of a light bulb as explained previously. A small water dish is always present, as these lizards drink frequently. At night the temperature can safely fall to 50 to 55° F. Some dry moss can be added to the vivarium if desired.

A good supply of live food must be maintained at all times. If cultures of mealworms are kept or if these are bought regularly they will provide a good standby. They are relished by all the skinks described. Gentles and blue-bottles are also taken but the three items mentioned should be given alternately, or varied, as the animals quickly tire of any one item of food. Variety with these small lizards is very important. Spiders, which are appreciated by most lizards, are a real tit-bit. These small skinks quickly become tame and will soon accept food from the fingers.

The beautiful speckled skink (*Mabuya homolocephala*), which also comes from South Africa, is sometimes available. The following description I wrote when I received my first specimen: "coloration greyish, with orange stripe down each flank, extending on to the tail." These fine lizards are shy and should not be kept with the bolder *Mabuya*

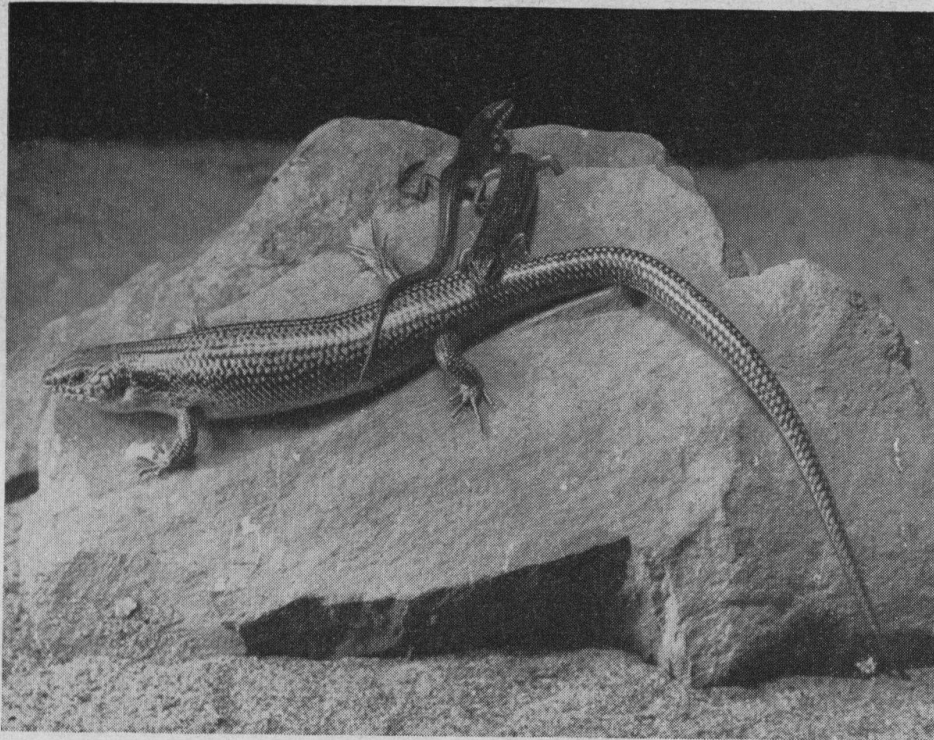


Photos:

Striped skinks (*Mabuya striata*)

Robert Bustard





U.S. bronze skink (*Eumeces obsoletus*) with young

*capensis*, which is apt to become a bully. They both require the same conditions, however.

Another species widespread in Africa—I have received specimens from Kenya and Southern Rhodesia—is *Mabuya striata*. This striped skink is rather attractive, having two dorso-lateral stripes of a pale brown or straw colour on a rich-brown background, which is peppered with paler spots. The throat is often reddish. The general appearance of this skink is clearly shown in the accompanying photograph of a couple of specimens in my vivarium. In my experience this species has proved shy, initially at least. I have always kept it in more humid conditions and with richer abundance of vegetation than suggested for the more southerly species. A temperature of 75° F. is recommended. Like the species described above it is viviparous and the lucky collector may be presented with a family of possibly three or four young, measuring about 2 to 2½ in. in length. With *Mabuya capensis* I have known the number to be as high as seven!

#### American Skinks

Turning to the American skinks, the sonoran or bronze skink (*Eumeces obsoletus*) is, in my opinion, one of the finest. (The many common names given to this skink shows the importance of the scientific nomenclature in identification.) This lizard often reaches about 12 in. in total length and, although it seldom tames well in the vivarium, makes a most handsome exhibit. They are always apt to bite and they will hold on for several minutes. The bite, while harmless, is often quite painful.

The illustration shows an adult female with two young. The young are darker in colour than the adults and have bluish tails. An adult female is usually brown or grey with the scales edged with black. This coloration gives it the alternative name of grey skink. Male specimens frequently display the attractive bronze colour. *Eumeces obsoletus* inhabits grassy slopes, where it hides under leaves and fallen trees. The vivarium should be arranged accordingly. I have found a temperature of 70 to 75° F. ideal.

Finally, mention must be made of the five-lined skink (*Eumeces fasciatus*). This attractive lizard, like *E. obsoletus*, is oviparous, the female coiling round the eggs until they

hatch. It measures about 8 in. The coloration is extremely variable and as with *E. obsoletus* varies between the adult and young and also between the two sexes. Adult males have a reddish coloured head, and this colour is more pronounced in the breeding season. This skink definitely likes moist surroundings, being found in woodland areas where it often hides in rotting logs or under leaves. If these conditions are simulated in the vivarium it lives very well. I kept my specimens at about 70 to 75° F. Like all the above-mentioned species it is insectivorous.

Many of the species described are often available and an attempt should be made to procure them. If other species come to hand the general principles described should be applied and a study of the skink's natural environment will help in the arrangement of a suitable vivarium for them.

## Maintaining Small Aquaria

(continued from page 235)

eggs to hatch out. Brine shrimps will live quite a few hours in fresh water, giving the neons plenty of time to eat up, and if anybody has objections because the diet is not varied enough, I can only say that my fish are still swimming about healthily after 18 months. If there is an ideal food, brine shrimp is it.

Here is an approximate cost of the main items required for this aquarium:

	£	s.	d.
Tank .. .. .	..	17	0
Light reflector (if bought) ..	..	7	6
Thermostat .. .. .	..	12	0
Heater .. .. .	..	10	0
Thermometer .. .. .	..	4	6
Plants .. .. .	..	15	0
Fish.. .. .	..	2	0
		<hr/>	
		£5	6 0

The above prices are approximate and could possibly be improved upon slightly, especially if less fish were bought initially.



Photos :

Robert Bustard

*Edible frog (Rana esculenta). This attractively coloured and active species seldom strays far from water*

## Hardy Frogs for the Vivarium

by ROBERT BUSTARD

IN the category of hardy frogs we find the three species which occur in Britain, namely the common frog (*Rana temporaria*), the edible frog (*Rana esculenta*) and the larger and recently introduced (1935) marsh frog (*Rana ridibunda*), which is now well established in the Romney Marshes. As these species are easily obtained they are likely to form the nucleus of the beginner's collection.

There are a number of ways of housing these frogs, since all can live in the outdoor reptiliary as well as in the indoor vivarium. If an outdoor enclosure is available I think that it is definitely preferable.

### Outdoor Reptiliary

It should be in a shady part of the garden and have a surrounding wall 3 to 3½ ft. high, and even then it is best to have an overhang on the inner side. This wall must be smooth, especially if toads are to share the enclosure since they are excellent climbers. The enclosure, which should be well planted with grass and damp-loving plants, must contain a roomy pool. This is particularly important for the marsh and edible frogs, as they are both largely aquatic and in a wild state seldom venture far from water.

An outdoor reptiliary has the additional advantage that the frogs will be able to find much of their food during the summer months. In addition they will soon learn the location of a tin sunk into the surrounding earth if it is filled regularly with gentles or mealworms. During summer small pieces of raw meat can be put into the enclosure to attract flies and bluebottles, which the inmates will catch with great agility. Marsh and edible frogs are also suitable inmates for an ornamental pond; however, the difficulty of keeping them within bounds can be quite a problem and the erection of a surrounding wall can spoil the whole effect. Usually they can be relied upon not to venture far

from the pond, but unless it has good surrounding cover some frogs will undoubtedly stray and become lost.

### Indoor Vivarium for Frogs

Alternatively these frogs can be kept in the indoor vivarium. The common frog will do well in a moist vivarium with a small water dish, in which it can sit when it feels inclined, and a piece of flowerpot or arrangement of stones under which it can hide. The vivarium should contain a good layer of earth covered by moss. Marsh and edible frogs require a rather larger water container, and do well in a converted aquarium where three-quarters of the available space is taken up by water. The vivarium should not be less than 24 in. by 12 in. by 12 in., and for the two last-named species should be roomier if possible, since they are great jumpers. The food can consist of earthworms, gentles, mealworms and bluebottles. Gentles and mealworms should be placed in tins sunk into the soil to prevent their escape before being eaten.

The common frog is too well known to require any description and is very variable in colour; some extremely attractive specimens are found in certain localities, my favourites being a rich reddish-brown colour with black markings.

The edible frog is somewhat larger than the common frog and has a more pointed snout. Large females may reach a snout to vent measurement of 4 inches. The coloration is greenish or brownish above, with or without bright leaf green, making the frog very handsome indeed.

The marsh frog, which is about 4 to 5 inches, the females always being somewhat larger than the males, is olive-brown and olive-green. Like the edible frog the limbs are barred with black and similar markings occur on the body. The marsh frog can be differentiated from the edible frog

as it invariably lacks the light vertebral stripe so characteristic of *R. esculenta*.

In the winter these frogs are best left to hibernate in the mud at the base of the pond if they are kept in the outdoor enclosure. This can only be done if the pond has a depth of about 2 feet in parts. If kept indoors the vivarium or aquarium should be moved to a cool frost-proof shed or garage and left there until the spring. The marsh and edible frogs will hibernate under the water, where they may be joined by the common frogs, or these may burrow under the moss and into the damp earth.

There are a number of other frogs belonging to the genus *Rana*, several of which occur in Europe but are seldom available. The North American leopard frog (*Rana pipiens*) is quite often available and is a very attractive species. The general body outline is similar to that of the edible frog although generally somewhat slimmer. The ground colour is olive-grey with dominant black bars and blotches. This frog does very well either indoors or outdoors and is a great jumper. The accuracy with which it can catch bluebottles and other insects by jumping at them from a distance of several feet has to be seen to be believed. It will accept the food mentioned above.

These hardy frogs discussed in this article will live for years in captivity, where, provided that they are allowed to



Leopard frog (*Rana pipiens*), a North American amphibian

hibernate and given access to a pond, they will breed each spring. They are ideal species for the beginner to gain experience with before progressing to the more difficult sub-tropical species.

## Breeding the Pearl Danio (*Brachydanio albolineatus*)

by E. WALLWORK

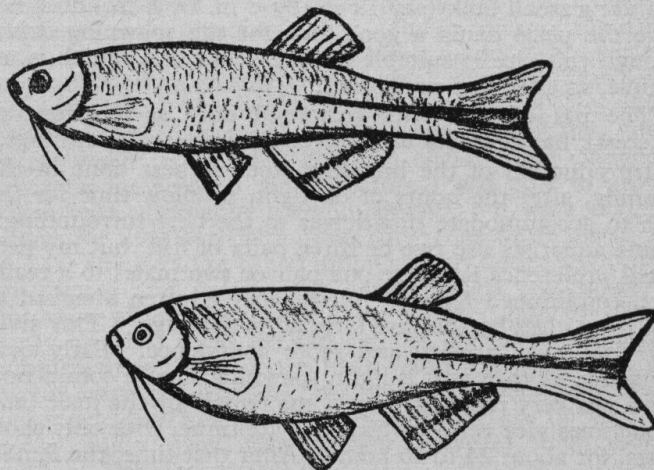
THE colour varieties of this beautiful little fish are usually available to aquarists. The customary one is silver-grey and overlaid with a most attractive mother-of-pearl sheen, with a broad orange-red stripe running from the centre of the caudal fin forwards to a position below the dorsal fin. This line is approximately two scales in depth and half of this depth is situated above and below the lateral line. In certain lights this line is also bordered by a violet colour.

The other colour variety of this fish is the golden pearl danio, which is basically the same fish, but overlaid with a uniform gold flush and the mother-of-pearl and lateral stripe are much less in evidence. It breeds the same as the usual type and is most likely a result of selective breeding, as this variety does not occur in nature.

It is often stated that the breeding of this fish follows similar lines to that of the zebra fish. There are, however, one or two important differences.

On average an adult pearl danio is  $\frac{1}{2}$  inch longer (male or female) than the zebra fish when adult, reaching about 2 in. long in the male and  $2\frac{1}{4}$  in. in the female. They are best bred when younger and at about three-quarters of their adult size. For considerations of size alone the pearl danio is easier to bring to breeding condition in a medium-sized tank than in a small one.

Pearl danios are preferably separated as soon as their sex becomes obvious, as unlike the zebra fish they cannot be brought into satisfactory breeding condition in a com-



Pearl danio; male above, female below

munity. Female pearl danios soon lose all their eggs in the company of vigorous males. Shape is the only reliable guide to sex in this fish. The female, naturally a little larger than the male, equally colourful, soon shows distension of the abdomen at its keel, extending evenly as far as the anal fin.

Feeding presents no problem, as they will eat almost

# EUROPEAN TOADS

by ROBERT BUSTARD

THERE is considerable diversity among European toads and a number of them have long been popular vivarium pets. The smaller species are definitely best suited to life in the indoor vivarium, as they will seldom be seen in an outdoor enclosure, but all the species mentioned can be kept out of doors in this country and can be permitted to hibernate outside.

It is convenient to consider these toads in two groups, the members of each group being suitable for a community vivarium on the basis of size. This does not mean that the members of the different groups cannot be kept together, but in my opinion the arrangement described shows all the species to their best advantage.

Among the larger species are the common toad (*Bufo bufo*), the natterjack toad (*B. calamita*), sometimes called the running toad, the spade-foot toad (*Pelobates fuscus*) and the green toad (*Bufo viridis*). These toads will all do well in the outdoor reptiliary and will live happily in an enclosure in company with the frogs described in last month's article. Naturally, the enclosure should contain ample drier areas with loose flat stones arranged to provide hiding places. Feeding arrangements under such conditions are identical with those outlined for frogs.

They can also be kept indoors either in a large community vivarium or in smaller vivaria. As with all amphibia they should not be overcrowded; a 36 in. by 15 in.

by 15 in. vivarium would be suitable for up to one pair of each of the four species mentioned above.

## Natterjack and Spade-foot Toads

Natterjack toads prefer drier sandy conditions and spade-foot toads spend most of their time buried in mud. For these reasons when keeping them indoors I prefer to keep these two species in separate vivaria, an 18 in. by 12 in. by 12 in. vivarium providing ample room for one or two pairs of natterjack or spade-foot toads. I provide my natterjack toads with a sandy soil with some moss and suitable hiding places. A water dish is really superfluous as they seldom enter the water except in the breeding season; however, a small pie dish can be sunk into the soil if desired. The vivarium must not be too dry and should resemble a woodland area. For the spade-foot toad a large pool should be provided and hiding places are not required as these toads will burrow down into the damp muddy earth, which should be several inches deep for this purpose.

The natterjack toad, which measures about 2½ inches, is often very attractive, being an olive green above with a prominent dorsal stripe which can be yellow, gold or reddish. This toad often progresses in a most unusual manner by short mouse-like runs, instead of by hopping like other toads.

## Green and Common Toads

The green toad will live well with either the common toad or the natterjack toad. It prefers somewhat damper surroundings than the natterjack toad although it can live in quite dry surroundings. My specimens in the outdoor enclosure are often seen sitting in shallow water or damp localities. The green toad lives for a long time in captivity and is a very popular species, easily obtained during the late spring and summer months. This species is very variable in colour, some being decidedly green (especially males) whereas others are olive coloured, heavily blotched with brown. It is about 3 inches in length. The colour can, of course, be varied to suit different surroundings. Below it is a dirty white to grey.

The common toad is very often found in gardens where it does much good by eating undesirable insects. They are very much creatures of habit and will frequent the same "home," e.g. in a rockery, for years and have a regular routine in searching for food, often being found in one part of the garden at a certain time in the evening. Large females may reach 4 inches; males seldom reach 3 inches.

Amongst the smaller species are the fire- and yellow-bellied toads (*Bombina bombina* and *Bombina variegata* respectively), also the interesting if sombre midwife toad (*Alytes obstetricans*). The midwife toad is terrestrial and best suited for an indoor vivarium owing to its small size (about 2 inches). It may sometimes be induced to breed and the unusual breeding behaviour, where the male carries the strings of eggs coiled round his hind legs, was described by me in *The Aquarist* (August, 1957).

## Fire- and Yellow-bellied Toads

The *Bombina* toads are also best suited for an indoor vivarium as they seldom reach 2 inches, although like the midwife toad they are hardy and will live in the outdoor reptiliary. Like the midwife toad they show a marked



Photo:

R. Bustard

Green toad (*Bufo calamita*), a popular species imported into Britain in large numbers each summer



preference for flies and bluebottles but will also eat gentles.

The *Bombina* toads spend much of their time in shallow water, ditches and puddles, and are good swimmers. They are therefore best kept indoors in an aquarium, which should be about half land (damp mud and moss raised above the water on bricks or stones) and half water. The water need only be about 2 inches deep and should contain some water weeds such as *Elodea canadensis*. An aquarium 18 in. by 12 in. by 12 in. provides ample room for half-a-dozen of these little toads and their amusing antics—they will soon become tame enough to take flies from the fingers—make them interesting little vivarium pets.

The colour above is olive, dark brown, or dark grey-black. Below, the fire-bellied toad is marbled with bright red whereas the yellow-bellied toad has the ventral side marbled in yellow or pale orange. This colour is also found on the ventral surfaces of the limbs. This bright colour acts as a warning to enemies and, when frightened, the fire-bellied toad arches the back and thus the undersides of the front and rear of the body and limbs are exposed, showing the bright coloration.

*Fire-bellied toad (Bombina orientalis). This active toad is easily kept in the indoor vivarium*

## COLDWATER FISH-KEEPING QUERIES answered by A. Boarder

**I have a pet shop and wish to make a pond to breed goldfish for sale. Can you give me any advice on the subject?**

The best advice I can give you is to forget your idea completely and *buy* fish for resale in your shop. I do not wish to appear unhelpful but if you have no previous knowledge of fish breeding you are not likely to be very successful at goldfish breeding. It is, of course, possible to breed goldfish in this country but at the moment I do not think that it would pay you. Goldfish can be imported so cheaply now. Just after the war it was possible to earn a little from breeding goldfish in this country but once imports were allowed the market was flooded with foreign fish and it was not a profitable business to breed common goldfish. Where fancy varieties are concerned it is so chancey that only a few top breeders are able to make much from their fish, and most only breed them now as a hobby. Goldfish bred out of doors in this country take such a long time to change from their original bronze to the desired gold; in Italy, for instance, this change takes place at a much earlier age. By all means make a pond and have a go at breeding some fish as a hobby, but forget the idea of making your fortune from it. Until cheap imports are forbidden there is little hope for British breeders.

**I have a large open-air swimming pool which is used only for a few months of the year. Would it be possible for me to stock the pool with coarse edible fishes during the months the pond was not used for swimming, so that a little fishing for food would be provided? I know nothing of the rate of growth of fishes and whether they would grow from sardine size to something big enough to eat in a season.**

Coarse fishes do not grow quickly enough for your purpose in this country. A small fish of the size you suggest would not be likely to grow more than half its size in a year. You could, of course, keep some fishes in the pond during the off-season months but they would

have to be removed when you start chlorinating the water in the summer.

**I have an aquarium with three small crucian carp, a catfish and a goldfish, with plants from local ponds. The fishes appear well and are eating a variety of foods, but two of the carp have a rash of what appear to be red spots or bites. Could you give me any idea as to what this might be?**

If the fishes have been bitten then it is almost certain that the catfish is the culprit. These fish can be very troublesome and I do not recommend that they are included in a community tank of coldwater fishes. If you must have a scavenger then use a tench, either a green one or a golden one (both good but the latter is more expensive). I have had many years' experience with keeping green tench with fancy goldfish and so far I have not known one of them to interfere in any way with the goldfish, although they are large enough to swallow some of the fancy fish at one gulp. The coldwater catfish must not be mistaken for the tropical kinds, which generally speaking do not reach a large size and appear to be harmless to other small fishes. The coldwater catfish can grow very large and is partly carnivorous.

**I have a garden pond which holds about 1,000 gallons of water. It has been going for the last 14 years and has a good stock of water plants and fish. Suddenly for no apparent reason a green film has begun to settle on the surface of the water. I flushed this off and within 24 hours the same thing has happened. What is the cause of this?**

It appears that there has been a quantity of free-floating algae in the water and that this has suddenly died. It has then floated to the top. The green algae will sometimes die off and a pond or tank which has been very green appears very clear, and the dead algae will either fall to the bottom or, as in your pond, come to the top. The algae has probably died because of a change in the pH of the water or the excess of certain gases which it dislikes. I have known this to happen in one tank among several similar tanks; it has suddenly gone quite clear after having been very green for some time. I have found that this clear tank has been rather dangerous to fish life and have changed the water completely. In this case all the dead algae fell to the bottom.

subject of some controversy in recent years. It is a native of China and is a peaceful, though not very highly coloured, old favourite, though it is not to-day kept to any large extent. Some years ago, however, a beautiful gold-and-black barb appeared on the market as *B. schuberti*, and it was said, by some, to be but a colour variety of *B. semifasciatus*. There are said to be slight anatomical differences between the two fishes and it has recently been given yet another name, *B. sachsii*. Whatever the true name of this fish is, however, it is worthy of a place in any collection of barbs.

The cherry barb, *B. titteya*, from Ceylon is another beauty, and is superficially unlike any of its family. It is slimmer in build than most of the barbs and has a black line running from nose to tail. The colours of the male are exceptional, for his body and fins are a deep glowing red unlike that seen in the other members of the group.

Before dealing with the popular species with vertical bars there are one or two other small species that are worthy of mention. *B. ticto* is, like *B. cumingi*, another two-spot barb, though the anterior spot is much smaller than the other one. The male's dorsal is edged with red. *B. terio* has one spot near the tail and *B. phutumio*, the dwarf barb, has three small spots.

Undoubtedly the most popular of all the barbs are the banded species exemplified by the tiger barb, *B. tetrazona*. There has been much confusion over the names of these barbs, and for years any barb from the Far East with vertical stripes was offered as *B. sumatranus*. The ordinary tiger barb, *B. tetrazona*, is too well known to warrant description, but some of its choicer relatives are less familiar to the ordinary aquarist. The six-banded barb, *B. hexazona*, has six deep-green vertical bands and the fins of the

male are red at the base whereas the anal fin of the female is colourless. In theory they are as easy to breed as the other species and there should be a good market for the offspring, as there is for the other striped barbs. Amongst the rarer barbs are the beautiful *B. pentazona* and *B. partipentazona*, both of which are well worth acquiring.

A barb that stands by itself is *B. nigrofasciatus*, the nigger or ruby barb. To be seen at its best it must be in a well-established tank, where it will soon settle down and become deep red in colour with intense black bars. The dark dorsal of the male distinguishes it from the female, whose fins are colourless.

The following large barbs are all desirable if space can be given to them. Some are old favourites and others are comparative newcomers to the hobby. The clown barb, *B. everetti*, and the spanner barb, *B. lateristriga*, both reach a length of about 5 inches. The clown barb has more colour and is usually chosen in preference to the spanner barb, which, however, is an attractive fish. *B. arulius* and *B. filamentosus* are still larger fishes, and the rays of the dorsal fins of the adults extend beyond the margins of the fin itself. A contrast to these four fish is the tinsel barb, *B. schwanenfeldi*, a silver fish of great beauty, and one that is continually on the move.

All the species mentioned so far have been Asiatic fishes, but recently various African species have been imported in small quantities. When opportunity arises these fishes are worth seeing. Amongst them have been species such as *B. wernerii*, *B. trispulus* and *B. schneemanni*, and others which are, at present, unidentified. More barbs will arrive in time and we now know enough about the family to be sure that they will make useful and ornamental additions to the tanks of the discerning aquarist.

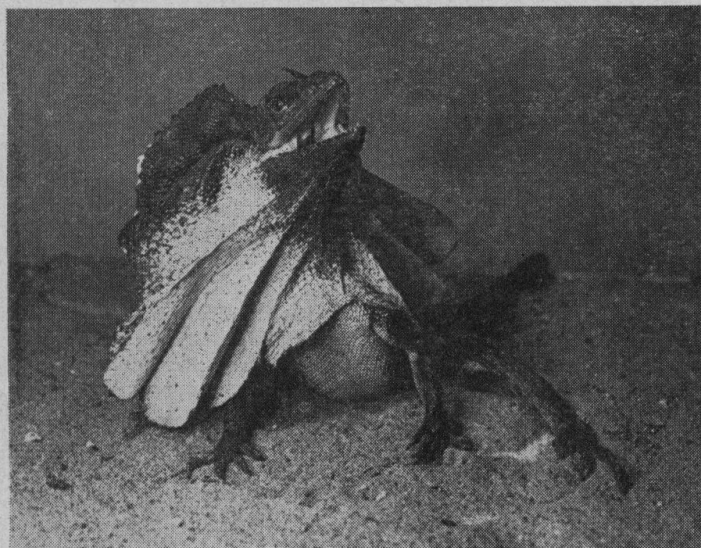
## Unusual Imports

by ROBERT BUSTARD

THE frilled lizard comes from the Australian outback, mainly in Northern Territories. It belongs to the family of lizards called the Agamidae, the members of which include as well as the many common *Agama* lizards, the bearded dragon (*Amphibolorus barbatus*), the mastigures (*Uromastyx*), the horny devil (*Moloch horridus*) and the flying dragon (*Draco volans*).

This large lizard measures about 3 feet, much of which is the long tail, and it has an enormous Elizabethan ruff (round the neck) which can be erected at will. This is a form of bluff to deter would-be aggressors. The frill, which measures about 10 inches in diameter, is a brilliant orange-yellow with black edgings and splashings, but the body is a sombre blackish brown. This lizard can run on its hind legs, using its tail as a balance; the resemblance to the prehistoric monsters of the Age of Reptiles is therefore complete.

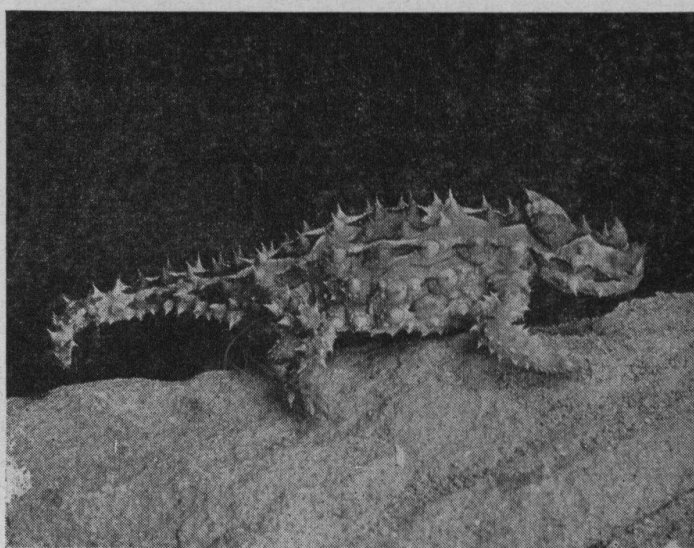
(Please turn to page 19)



Photos :

R. Bustard

Frilled lizard with frill partly erected



Australian mountain devil or horny devil

## FEDERATION OF SCOTTISH AQUARIST SOCIETIES

A VERY successful meeting of the **Federation of Scottish Aquarist Societies** was held recently at which 80 aquarists from all over Scotland were present. At the business session the Constitution of the Federation was unanimously adopted. Various suggestions from affiliated societies were discussed and were remitted to the committee for further consideration.

There were 85 entries for the table show and the winners were: Swordtails (16 entries): 1, Hector Kerr, Edinburgh A.S. (red-eyed red); 2, Mrs. J. Taggerty, East Fife A.S. (green); 3, Alex. Cross, Dundee A.S. (black); 4, D. Mackersie, Kirkcaldy A.S. (red-eyed red). Characins (40 entries): 1, Ian Clark, Inverness A.S. (*Hyphessobrycon rubrostigma*); 2, Walter S. Bisset, Jr., Edinburgh A.S. (*Hyphessobrycon flammeus*); 3, Gordon Ritchie, Kirkcaldy A.S. (*Moenkhausia pittieri*); 4, E. J. Seymour, Dundee A.S. (*Hyphessobrycon rubrostigma*). Gouramis (23 entries): 1 and 2, Alex. Cross, Dundee A.S. (*Helostoma rudolfi*); 3, N. Kennedy, Edinburgh A.S. (*Colisa labiosa*); 4, W. Spark, East of Fife A.S. (*Trichogaster trichopterus*). Dwarf Cichlids (six entries): 1, J. Rawlings, Inverness A.S. (*Pelmatochromis kribensis*); 2, Ian Clark, Inverness A.S. (*Pelmatochromis kribensis*); 3, J. Rawlings, Inverness A.S. (*Pelmatochromis kribensis*); 4, D. Oxley, Edinburgh A.S. (*Apistogramma ornatipinnis*). Best Fish on show: This award went to Ian Clark, Inverness A.S., for his very fine *Hyphessobrycon rubrostigma*.

The next full meeting of the Federation, which will also be the annual general meeting, will be held in Inverness on Sunday, 6th September, 1959. Full details will be issued in due course.

## GOLDFISH SOCIETY OF GREAT BRITAIN

A QUARTERLY meeting of the **Goldfish Society of Great Britain** was held on the 7th March at the Friends House, Euston Road, London, N. Welcome guests were three members of the Bristol Coldwater Fish Breeders Group. Capt. L. C. Betts explained the G.S.G.B. approach and principles regarding judging goldfish. Members were issued with judging sheets and joined in a judging exercise by appraising seven singletails staged for this purpose. Mr. R. J. Affleck then described the result of some research which had been undertaken by the Technical Committee into the question of body length in singletails, and said that a publication giving full details was being prepared for G.S.G.B. members.

The final item on the programme was the presentation of a canteen of cutlery to Capt. L. C. Betts in recognition of his services to the Society and to the goldfish fancy prior to his retiring from the chairmanship after 10 years. The next meeting will be held at Kingsway

Hall on 6th June, when it is hoped to formalise standards for pearl scales, celestials, bubble-eyes and perhaps pom poms. Visitors will be welcome.

SOME recent show results are reported from **Friends Aquarist Society** and these are as follows: Inter-club with Catford—1st leg: Catford 1,293 points; Friends 1,241 points. The classes were Anabantids, Characins, A.O.V., Livebearers. Highest pointed fish was a bleeding heart tetra with 92½ points, belonging to E. Angus (Catford). The 2nd leg resulted as follows: Friends 1,178 points; Catford 1,147 points. The classes were: Barbs, Cichlids, Egg-laying Toothcarps. Highest pointed fish was a tiger barb with 84 points belonging to E. Spooner (Friends). The Cats and Loaches competition held recently was won by C. Ford with 87 points. This club who meet in Brixton would welcome more new members and the secretary is Mr. E. H. Barfoot, 378, Grove Road, Mitcham, Surrey. Telephone: Mit. 3839.

PLANS are well advanced for the **Catford A.S.** first annual open show, which will be held on Friday, 22nd May and Saturday, 23rd May next. Entries are now pouring in for this event in which many excellent trophies may be won including the London Tooth Carp Championship Trophy. Any show secretaries who may be interested should write for show schedules to Mr. S. N. Cornock (show secretary), 33, Howard Road, Bromley, Kent. Secretaries are advised not to delay as a large entry is anticipated in all events.

DESPITE a slight decline in support at the beginning of the year, the **Hampstead Aquatic Society** ended the year with an increase in members, it was announced at the annual meeting.

The Mayor of Hampstead, Lieut.-Colonel H. Ashley-Scarlett is president and George Cansdale, vice-president; Mr. P. B. Utton is chairman, Mr. L. Coatman, secretary and Mr. K. J. A. Pye, the treasurer. Mr. K. Walker was elected show manager and Mr. R. Cryer show secretary.

A TABLE show for two classes of tropical fish was the main feature of the last meeting of the **Hounslow and District A.S.** The classes were for Livebearers and Pairs, and the results were as follows:

Livebearer class: 1, Mr. B. Boulton, double sword guppy; 2, Miss Carter, green swordtail; 3, Mr. Woodward, red wagtail sword.

Pairs class: 1, Mr. Worms, three-spot gourami; 2, Mr. Luff, black swords; 3 tie, Mr. Woodward, neon tetras and pearl gourami, and Mr. Worms, three-spot gourami.

While the show was being judged, Mr. R. Luff gave a short talk and also answered questions on fishkeeping.

MEMBERS of the **Walsall Aquarium and Pool Society** are fortunate in that their president, Mr. S. Millis-Clark, is an expert colour photographer. At the March assembly of the Society, Mr. Millis-Clark projected a large number of his slides depicting his beautiful garden and pools. Besides having a flair for finding just the right angle for the unusual photograph, Mr. Millis-Clark is also an authority on garden pools and the members were given many useful ideas for improving their ponds.

The Society's programme for May includes a table show of livebearers and an outing to the Severn Wildfowl Trust.

THE clubroom at the **Wirral Aquarist Association**—formerly Birkenhead and District—resembled a horticultural stand at a flower show at the earlier meeting of the month. Mr. Jones, a commercial grower of cactus who is also a club member, gave an informative talk on the growing, propagation and keeping of cacti and succulents.

He brought about 100 specimens to illustrate various points in his talk, and answered many queries put to him on the subject, during the course of the evening. Second meeting was the annual general meeting when election of officers took place, after the main committee meeting and reports had been read.

MEMBERS of the **Bradford and District A.S.** recently enjoyed an excellent illustrated lecture by Dr. Elliott of Leeds. The slides were very good and showed a wide variety and selection of pond life. Arrangements are already in hand for this year's show.

THE annual general meeting of the **Reading and District A.S.** was held recently when the following officers were elected: Chairman, Mr. Pitts; hon. secretary, Mr. G. Thompson, 57, Royal Avenue, Calcot, Nr. Reading, Berks.; treasurer, Mr. I. Godden. President for several years past, Mr. A. Crisp has consented to hold office once again. Meetings are held on the first and third Friday in the month at the Elephant Hotel, and new members will be welcomed.

A MONTHLY newsletter is now being published by the **Wirral Aquarists Association**. The club meets on the second and last Wednesday every month at 7.30 p.m. at the Conservative Club Rooms, Bedford Road East, Rock Ferry, and the secretary is Mr. L. Fidal, 5, Buttermere Avenue, Noctorum, Birkenhead.

## AMALGAMATION

THE Prestwich and District Aquarist Society and the Bury Aquarist Society have now amalgamated, and the new title is the **Prestwich and Bury Aquarist Society**. The chairman is Mr. N. J. Boardman; vice-chairman, Mr. L. Barnes and the secretary is Mr. N. Dyson, 60, Wilton Street, Whitefield, Manchester. The meeting night is the second Tuesday in the month at the Junction Hotel, Whitefield.

## UNUSUAL IMPORTS

(continued from page 14)

The frilled lizard is very rare and the specimen shown in the photograph formed part of an import from an expedition by friends of mine. It is possibly the first specimen to reach Britain since the 1930's.

The mountain devil or horny devil (*Moloch horridus*), illustrated here, is a heavily armoured lizard also from Australia and feeds entirely on certain species of ants.

As the photograph shows, the spines on the body and tail are continued on to the limbs; small horns are present

on the head and the neck is protected by a large protuberance surmounted by two spines. This spiny nature seems to be characteristic of certain desert lizards and is well shown in the American horned lizard (*Phrynosoma cornutum*), which will be familiar to many readers. It is a member of the Iguanidae, and the close resemblance to the horny devil is an example of "parallelism" or parallel development. This is often seen in unrelated groups where members of the various groups have superficial similarities occasioned by their adaptation to the same type of environment.

The horny devil is seldom seen in Britain owing to its rarity and the difficulty in providing it with food. Two specimens which I kept laid four and five eggs respectively.

like to write to me, I would be delighted to hear from them, as I am practically cut off from other aquarists. The only thing I can look forward to is my copy of *The Aquarist*. I tried joining our local aquarist society, but find practically no interest in coldwater fishes. In fact most of the meetings, I find, are taken up with club business and red tape. All letters will be answered.

FRANK BUTTERS,  
57, Conway Road, Knypersley, Biddulph,  
Stoke-on-Trent  
(Telephone: Biddulph 2028).

### Resuscitation of Frozen Fish

IN relating the following incident, I do so in order that I might help our readers who have garden pools, to save fish which appear to be quite dead. Despite keeping an ice-free area on my 9 ft.-diameter pool I noticed a 9 in. golden carp lying on its side under 2½ in. of ice. Chipping the ice away with an ice pick I took the fish into the house, turned it about from hand to hand, but as its mouth was wide open, I decided it was dead, and threw it on the fire.

Later, I saw another one, the same size, lying on its side. So once more chipping the ice, I brought it into the house. But as this particular fish has been in the pool since 1945, and named "Callosus," I was very anxious to make sure that it was dead. So, holding the fish upright, I poured tepid water from a jug into its wide open and rigid mouth. Within a few seconds its tail began to twitch, I continued to pour in the water until it became impossible to hold the fish any longer.

Until I could fill a larger aquarium tank I put it in the sink bowl in tepid water, where it began to roll from side to side. Within 15 minutes it had regained its equilibrium and was put into the tank where it is now fully recovered. Would that I had tried this remedy with the other fish, which was bought only last summer.

It was the fact that "Callosus" was tame, and an old friend, that made me try to save him.

So, if any readers find fish appearing to be dead it might pay to try my remedy.

(Mrs.) OLIVE M. MATTHEWS,  
Lymm, Cheshire.

### Fancy Goldfish

MR. N. E. PERKINS' article on celestial goldfish in the January issue of *The Aquarist* once again brought to light the fact that several of to-day's coldwater judges and the pointing systems used are completely out of touch with the difficulties met in producing the higher types of goldfish. They do not seem to realise that the further away from nature the creature is removed, the harder it is to retain the mutation. As fancy goldfish are usually shown in mixed classes, fantails and veiltails have an advantage over lionheads, bubble eyes, celestials and even moors.

Surely there is a need here for a system of pointing to be brought into operation whereby points are given to a variety based upon the difficulty in producing it?

R. D. ESSON,  
Willesden, London, N.W.10.

### Cacti in the Fish House

I HAVE been interested in your recent short articles on growing cacti in the fish house. I do not agree with growing cacti in the humid atmosphere of the average fish house as cacti need a very dry atmosphere to succeed.

I would like to suggest to any aquarist who has a heated fish house to try orchids; the warm humid conditions are ideal for the growing of these plants. Contrary to general opinion the growing of orchids is no more difficult than growing cacti or any other pot plant. Given a reasonable amount of daylight and shading from the direct rays of the

sun in summer, these exotic plants will give a wonderful display with very little attention.

Orchid plants range in price from a few shillings to several pounds, and are divided into three main classes: cold house, intermediate and hot house; there are dozens of varieties to suit all pockets and various degrees of heating.

E. A. CARLESS,  
Portsmouth, Hants.

*Our contributor to the series of notes on cacti is considered to be one of the leading experts on growing cacti in this country, and he writes:*

*The statement that cacti need a very dry atmosphere to succeed is not correct for all species. Contrary to general belief, many cacti are found in Brazil, some even growing as epiphytes on trees in the forests in company with some of the orchids. Even some of the Mexican cacti must be given some shade as they grow in the shade of shrubs and long grasses in their native habitat. Many genera grow better in a fish house than they would in a sunny greenhouse. Such genera are "Epiphyllum," "Zygocactus," "Schlumbergera," "Rhipsalis," "Pereskia," "Nopalxochia" and many species of other genera. Fish-house conditions are also ideal for raising cacti from seed, the conditions being those most favoured by the leading growers. Most cacti growers prefer them to orchids as most are much more interesting and spectacular when not in flower than orchids.*

## Most Valuable Snake in the World?

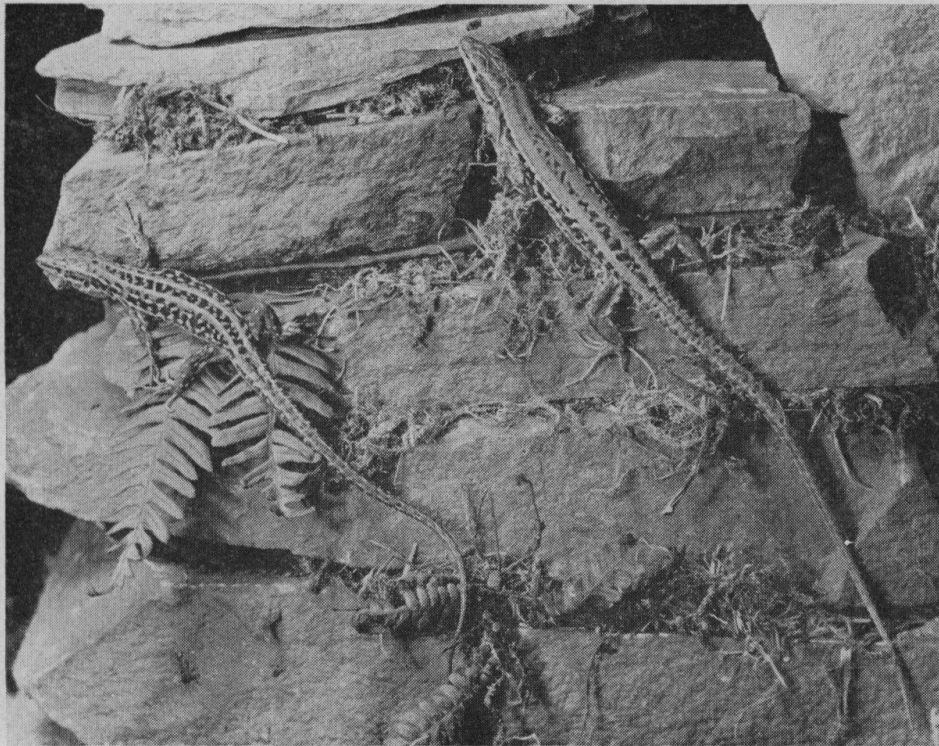
MR. P. RHYINER, the famous animal collector, has deposited his white python for a short season at Paignton Zoo. This white python is the first white snake ever known in zoology. It is milk-white with blue eyes and is nearly 7 feet long; it is valued at £5,000.

The snake was first heard of by Mr. Rhyiner 4 years before he actually secured it. Owing to the folklore attached to the white snake there was a tremendous amount of opposition to the capture and removal of the snake from East Bengal. One of the legends comes from China, where the snake is known as "Pie-su-Chang" or "Lady White Snake." The story is that a white snake was once picked up by a student and kept in his desk at school and later taken home at holiday time. The student later took pity on the snake and released it. Sixteen years later the snake turned into a beautiful maiden who sought out the youth and expressed her gratitude and later married him. The Gods, however, were so wrathful that she should have married a human being that they changed her back into a white snake.

Another legend emanating from India is that the snake is really the Goddess Kali, the Goddess of Destruction, and that she appears once in a thousand years in the form of a white snake. It is interesting to note that geneticists estimate that it would require one thousand years for a combination of genes to produce a pure white snake.

As already stated, there was great opposition to the removal of the snake and after lengthy consultations with the High Priests, it was resolved to perform a ceremony of appeasement to the Gods. The ceremony commenced at sundown and went on throughout the night to sunrise. There was a sacrifice of a white cock to the Gods and the loosing of many white pigeons. At dawn, Mr. Rhyiner handed over a considerable sum of money to the Temple and was then allowed to remove the snake. In addition to the sacrifices, there were lengthy incantations by the High Priests and Local Elders.





Photos:

Robert Bustard

Wall lizards (*Lacerta muralis*) are excellent climbers and a wall such as that illustrated should be present at the back of their vivarium or in the reptiliary

## Hardy Lizards—by ROBERT BUSTARD

**B**Y the month of April all the British lizards have emerged from hibernation and can be seen, on good days, lying basking in the sun. The mating season for the slow-worm (*Anguis fragilis*) and the common lizard (*Lacerta vivipara*), which have been active for about a month now, has commenced and May is an ideal time to add these specimens to the collection.

Imports of the hardier European lizards are arriving by May and it is warm enough to allow such species as the wall lizard (*Lacerta muralis*) and the green lizard (*Lacerta viridis*) to go straight into the outdoor reptiliary.

### British Lizards

Let us take the British species first, all of which are ideal for the beginner because they are easily kept and can be caught or purchased very cheaply. Slow-worms can often be found hiding under flat stones. If a lizard is frightened and evades capture it is a good plan to remain still—it will often return to bask in the same spot after a few minutes.

The slow-worm is easily kept in a simple vivarium, which can be of wood with a glass front. A layer of soil (3 in.) is placed in the foot, moss is set on top of part of this and a large flat stone or slab of bark is placed in a corner of the vivarium. A small water dish is added and an area of hard-pressed bare soil is left for feeding. A suitable size of vivarium for a pair of slow-worms is about 24 in. by 12 in. by 12 in.

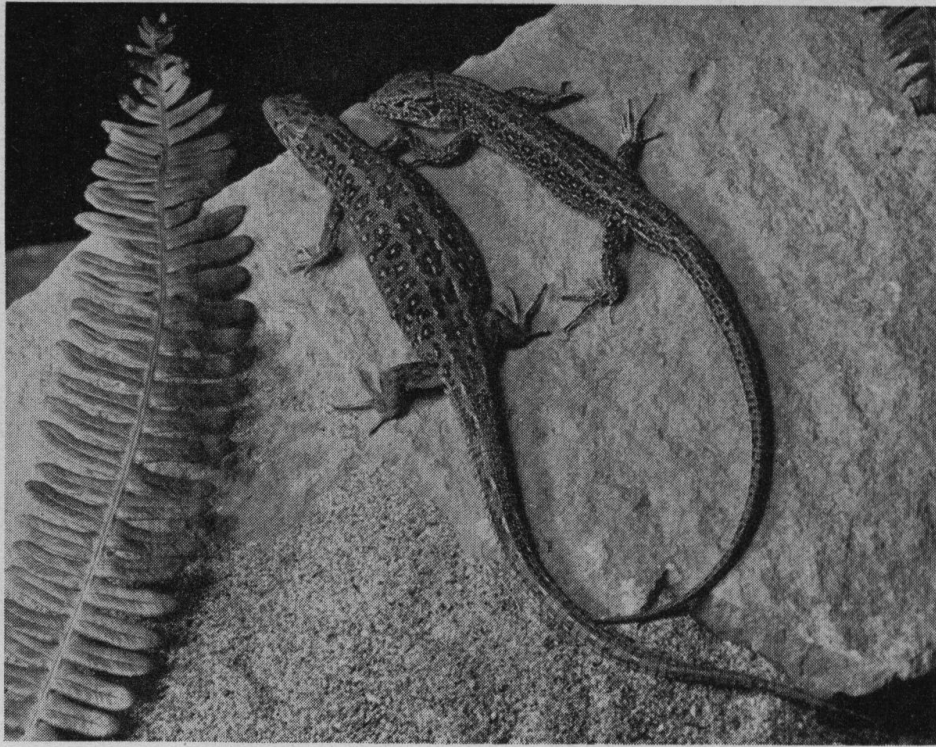
When the slow-worms are introduced they will soon construct a few tunnels in the soil leading to their hide-out under the stone. If the vivarium is placed in the sun they will come out and bask. The best time to feed them is in the evening and food is simply dropped in front of them. Suitable food is small earthworms, or slugs, the white variety being much preferred. Soon the slow-worms will feed in the presence of the owner. They are interesting to

watch as they approach their prey, and then come down on it deliberately from above. Slow-worms are ideal subjects for the outdoor reptiliary, and specimens in the collection often give birth to their young, which number usually from six to 12. The care of baby reptiles will be discussed in a future article during the summer when the subject is topical.

The slow-worm, sometimes known as the blind-worm (it is neither blind nor slow), is a legless lizard. Although its appearance is somewhat snake-like it shows the usual lizard characteristics (not found in snakes) including the ear opening to the exterior and movable eye-lids. The coloration is very variable. Adult specimens reach about 15 in. Price varies from 2s. 6d. to 4s., depending on size.

The other two species of British lizards are of the characteristic lizard form and possess four legs, which are well developed. The common lizard, like the slow-worm, is widely distributed and produces living young, i.e., it is (ovoviviparous). Adults measure about 6 in. The coloration of this attractive little creature is very variable, being brown with black markings above. A dark vertebral line is usually present. Below, the female is yellow or pale orange whereas the male is bright orange or reddish. The base of the tail is thicker in male specimens and this, apart from the colour, is a simple way of sexing members of the Lacertidae. This species can be purchased for 2s. 6d.

If the common lizard is housed indoors it must have its vivarium placed in the sun each day for as long as possible. Specimens in nature bask in the sun from early morning to late evening. The vivarium (of similar size to that for the slow-worm) should have a few inches of sand on the floor and flat stones should be arranged at the back and sides to provide hiding places and basking sites. Some dry moss can be added if desired. A small water dish should be



Shortly after this photograph of these sand lizards (*Lacerta agilis*) was taken the female (left) laid nine eggs

present at all times for all these lizards. This arrangement is also suitable for the sand lizard (*Lacerta agilis*) and the wall lizard (*Lacerta muralis*) described below. The vivarium size mentioned above is suitable for only between two and four specimens and should be larger if possible.

Food for these lizards can be any live insects. The main stand-by of the collector are gentles, bluebottles and mealworms, but non-hairy caterpillars, small moths and butterflies will also be eaten. Spiders are very readily accepted and are a good item to tame them with as they will quickly learn to take them from the fingers. It is most important to provide variety in diet, as, like all creatures, they soon tire of a monotonous diet.

#### European Lizards

The sand lizard and the wall lizard are both oviparous; in fact the common lizard is the only member of the genus *Lacerta* to produce live young. Wall lizards may produce several clutches of eggs in the course of the year. The hatching of the eggs and rearing of the young has been discussed at length in the current issue of the *British Journal of Herpetology* (vol. 2, no. 7: December, 1958).

The sand lizard lays between six and 12 eggs in one clutch each year. Both of these lizards measure about 8 in. when adult. The male sand lizard is grey-brown above with sides and underparts bright green. This colour is intensified in the breeding season. The female is greyish-brown above with deep-brown markings which have a white spot in the centre. The underside of the female is cream. The sand lizard costs between 2s. 6d. and 5s.

The typical coloration of the wall lizard is green and black above. The green is frequently restricted largely to the central area of the back, and towards the sides black markings cover much of the skin. On the flanks brown markings may also be present. The underside is creamy white. The wall lizard is an exceptionally active species and a good climber. Like the other species described it is suitable for either the indoor vivarium or the outdoor reptiliary. Wall lizards cost about 2s. 6d. to 3s. 6d.

Most lizards are able to break off their tail if this is grasped suddenly and the four species described are no exceptions. This trait often enables them to escape with their lives if an enemy grasps them by the tail. The broken tail fragment writhes around for a few minutes and thus diverts the attention of the pursuer from the escaping lizard. The break is caused by sudden muscular contraction and is a form of autotomy.

Lizards, when they become tame, are much less likely to part with their tail. Specimens which have lost most or part of the tail regrow the lost portion but this is not so long nor as well formed as the original tail.

## Collector in South America

A MEMBER of the staff at Paignton Zoo has recently left for South America on a collection trip of tropical fishes and reptiles.

Mr. Veerasawmy will make his base camp at Georgetown and will then operate on the Brazilian and Venezuelan borders and the Orinoco River, where he will have to rely a good deal on the natives and their intimate knowledge of the habits of the reptiles and fishes he is seeking.

Mr. Veerasawmy hopes to bring back some large boa constrictors, anacondas, the venomous coral snakes, fer-de-lance and mountain rattle snakes. The reptiles will include iguanas, strong-jawed Teguxin lizards, dainty Ameiva lizards and red-headed tortoises. The tropical fish collection will include the leaf fish, man-eating piranha and electric eels.

Quite a number of tropical fishes were taken from the Paignton Zoo Aquarium in a specially constructed crate with all modern conveniences as an exchange for South American fishes.

plate bedded in glazing compound, which prevents contamination from the metallic fittings.

### Wooden Aquaria

Wooden-framed aquaria are eminently suitable for marine use. I have described the construction of a plywood-framed aquarium previously (*The Aquarist*, March 1954). Construction can be facilitated by the use of modern marine glues. I have also constructed small wooden-framed aquaria from softwood. The accompanying diagram illustrates a simple, cheap and easily constructed example. The one illustrated was made with the simplest of tools in a little over an hour including glazing. These aquaria are rendered leak-proof by completely lining the inside with glass, which should, of course, be bedded with glazing compound at the angles as in a normal aquarium. Larger wooden aquaria can be made in the form of wooden boxes glazed on one side. Marine-quality plywood, though expensive, is excellent for such larger aquaria.

Before stocking the aquarium it should be filled with fresh water for a week, and then emptied after the inside has been thoroughly scrubbed.

Next month suggestions for stocking and maintaining the marine aquarium will be given.

## Herpetologist's Notebook

by ROBERT BUSTARD

COMMON frogs and toads have all left the ponds and it is a month since many of the tadpoles wriggled their way out of the protective jelly surrounding them. It is now the peak breeding season for the natterjack toad (*Bufo calamita*) and the edible frogs (*Rana esculenta*) are also mating. By the end of the month the tadpoles of the common species will have reached a "useful size" and will be appreciated as food by such different groups as terrapins, clawed toads (*Xenopus*), axolotls (*Siredon mexicana*) and other aquatic newts and salamanders and baby monitors (*Varanus*).

All three species of British newts are still to be found in the water, where they are usually much more easily collected than during their terrestrial phase.

The common lizard, viper and grass snake all mate in April and May, and the slow-worm from the end of April to the end of June. May is the peak mating time for the local and beautiful sand lizards. Specimens caught at this time of the year may well be gravid and care should be taken to see that they are properly housed to ensure that egg-laying and hatching can take place satisfactorily (egg hatching will be discussed next month). With viviparous species (livebearers) no special precautions are necessary.

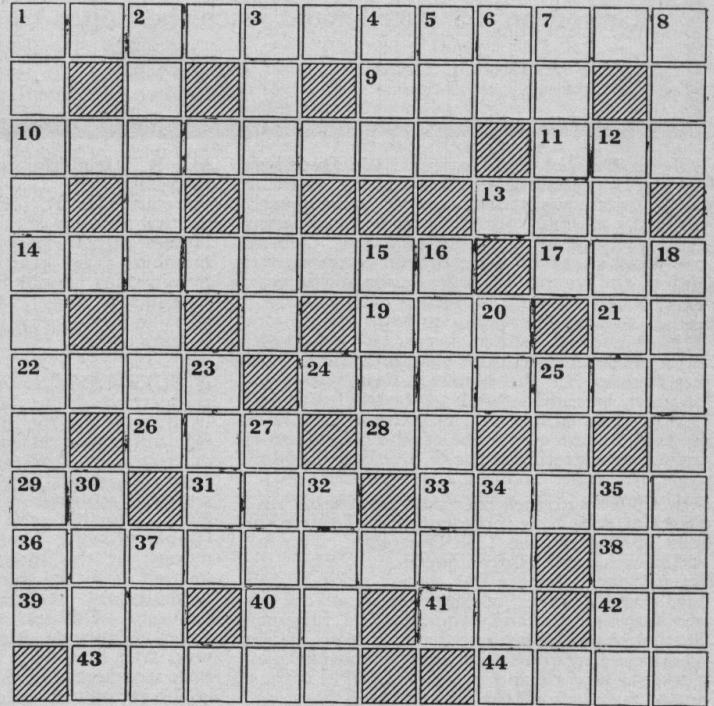
My chameleons and anoles have been in the outdoor enclosure for several weeks now and May is an ideal time to add to the European species for either the indoor or outdoor reptiliary. Newly purchased specimens of the species listed below can be placed at once in the outdoor enclosure: wall lizard (*Lacerta muralis*); green lizard (*L. viridis*); grass snake (*Natrix natrix*); dice or tessellated snake (*N. tessellata*); green tree frogs (*Hyla arborea*); natterjack toad (*Bufo calamita*); green toad (*B. viridis*); Alpine newt (*Triturus alpestris*); Italian great crested newts (*T. cristatus karelini*); and spotted or striped salamanders (*Salamandra salamandra*), to mention the most popular species, are now available.

Insect life is once again abundant and a wide selection can be caught or bred to provide a change in diet.

# The AQUARIST

## Crossword

Compiled by J. LAUGHLAND



### CLUES DOWN

1. Ring for cornering food supplies (7, 5)
2. *Asteroides* (8)
3. Treat with iodine to remedy deficiencies (6)
4. Obtain (3)
5. Position or untruth (3)
6. Nine across (1, 1)
7. Efts (5)
8. Of the same breed (3)
12. Dodge (5)
15. Savoury dish (4)
16. Water lilies (7)
18. Ide spars, hopelessly knocked around (8)
20. Fellow who deserted (see 9 across) (1, 1)
23. When first of the spawn is gone the rest is in pledge (4)
25. Meadow (3)
27. The element for fishes (5)
30. None upset over this fish (4)
32. The heredity-carrying factor (4)
34. "The river-fox for cunning." (Waltton) (4)
35. Eros? There is a connection and an end-product! (4)
37. Over to 35 (and forgive the awful pun) (3)

### CLUES ACROSS

1. According to Dr. Johnson they have "a fool at one end and a worm at the other." (7, 5)
9. Politician leaves empire for republic (4)
10. Without a tail (8)
11. Membrane between toes of amphibious creature (3)
13. Television broadcasting concern (1, 1, 1)
14. Juice of scalded or boiled vegetation, especially as base for breeding microscopic food for fry (8)
17. Shad is depressed on losing an aspirate (3)
19. Scots chimney (3)
21. Of the French (2)
22. Fishes do this at surface, tank is lacking oxygen (4)
24. Slipper could cause these in pond (7)
26. Donkey could cause this, or wash, many (3)
28. Exclamation (2)
29. Not out (2)
31. Not a wage, it gives you a shake (3)
33. *Aequidens* for A.A. around car (5)
36. Most brilliant fish in the tank (4, 5)
38. Exclamation of the coarse fisherman, perhaps (2)
39. Governor in short (3)
40. In French (2)
41. I.e. from father leaves only the railway, now nationalised (1, 1)
42. Just hesitancy, or royal cypher (1, 1)
43. Mother o' pearl (5)
44. Fish-lover of sorts (4)

(Solution on page 39)

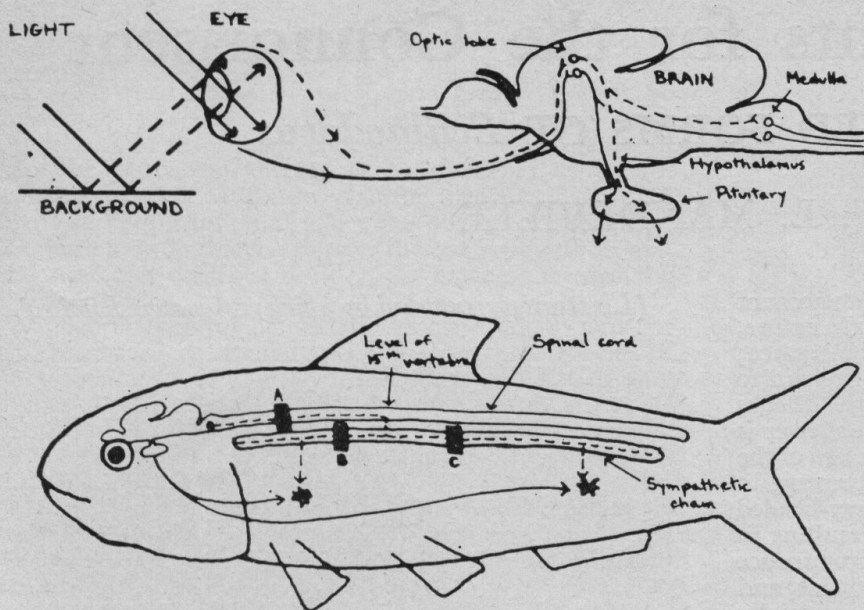


Fig. 3. Factors controlling the background response in the minnow. A cut across its spinal cord at A destroys the rapid colour response of the whole fish. Cuts at B and C in the sympathetic chain of nervous tissue destroy the rapid response of the anterior or posterior parts respectively of the fish. Arrows from the brain of the fish in the lower diagram represent the hormonal control over the pigment cells through the blood stream

fish in which the spinal cord has been cut anterior to the fifteenth vertebra abolishes any response to the background and the fish remains an intermediate colour, with its melanophores about half expanded, irrespective of its surroundings. Operations involving partial removal of the pituitary gland have shown that the melanophore-contracting hormone originates in the anterior portion of the glandular part of the pituitary. The melanophore-expanding hormone probably originates in the posterior glandular portion, though this has not to date been satisfactorily confirmed. Figure 3 summarises the factors controlling the melanophores in the minnow.

A number of suggestions have been made about the mechanism by which the chromatophores are able to alter the distribution of their pigment in response to the stimuli reaching them in the form of nerve impulses along nerves or

hormones in the blood stream. The most likely seems to be that the pigment granules migrate within already formed channels in the chromatophore under the influence of electrical potential differences between the centre of the cell and the ends of its branches. Reversal of the polarity alters the direction of migration of the charged pigment particles, and this can be observed in the living melanophore by the use of suitable micro-electrodes and amplifiers. Another possibility is that changes in hydrostatic pressure within the cell, brought about by contractions of the wall (which has been shown in one electron-microscope study to be fibrous and apparently contractile), are responsible for the migration of the granules. The old idea that the chromatophores were amoeboid cells in which the branched structure of the expanded melanophore was due to a pushing out of pseudopodia-like processes is now largely discredited.

## Herpetologist's Notebook

by ROBERT BUSTARD

**M**ANY species of European amphibians and reptiles are now available and the following are representative: (a) Suitable for the outdoor reptiliary: fire-bellied and yellow-bellied toads (*Bombina bombina* and *B. variegata*); midwife toad (*Alytes obstetricans*); tortoises (common hardy varieties only); European terrapin (*Emys orbicularis*); Spanish terrapin (*Clemmys leprosa*); all of these can also be kept inside. (b) Unsuitable to the outdoor reptiliary because of their large size or preference for warmer conditions: eyed lizard (*Lacerta lepida*); Scheltopusik or glass "snake" (*Ophisaurus apodus*)—a legless lizard; aesculapian snake (*Elaphe longissima*); four-lined snake (*E. quatuorlineatus*).

\* \* \*

This is a good month in which to purchase ordinary tortoises, and tips useful to the beginner are: (1) buy, if

possible, from a dealer who prefers quality to quantity—the few extra shillings are well worthwhile; (2) select a medium or large specimen, for they are much harder (babies, although cute, are hard for the beginner to rear); (3) always select an active specimen with bright eyes, which withdraws into its shell when lifted up suddenly or sharply tapped.

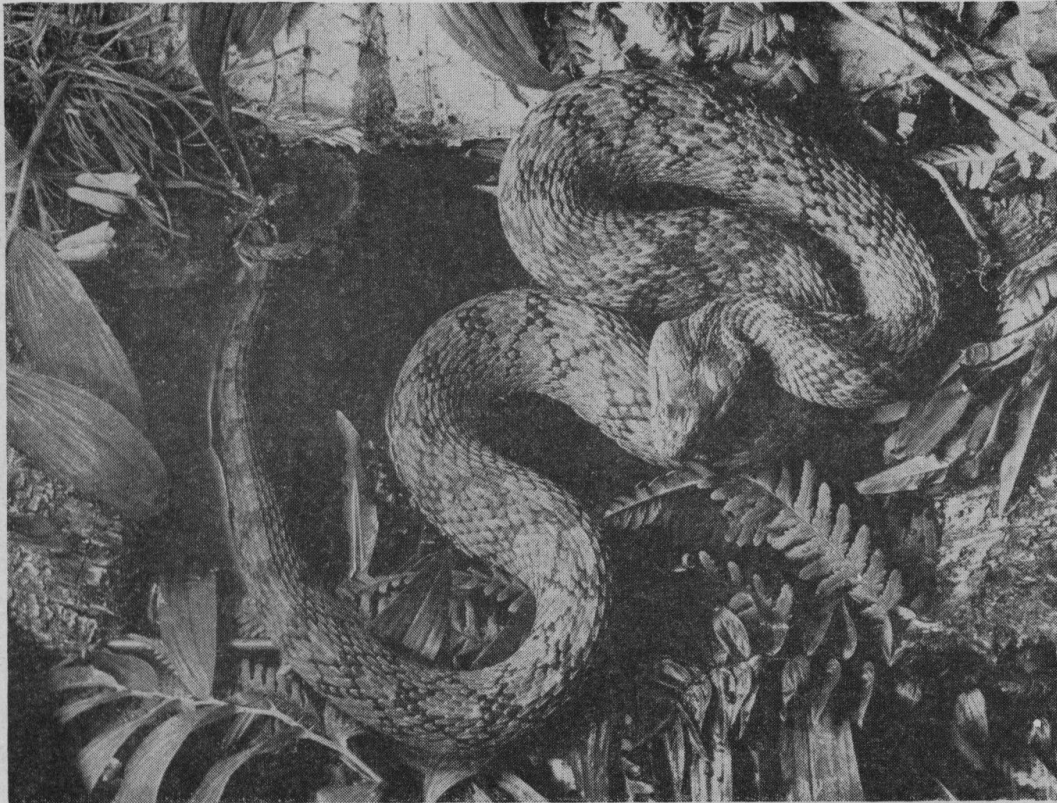
\* \* \*

Both the grass snake and the sand lizard lay their eggs in June and July and these can be hatched fairly easily. If the sand lizard lays its eggs in the outdoor reptiliary (suitable sandy areas should be provided), these will hatch in due course provided that the spot receives adequate sunshine. Alternately, they can be removed and incubated indoors at 70 to 80°F in slightly damp sand and earth mixture or in dampish moss. The latter procedure is followed when specimens lay eggs in indoor vivaria.

Grass snakes in nature lay their eggs in rotting vegetation. Manure heaps are a favourite resort. Here the heat of decomposition incubates the eggs and if this can be copied on a smaller scale the eggs can be safely hatched. In egg incubation the amount of moisture must be carefully controlled; too little causes the eggs to dry up and too much causes them to rot. Practical experience is essential and is best obtained with such simple species.

\* \* \*

The period June to September is also ideal for adding to the tropical collection. The weather is warm enough for the more delicate species to travel with the minimum risk of catching a chill.



Photos:

Robert Bustard

The U.S. water snake (*Natrix erythrogaster transversa*) grows to about a yard in length and looks decidedly vicious

## Hardy Snakes by ROBERT BUSTARD

THE collector who is interested in snakes has, to all intents and purposes, but one native species which he can hope to keep in the vivarium, namely, the grass snake (*Natrix natrix*). There are three species of snakes found in the British Isles but the smooth snake (*Coronella austriaca*) is restricted to areas of Hampshire and Dorset, where it requires protection. No one with an interest in reptiles should capture native smooth snakes but should keep Continental specimens. The third British snake is the adder or viper (*Vipera berus*), which is poisonous and which refuses to feed in close confinement, but does well in the outdoor reptiliary. The viper is not mentioned further as I do not recommend the keeping of poisonous snakes, especially by beginners.

### Grass Snake

The grass snake is widely distributed in England and Wales but is absent from Scotland and Ireland. In Britain male specimens do not usually exceed 2 feet in length and females measure about 30 to 36 inches. Much larger specimens are on record for various parts of the country and in Southern Europe large specimens are quite common. The coloration is olive-brown or olive-grey with vertical black markings on the flanks. At the back of the head are two yellow patches which form an incomplete collar. They are bordered posteriorly by a dark region. The ventral surface is dull white with black markings.

The grass snake is a lover of water, from which it never strays far, and is an excellent swimmer. It is also a good climber. The vivarium for these snakes should, therefore, have an ample pool and also some branches for climbing. It is most important that it should be able to bask in the

sun on occasions and that the whole vivarium is not permanently damp. It is a strange fact that water snakes which in nature spend all their lives in and around water, frequently suffer from skin diseases and die in captivity unless they have access to dry surroundings for part of the time.

The main article of their diet is the common frog, but smooth and palmated newts and also minnows are acceptable. Baby grass snakes can be fed on tadpoles. Newly caught grass snakes will often emit an evil-smelling substance when handled but they do not persist with this habit and they become very tame. An indoor vivarium for them should not be less than 30 in. by 12 in. by 12 in. They do well in the outdoor reptiliary. Price is between 5 shillings and 7 shillings and sixpence, depending on size.

### Other *Natrix* Species

The dice or tessellated snake (*Natrix tessellata*), from South and Central Europe, requires very similar conditions to the grass snake. If kept out of doors it should have a sheltered position, owing to its more southerly natural distribution. Although this species will feed on the amphibians listed above it is particularly partial to fish. It is very fond of water.

The tessellated snake, which grows to about 30 inches, lives very well in captivity, where it is very docile. Many of the so-called grass snakes available in the summer months from Italy are actually dice snakes, and I have often found several specimens in a dozen "grass snakes" to belong to this species. Specimens cost between about 7 shillings and sixpence and 15 shillings. (Readers who would like to know more about *Natrix tessellata* are referred



*Russian smooth snake*

to an excellent article in the *British Journal of Herpetology*, vol. 2, no. 7, December, 1958.)

The third species belonging to the genus *Natrix* which occurs in Europe is the viperine snake (*Natrix maura*), so-called from its resemblance to the viper (*Vipera berus*). Although newly caught specimens are aggressive they become tame in captivity, where they require similar treatment to the grass and dice snakes. Unfortunately this species is seldom available. All the above-mentioned snakes are oviparous.

Several American snakes of this genus are sometimes available. They are suitable only for the indoor vivarium and if kept at room temperature do not require any additional heating, although a light bulb for basking is appreciated. They are more active at about 70°F. Food should consist of amphibians and fish. Typical of these snakes is the common U.S. water snake (*Natrix sipedon*), in which the brown body is transversed by reddish brown blotches above and is white or yellow below.

#### Smooth Snake

The smooth snake has a wide range in Europe and is frequently imported (the specimen illustrated was a Russian example sent to me from Czechoslovakia); it is a most attractive small snake. It grows to about 2 feet. The smooth snake is a lover of dry areas such as heaths where the lizards on which it feeds are abundant. The prey, although sometimes held in the coils so that it can obtain purchase for swallowing, is not constricted. The best food is the common lizard (*Lacerta vivipara*), in the absence of which slow-worms (*Anguis fragilis*) can be given. This species is ovoviviparous, giving birth to living young enclosed in a transparent membrane from which they

escape very soon after birth. The young, born in August or September, vary greatly in number. Its ground colour is brown, olive-brown, grey or even reddish with a series of dark brown or black spots. The under surface is very variable; some specimens are brown or grey whereas others have an orange tinge.

Smooth snakes may bite when wild (their tiny jaws cause little effect to man), but in captivity they quickly become tame and show considerable intelligence. They do well either indoors or in the reptiliary outside. I have on several occasions watched these snakes mating. A few years ago I received two pairs of these snakes and housed them overnight in a small indoor vivarium (20 in. cube) as I wished to remove some lizards from the reptiliary before adding the snakes. Later in the evening I saw the two males fighting for the possession of one of the females. They were tightly coiled round each other, and later one of the males was seen to be in copulation. The fighting between the rival males and the mating act were witnessed again the following day. The young at birth measure about 7 inches. The price is about 15 shillings.

## GNAT LARVAE

### A Valuable Live Food

**G**NAT and midge larvae make a valuable live food for coldwater and tropical fishes. And the larvae may be obtained quite easily without any expense or much trouble on the part of the aquarist. All that one needs are a few old, shallow tins or disused kitchen utensils sufficiently large to hold about a gallon or so of water.

Fill the containers with water and introduce into each one of them some pieces of lettuce stump, cabbage leaf, banana skin or similar vegetable matter, for the female gnat or midge prefers to deposit her eggs on water containing rotting vegetation. The eggs are bound together in the form of tiny rafts, dark brown or black. At a quick glance, they resemble flakes of soot or slivers of charcoal on the water surface.

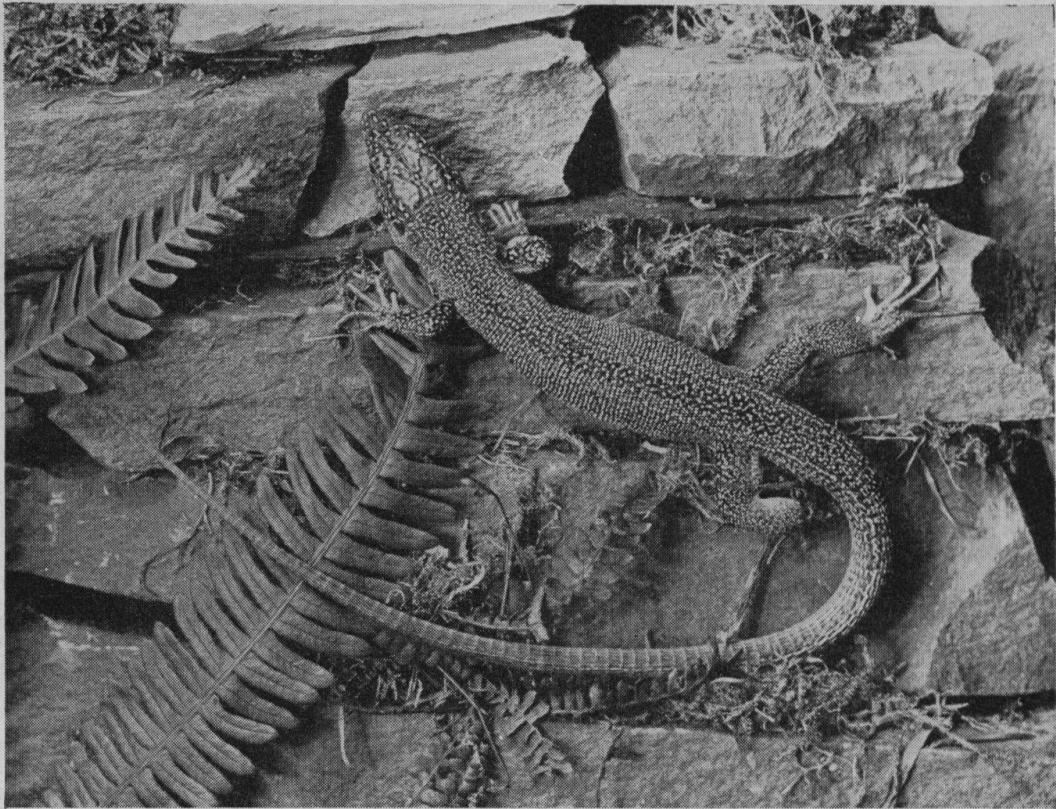
The eggs hatch out very quickly after being laid, in about 24 hours, and the tiny larvae hang head-downward from the top of the water. The tail end of the body is furnished with a breathing tube. At the slightest disturbance of the water, the larvae, commonly called "wrigglers," go zig-zagging to the floor of the container, where they will remain for a minute or so until they feel the need for a fresh supply of oxygen. The "wrigglers" nourish themselves on decaying organic matter, bacteria and other minute forms of life always present in stagnant water, and in due course become pupae.

As pupae, they still "hang" from the surface of the water, but at this stage of their existence they will have developed antennae and other structures which are all bunched up at the head end of the body; when disturbed they shoot through the water like tiny comets, all head so it seems.

As this stage of their development is close to the time when they split down the back, and become fully fledged insects, it is wise to net them quickly and feed them to fishes. The pupae are a trifle large for guppies and similar-sized fishes, but barbs, the larger-sized characins and young cichlids go quite mad about them.

Better still, remove the egg rafts as soon as they are noticed, and float them in the aquarium. As the larvae hatch out they will keep all the fishes well supplied with

(Please turn to page 52)



Photos:

Robert Bustard

Green lizard (*Lacerta viridis*). This specimen is "peppered" with yellow dots

## Lizards from Southern Europe

by ROBERT BUSTARD

**M**OST of the subjects of this article have been popular vivarium inmates for many years. They are easy to obtain, featuring in dealers' lists each season. They are attractive lizards which do well in captivity with a minimum of attention.

The green lizard (*Lacerta viridis*) is, as its name suggests, a handsome shade of green. Some specimens have numerous tiny yellow flecks on the back. The ventral surface is yellowish. Male specimens are easily identified in the breeding season by the bright-blue coloration on the throat and jowls. The base of the tail is always thicker in male lacertids than in females and this is a fairly reliable guide to sex in many species of lizards. A large adult will measure about 16 inches, the average size of specimens imported being between 12 and 15 inches.

This lizard is at home in the outdoor reptiliary, where it is seen to advantage. Green lizards do not appear to do nearly so well indoors, where they often suffer from skin complaints. Owing to its larger size (as compared with the wall lizard, for instance) and its active nature, it is especially suited to the garden enclosure. These lizards although shy at first—when if handled they may give quite a sharp nip—become quite tame in time. The usual insect fare such as mealworms, gentles, bluebottles and spiders is suitable. I have found they are very fond of cabbage-white butterflies and I collect the fully-fed larvae and place the resultant pupae in the reptiliary, where the butterflies emerge in due course. This is one of the advantages of the completely enclosed reptiliary. Mine is fly-proof and food, therefore, cannot escape before it is eaten. I often

think that we in Europe undervalue this lizard since we can obtain it relatively cheaply (prices vary between about 4s. 6d. to 7s. 6d. per specimen). Friends abroad rate this lizard very highly.

### Eyed Lizard

The largest European lacertid is the eyed lizard (*Lacerta lepida*). This strong well-built lizard grows to about two feet. Owing to its more southerly range—it is found in Southern Europe and North-West Africa—it should be housed in a roomy indoor vivarium, 30 in. by 18 in. by 15 in. would be ideal for a pair. I keep my specimens at 70-75° F. by means of an electric-light bulb, except when the vivarium can stand in the sun. The vivarium can have a floor covering of sand with logs or stones for the lizards to hide behind and bask on. As always, a small water dish must be present. The ground colour of the eyed lizard is green with dark-blue or black markings on the back. On the flanks these markings may take the form of closed rings or "eyes", hence the name of the lizard. Below it is yellowish or pale green.

Owing to its large size this species should be kept apart from its smaller relations. It does well on the usual insect diet and most of the specimens I have kept have also readily taken strips of raw meat. This is a very good species. Specimens vary in price from about 10s. to 30s. depending on size.

The Spanish lizard (*Psammodromus hispanicus*) has a similar range to the eyed lizard and therefore requires similar conditions. This small 6-inch lizard has keeled scales

and does well in a sandy vivarium with dry moss and stones for hiding places.

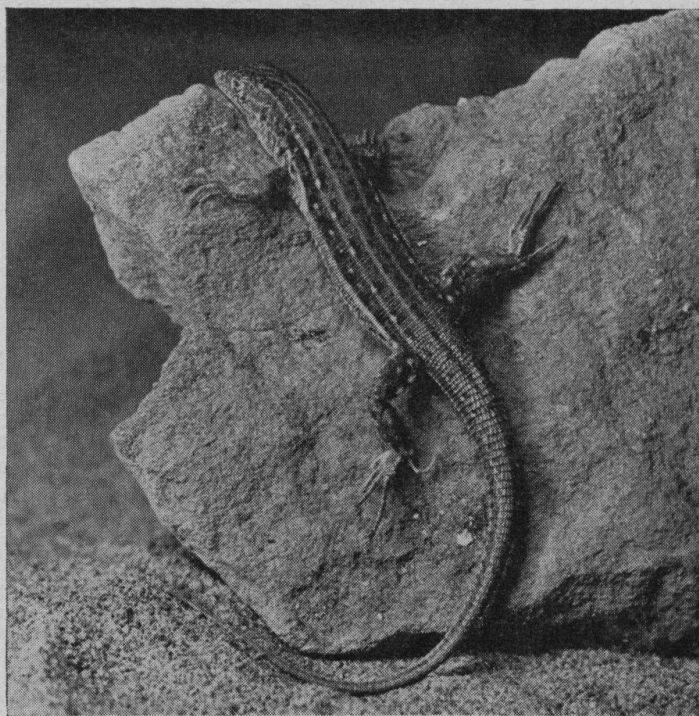
Lizards requiring similar conditions are those of the genera *Acanthodactylus* and *Eremias*. Specimens are often available and are easily kept. They like a dry warm vivarium (temperature about 75°F.). The usual insect fare is acceptable. They are usually small in size and some are very attractive. *Acanthodactylus boskianus* has golden stripes on the body and *A. pardalis* from the Eastern Mediterranean has brown markings on a khaki background.

#### Russian Steppe Lizard

As an example of the genus *Eremias* the photograph shows the Russian steppe lizard (*Eremias velox*). In these lizards the lower eyelid has a transparent section which protects the eye without loss of vision when the lizard is digging in the sand.

The glass "snake" (*Ophisaurus apodus*), often listed by dealers by its Russian name of "Scheltopusik", is a native of S.E. Europe, S.W. Asia and N. Africa. This giant legless lizard takes very kindly to captivity and does well in a roomy indoor vivarium at 70°F. It can be kept out of doors if the situation is really sunny but care must be taken to see that it cannot burrow out of the enclosure. The glass "snake" has been a popular pet in this country for very many years. It is hardy and long-lived. My specimens have been fed mainly on raw meat sometimes dipped in beaten raw egg. They also relish large earthworms, slugs and snails. Small and medium-sized mice are also suitable. The European glass "snake" (other species also occur in the United States) is said to reach a length of four feet, but the specimens imported are usually between two and two-and-a-half feet. The largest specimen I have kept measured 39 inches.

This lizard has long been a favourite of mine. It becomes very tame and appears to be quite intelligent. Care



Russian steppe lizard (*Eremias velox*)

must be taken in handling a new specimen, as if it breaks off its tail it appears to have broken in two! The head is olive-coloured and decidedly lizard-like. Specimens vary in price from about 15s. to 30s.

## Thick-Lipped Gourami

(continued from page 67)

around 120 by this time. Of these only 87 reached maturity, but even that was quite rewarding. It is clear then that a large tank is essential, because it gives more swimming space to the batch, greater aeration surface per fish and is less liable to contamination by Infusoria and dried foods. Size of Infusoria is also most important; in my opinion, *Paramoecium* is too large in the early stages and

*Euglena* is about right, *Stentor* and *Stylonychia* being acceptable when young. Green water is the most acceptable food at first if a good batch of these fish is to be raised, as the fry are very small indeed and the early food has to be in small sizes. As with all labyrinth fishes it is important to prevent cold air from passing over the surface of the water, especially at the end of the second week, when the labyrinth is forming, and the fry are most susceptible to chills, which prove fatal. For this reason a good fitting cover glass is essential.

### AQUARIST'S CALENDAR

**1st-9th August:** Southend, Leigh and District Society open show at Southend.

**20th-22nd August:** Walthamstow A.S. annual show at Hawthorne Road Halls, Walthamstow.

**26th-29th August:** Midland Aquarium Pool Society annual open show at Bingley Hall, Birmingham.

**2nd-5th September:** Coventry Pool and Aquarium Society open show at Old Grammar

School, Hales Street, Coventry.

**4th-5th September:** Bethnal Green A.S. annual open show at 229, Bethnal Green Road, London, E.2.

**8th-12th September:** East London A. and P. Association annual show at Central Hall, Barking Road, East Ham, London, E.6.

**12th-13th September:** Willesden and District Aquarists Club annual show at Roundwood Park, Willesden.

**4th-10th October:** Leeds and District Aquarists Society annual show at Leeds.

**10th-11th October:** British Aquarists Festival at Belle Vue, Manchester.

**14th-17th October:** Bradford and District A.S. annual show at Mechanics Institute, Bradford.

**30th-31st October:** Bristol Aquarists' Society annual open show at the Bishopston Parish Hall, Bristol.

## BRITISH AQUARISTS' FESTIVAL

10th and 11th OCTOBER

Belle Vue Zoological Gardens, Manchester

Classes cover all tropical and coldwater fish

Hon. Show Secretary: Mr. Geo. W. COOKE, "Spring Grove," Fieldhill, Batley, Yorks.





large or too small a particle size may be the cause of the trouble. Little fishes cannot eat large particles of food and conversely large fishes will not touch dust-fine particles. In each case food will be left behind to rot and cause trouble later on.

Any form of dead and decaying organic matter must be looked upon as a potential source of trouble. Dead plant leaves should be diligently removed at frequent intervals and not left to rot and disintegrate in the aquarium. Growing plants are an insurance against algae but dead and dying plants are a menace and the sooner they are got rid of the better.

It is not commonly realised that overcrowding a tank with fishes can be an important factor contributing to the production of algae. Under such conditions the excess of excretory products produced will once more tend to provide an excess of potential food for algae. The condition is perhaps further aggravated by the large amount of carbon dioxide freely available for photosynthesis. Few aquarists would knowingly leave dead fishes to rot in a tank, but when a fish dies in some odd corner behind a piece of rockwork then it adds to the rotting organic waste and hence constitutes a potential source of algae. Thus disintegrating bodies of dead snails and the excreta of living ones also add to the organic waste in a tank, but this is only one side of the story as we shall see later; a few snails are an asset and help to keep down the growth of certain types of algae.

#### Excess of Light

No amount of breaking down organic waste will produce algae unless a fair amount of light is also available. It is also, I think, true to say that under a given set of circumstances too much light, particularly daylight, will encourage algae formation where none would have formed otherwise. The accurate control of light is thus important, but it must be remembered that the reverse, i.e. starving the tank of light, is also not without danger. Plant growth will be adversely affected and one of the main means of keeping down the concentration of nutrient salts will be rendered ineffective. There is a further real danger which must be appreciated. Organic waste plus light, as we have seen, produces algae, but organic waste with little or no light produces a large population of bacteria and unutilised salts, i.e. a state of pollution. The water, instead of going green, will become turbid and foul-smelling. Of these two evils algae is certainly preferable, for at least the fishes are happy and not adversely affected as in a polluted tank. Thus a judicious reduction of light is useful when algae threatens, but this must be accompanied by a drastic search for other causes tending to lead to a build-up of waste material. Dried-food feeding is best cut out altogether until the trouble is halted.

Further, whereas the green varieties of algae need copious amounts of light the brown variety does not and will thrive in poor light conditions. The cure for this type of alga is to raise the intensity and duration of illumination, thus favouring the growth of aquarium plants and rendering conditions unfavourable for the development of brown algae. At the same time steps must be taken to rectify any build-up of organic waste in the tank.

It has been suggested that by varying the colour of the light, algae may be brought under control. It has been reported that blue light can clear a tank of algae trouble without any damage to plants. This can be achieved by fixing blue cellophane to the outside of the glass side of the tank and cutting down or cutting out ordinary illumination from the top. I have no personal experience with this method; it is an idea that needs investigation further before we can judge its value.

#### Snails and Algae

A few snails are an asset in any aquarium; they assist in keeping the surface of the plant leaves clean and healthy. Plants respire through their leaf surfaces and also in many instances absorb water and other substances through their leaves; it is therefore important that this vital surface is kept free of debris and algae growth. Snails play a vital role in doing this for they can remove the fine deposits of at least the soft varieties of algae. Blue-green alga and the short bushy hairy alga are unfortunately not touched by snails.

Thus it will be obvious that snails help in a dual fashion. Firstly they remove traces of algae directly and secondly by keeping the plant leaves clean; thus, by favouring healthy plant growth they produce a condition in the tank unfavourable for the development of algae. On the other hand, too many snails can be a serious menace. They are voracious feeders and will produce a large amount of excreta which will increase the organic waste in the tank. They will tear up healthy plants, particularly the soft-leaved varieties (e.g. Indian fern). By interfering with plant growth they set up a condition where algae can thrive.

(To be continued)

## Herpetologist's Notebook

IN July and August the common lizard (*Lacerta vivipara*) produces its young, which are usually about half a dozen in number. Since this may well be the first birth which the collector will encounter, some notes on the care of the young may prove useful.

If the lizards are in the outdoor reptiliary and this is well planted the youngsters will find sufficient food. They can be safely left there provided that there are no larger lizards, e.g. green lizards (*L. viridis*) which might eat them. Even the sand lizard (*L. agilis*) may attack and eat young common lizards, so care must be taken and the young removed if they are in danger. If they must be kept indoors, then they are best moved to a small vivarium, by themselves, which should receive as much sunshine as possible. There they should be fed on tiny gentles, small flies (*Drosophila*, the fruit fly, is ideal and these are easily cultured) and other small insects. Growth under optimum conditions is fairly rapid.

This is the time of year to add to the tropical and sub-tropical collection and the following lizards and snakes are recommended. Lizards: baby iguanas (*Iguana iguana*); baby monitors (*Varanus niloticus*, *V. salvator* and *V. gouldi* for instance); Anoles (*Anolis carolinensis*); U.S. bronze skink (*Eumeces obsoletus*); stump-tailed skink (*Trachysaurus rugosus*); blue-tongued skink (*Tiliqua scincoides*); S.African skinks (e.g. *Mabuya capensis*); zonures or girdle-tailed lizards (especially *Cordylus cordylus* and *C. cataphractus*); chameleons (such as *Microsaura pumila* or other dwarf species—avoid *Chamaeleo chamaeleon*); geckoes (many suitable species); bearded dragon (*Amphibolurus barbatus*); bloodsuckers (*Calotes versicolour*); fence lizards (*Sceloporus*); and alligator lizards (*Gerrhosaurus*). Snakes: king snakes (*Lampropeltis getulus* and others—strongly recommended); common boa constrictor (*Constrictor constrictor*), avoid tree boas and Cuban boa; Indian python (*Python molurus*); African pythons (*P. sebae*) and royal python (*P. regius*); Australian carpet python (*Morelia spilotes*); U.S. yellow rat or chicken snake (*Elaphe quadrivittata*); red rat snake (*E. guttata*)—a very handsome species; hog-nosed snake (*Heterodon contortrix*); African house snakes (*Boaedon lineatus* and *Lamprophis inornatus*); egg-eating snake (*Dasyplectis scaber*); and mole snake (*Pseudaspis cana*).

Readers will realise that this list is only a suggestion of a limited number which the author has found particularly interesting and suitable for vivarium life.

# IGUANAS

by ROBERT BUSTARD

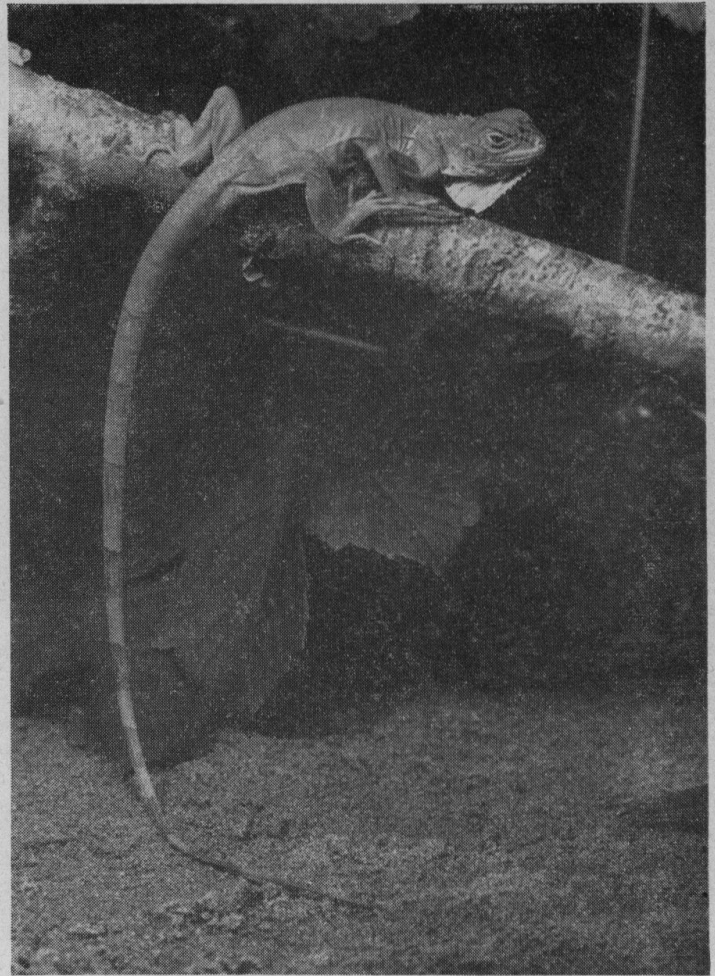
**Y**OUNG specimens of the common iguana (*Iguana iguana*), most of which are mere babies, are often available in the more enterprising pet shops. Their attractive appearance—they are a vivid green, with a long tail and the suggestion of a crest on the neck and back—interests many collectors. Unfortunately many die owing to lack of knowledge about their requirements.

Iguana babies are now imported into Britain in considerable numbers. They have been collected in Central or Northern South America or the West Indies and shipped to the United States from whence most of the specimens seen in Europe come. When the collector purchases a specimen it may not feed. This is understandable as it has been crowded for some time and is not accustomed to the foods we have to offer it, such as lettuce, banana and tomato. These differ greatly from the leaves and berries it has been accustomed to nibble in its native country. With good care, however, they soon settle down and do well.

In my opinion the best specimens to buy are those between about 18 and 24 inches in length. Such specimens are definitely easier to rear than babies, which may measure about 15 inches, most of which is tail. When purchased they should be brought home to the vivarium and allowed to settle down. Food should be provided and a watch must be kept to see if the specimen starts to feed within the first 2 or 3 days. Newly purchased specimens may not feed when being directly observed but it is easy to see if the food has been sampled or merely ignored.

Iguanans enjoy any vegetable food and I feed my specimens on many fruits and vegetables including boiled carrot, tomato, banana, grapes (halved for babies), lettuce and the soft leaves of cabbage and sprouts. Many specimens if well housed will feed without trouble but about half of those imported do not do so. These, unless carefully treated, refuse food and eventually die. Yet it is quite easy to provide for them. What I do is to hold them on my lap and feed them by hand on lettuce leaves and grapes. The lettuce leaf is gently put into the mouth when it is opened (never force open the mouth) and the iguana will commence to chew. Allowing for exercise between feeding, the day's feed can be given each evening in about half an hour. I hand-feed all newly imported specimens unless they feed of their own accord. I usually find that after several days of such treatment they are nibbling food in the vivarium and, after a fortnight, I can stop feeding them since they are feeding normally. I decrease the amount I hand-feed gradually during the second week. On no account force food into the mouth or down the throat. With patience they will accept food from the hands. If the leaf is pressed gently against the mouth most specimens open it and begin to chew the food.

These active arboreal lizards require a roomy vivarium, which should have branches for climbing and an ample pool. Iguanans like to lie along branches, and a healthy specimen will never spend much time on the ground. In nature, when frightened they jump into the water, where



This specimen of the common iguana is 18 in. long. It shows its dewlap below the jaw partly expanded

they are excellent swimmers. I suggest that a suitable size for one or a couple of youngsters is a vivarium 36 in. by 20 in. by 20 in., but use a roomier one if possible, to allow for growth. Fully grown specimens measure over 5 feet and in a year or two our specimen may measure about 3 feet. If tamed as a baby it will be a most impressive pet indeed.

I know of several that are household pets, being allowed out of their vivaria to lie in the sun or move at random in a room. Indeed I have had several of my own which became very tame and could be trusted with our cat and dog and even children. Iguanans readily sit on one's arm or shoulder, and although when newly obtained they may lash with the tail when frightened, they soon learn to trust their owner. They naturally dislike being placed on the ground, and probably regard their owner as some kind of "mobile tree" on whom they feel perfectly secure.

The best temperature for iguanans is about 75°F. This can safely fall to 55-60°F at night. Most people think that they feed exclusively on a vegetable diet, but this is not the case. Captive specimens like raw meat twice a week and babies often relish mealworms and earthworms.

There is a small species—which requires similar treatment—the naked-necked iguana (*Iguana delicatissima*), mature at less than 2 feet. People often ask me what they can keep with their iguana. I keep mine with an Australian water dragon (*Physignathus lescurii*), each of which measures about 3 feet. They appear to do very well in the same vivarium, since both require the same conditions.

# The Hog-Nose Snake

by ROBERT BUSTARD

*Photographs by the author*

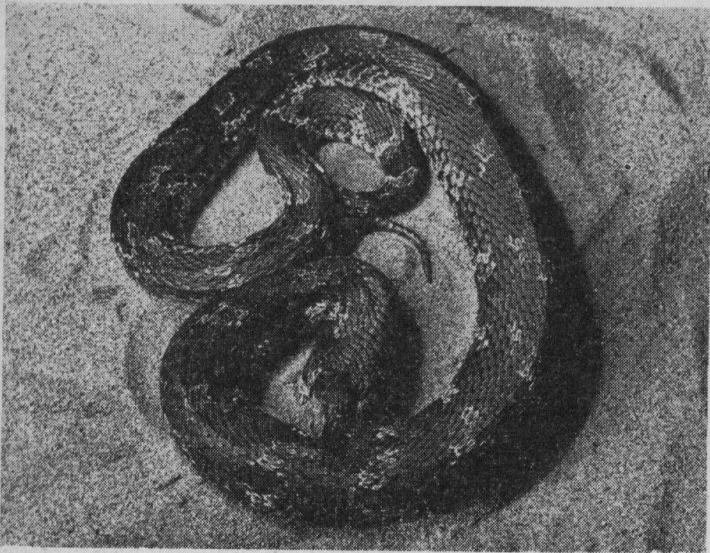
**T**HERE are a number of North American snakes which are firm favourites of reptile-keepers on both sides of the Atlantic, and the hog-nose snake, because of its extraordinary habits and hardy nature, is one of these.

The Eastern hog-nose snake (*Heterodon platyrhinos*) grows to a length of about 3 feet but many of the specimens for sale are only about 2 feet. The coloration is variable, but one common colour scheme incorporates yellow blotches on a dark background. The most handsome specimens have the yellow replaced by red on the anterior part of the body. Specimens which are totally black above and white ventrally are encountered in mountainous regions.

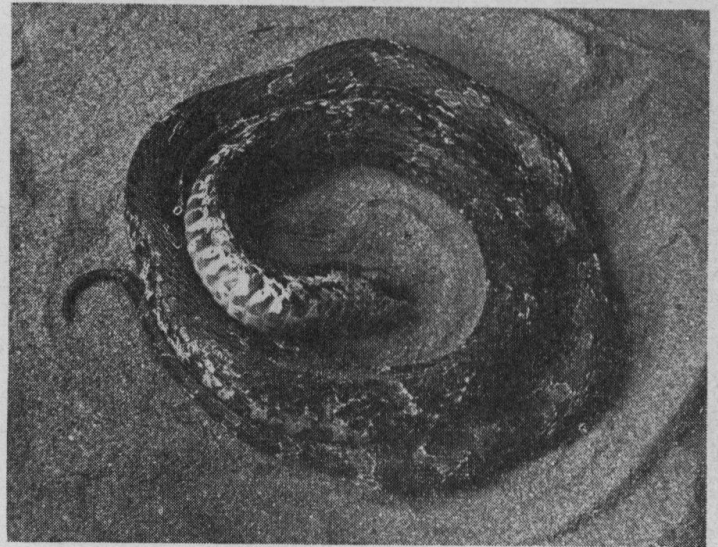
This completely harmless little snake has earned such names as "spreading adder" and "puff adder" owing to its

display behaviour. It is a great bluffer and when disturbed it coils up and hisses loudly. At the same time it inflates its lungs with air, appearing much larger than it really is. The deadly appearance is enhanced by the upturned snout (which is used for burrowing) and the manner in which it flattens its head and neck region. This is brought about by moving anterior ribs, which normally lie close to the body, and, when moved to make a right angle, expand a fold of skin and give a somewhat fearsome appearance. This same feat is seen to perfection in the cobras, where the hood, with the eye-markings on the back, is very impressive.

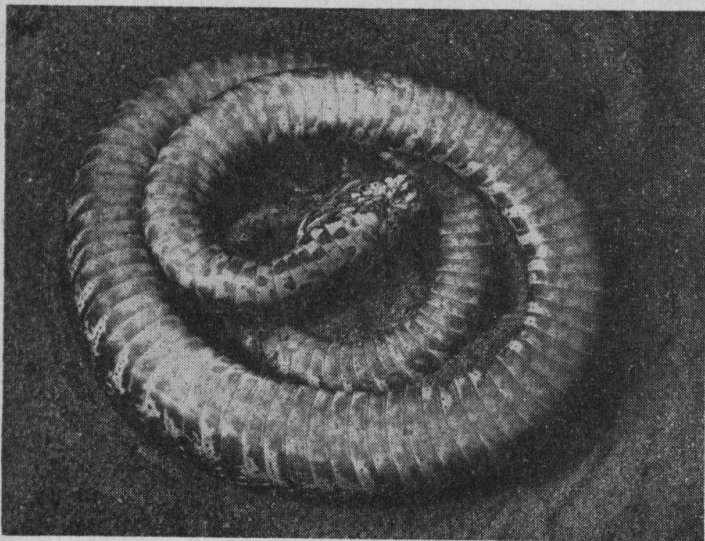
The display of deadliness can turn to one of aggressiveness and indeed may be kept up for some time. If the



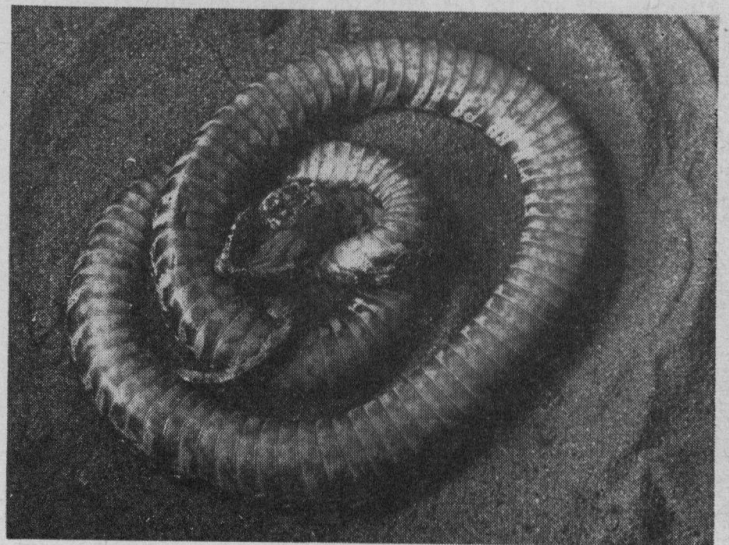
A hog-nose snake starting to writhe in the early stages of its "sham-death" act



Commencement of the turn on to its back in the hog-nose snake's "death" display



Writhing movements continue as the hog-nose snake lies on its back with mouth open



Movements stop and the snake lies as depicted, although it will turn over again if set round the right way and continue to feign death

snake is not provoked further it will remain hissing for several minutes. If, however, it is disturbed it may even strike at the enemy. Should one look closely, one would detect that the strike is usually made "past the enemy" and not at it, and it is also made with the mouth closed—so very different from the behaviour of a venomous snake. This "dummy striking" is also seen in the egg-eating snake (*Dasypeltis scaber*), where it is all the more amusing since the snake is practically toothless and a bite could have little effect. The important thing to realise is that bluff is widespread in nature and it is seldom challenged. Would you wait to see if a snake actually struck at you? This aggressive behaviour must indeed save the life of many of these snakes. The bright coloration is also helpful to this snake since yellow, orange and red are warning colours in nature.

The hog-nose snake is a wonderful actor and has another very convincing little trick. This is the "dying act." If we were not frightened off by the display of aggressiveness then suddenly the snake starts to writhe around as if in convulsions. After a short time it turns over on to its back, the mouth opens and the tongue hangs out. The writhing continues for several moments and then the snake

remains motionless—to all intents dead. Should we remain still, however, we will see the snake slowly turn over and move off, although should it see us it will very likely sham dead once more. There is one interesting point about this performance—the snake feels that it must be lying on its back to be dead; should we poke it when it is shamming dead it remains still, but should we turn it over right way up, it turns upside down again and then remains motionless as before.

It should be made clear to the reader that this is innate behaviour over which the snake has no control. Thus the snake is not behaving in a "clever" manner but instinctively. This is borne out by the stereotyped act it performs, the various motions being shown in the accompanying photographs.

In captivity this snake does well in a sandy vivarium at a temperature of about 70° F. A vivarium of 24 in. by 12 in. by 12 in. would be suitable for a couple of these snakes. They feed on toads, and captive specimens soon settle down and feed well. Unfortunately, once they become tame they are loathe to perform, but they are still very handsome specimens and well worth a place in the collection.

## Indoor Ponds

At the Caravan Exhibition held in London this year there was an eye-catching display of water gardening as part of the exhibit arranged by the United Dominions Trust. The display was the work of Neale Brothers (Nurseries) Ltd., who have kindly supplied these notes on the project.

The idea was to construct a pool and rural setting for the two business caravans of U.D.T., and this necessitated the use of many plants which would not normally grow in the open air and would most likely not be in flower at the same time under ordinary conditions.

The general construction was Somerset peat for the planting areas and the higher levels, and Westmorland stone was used for the rocky effects. The pools were made of 10 ft. wide black polythene, and they were shaped by turning the polythene under and edging it up into a basin by pushing peat under the rim. The aim was to have a pool containing about 4 in. of water.

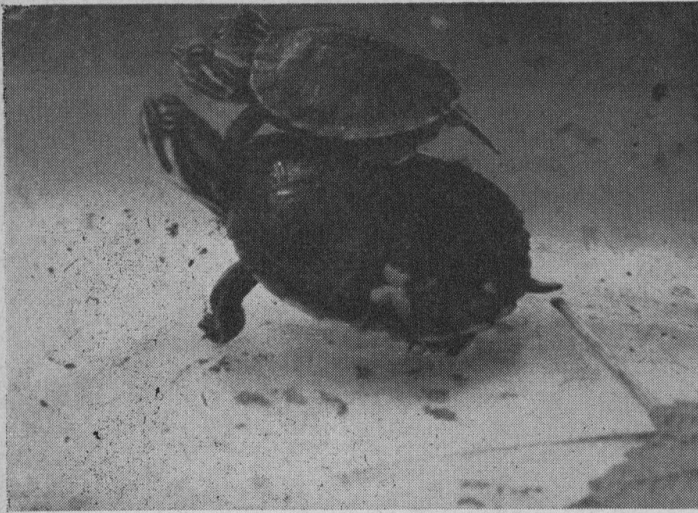
After the polythene was in position water pumps were installed at the highest point of the garden, and in order that the distance of throw of the fountains could be regulated, two Stewart Turner single-jet nozzles were used. As the pools were approximately 12 ft. long by 6 ft. wide, it was important that the fountains should give maximum



agitation to the water in order that a scum should not be formed. For this purpose the jets were ejected almost horizontally from one end of the pool to the other, and this provided a current round the full area of the pool.

After the pools were filled, washed grit, rocks, stones and driftwood were placed in various positions to give decorative effects in the water. After the planting had been completed and the fountains had been on for several hours, about 30 goldfish (each approximately 2 in. long) were added to each pool.

During the 10 days the show was on, the fish derived almost their entire food from the ice-cream wafer biscuits which visitors dropped into the water! An interesting feature was the way in which the fish seemed to line up into single file to swim under the jets of water, and despite their unusual diet, not a single fish was lost throughout the entire show.



These two specimens of red-ear or painted terrapin (*Pseudemys scripta*) are each about 1 year old. The upper one was fed mainly on raw beef and the lower one was given the diet described by the author

IT was Konrad Lorenz, I think, who wrote that chelonians don't live in captivity, they just take a long time to die. This thrust, aimed at the majority of terrapin owners, was very close to the mark. But, to be fair, he should have added that the statement need not hold true if the reptiles are intelligently treated. Most of these terrapins, in fact, are picked up from store counters on impulse, by people who never expect them to last longer than any other cheap toy. The material evidence of this attitude is the dishes which are displayed for sale as terrapin containers. Not even large enough to provide reasonable accommodation for the hatchling, they calmly ignore the fact that the poor beast will have to grow if it is to live at all.

The aquarist or vivarium owner who takes some interest in his pets is, of course, certain to do better than that. But at the best the beginner with terrapins is liable to make some mistakes. The question of temperature is a vexing one. I do not pretend to know anything about European terrapins, but the purchaser, even in Britain, who picks up a terrapin at random, is liable to find that he is getting American terrapins. There is a genus (*Chrysemys*, the painted terrapins) which occupies the northern part of U.S.A., and extends even into Canada, but for some reason these are hardly ever handled by dealers. Very likely the terrapin you buy will have a red stripe along each side of its head; it is therefore a "red-ear," *Pseudemys scripta elegans*. Nearly all the chelonians which turn up in North-American pet shops are this sub-species, and certainly a great many are reaching Britain. There are other forms of *P. scripta*, which do not have the red stripe, and also three other species of the genus. The safest solution is to assume that, if you have an American terrapin, you have a sub-tropical species.

The essentials for success with sub-tropical terrapins are ample light, high temperature for at least the greater part of the year, enough water to give the animals freedom in swimming, and abundant natural foods. Since the "turtle dish" and terrapin food offered by the dealer are equally useless the new owner must use his ingenuity in supplying both these needs. An ordinary aquarium is frequently used. Some sort of an island is needed, or a bank of stones at one end, reaching above the water level. This means that the aquarium can be only partly filled with water. A cover is needed only to conserve heat; the turtles will not climb out.

I have never adopted this plan, for several good reasons.

## Success with Sub

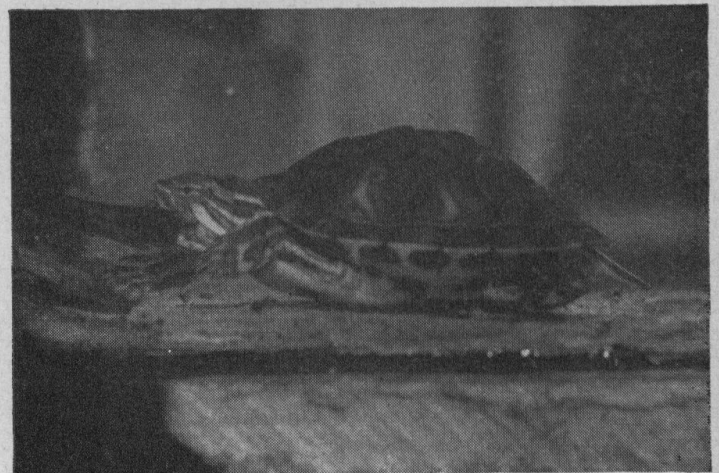
by RICH

(Photograph

From the start I planned to see my terrapins reach full size, and with the wasted space in a partly filled, rock-encumbered aquarium, I estimate that one of 30 gallons capacity would be required for two 6-inch terrapins. I have five, the largest nearly 5 inches now. I like to have my terrapins outside in the summer, and out-doors is no place for an expensive glass tank. Lastly, these animals, unlike fishes, can be viewed from above as advantageously as from the side.

When my terrapins were smaller I kept them in dish pans, which I placed outside, with a sheet of glass over them, on sunny days. Most of the year the sun's heat, through glass, will get the water up to 70°F or better. Later I employed an enamelled cast-iron sink of about 8 gallons capacity (these things can be found on rubbish heaps around here—I have not learned why people throw them out). This receptacle was, of course, too heavy to move around. I started using it during the winter, and kept it in a shed that is quite open, with only wire netting over one side. The turtles remained in the sink, using rock islands as basking stations. Late in the spring I moved them out-doors.

The device I then rigged is shown in the photograph. I built a rough box that would take the sink with a surround of 6 to 8 inches width. I stuffed this box, tightly around the sink, with peaty soil. This serves the double purpose of conserving heat and giving the turtles a promenade, making islands in the tank unnecessary. But it transpired that the turtles were unable to climb out of the sink, even when it was quite full of water. So I still had to build a ramp in the water, and this had to be constructed of large, heavy stones, otherwise the active little reptiles soon pulled the whole thing down. An improvement on the present set-up, which I plan to try later, would be to fill the whole



A painted terrapin dealing with a caddis larva under water. The insect has been seized by its head and the terrapin is seen to have moved its claws forward ready to tear the case from the caddis larva

# Tropical Terrapins

GUPPY

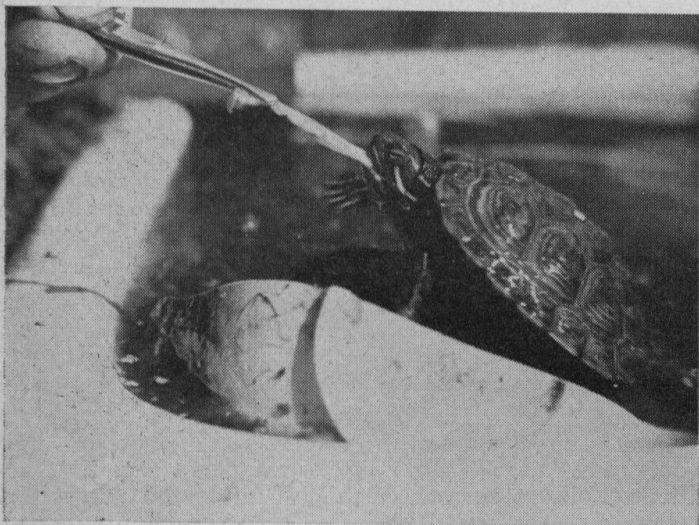
(the author)

box with concrete, and dish the middle part out. The edges could be made shelving and rough to give the terrapins' claws a grip. The box could easily have been made deep enough to prevent the animals from climbing out, but a wire-netting cover is necessary anyway, to protect them from birds and from our cats, which persist in regarding them as intriguing playthings.

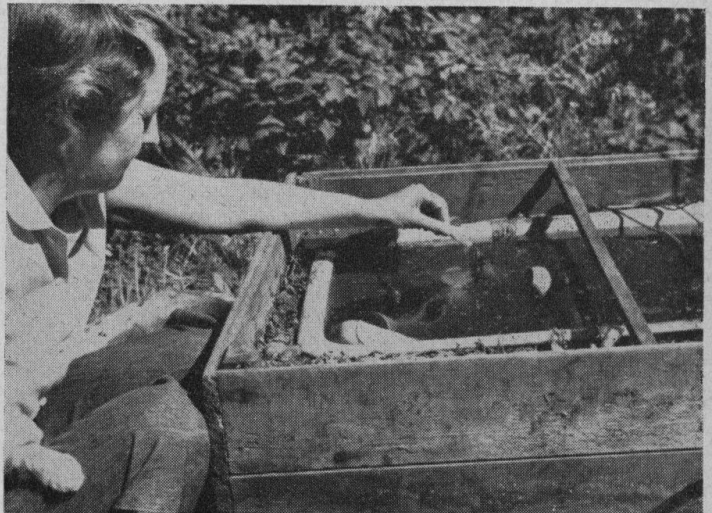
The cool nights in my part of the world (British Columbia) make heat necessary at all seasons. In the summer one 50-watts heater suffices. I set the thermostat at 75°F, and at night cover the box with a single transparent plastic sheet. This is removed if the water temperature rises to 85°F; if it persists in rising further, some shade must be supplied. The thermostat would have gone the way of the ramp stones, had I not placed it in a bottle, which in turn is wedged in position by stones, and tied down with string. The water level in the bottle must be kept to just the correct level on the thermostat.

It proved feasible to move the box, dirt and all, into the shed which served the terrapins as their winter quarters. With the addition of another 50-watts heater, the water remained at 75°F through a cold spell, during which the air temperature dropped as low as 15°F. However, I intend to let the terrapins hibernate during the 3 worst months; I am confident that this is safe enough. When they were hatchlings only a month from the pet shop, I let them hibernate for 3 weeks, and the following winter for 2 months.

It is my guess that many of the baby terrapins never learn to eat. Frequently they are offered only dry packaged food, which they are very liable to refuse even after they have become adjusted to vivarium life. How much less likely will they be to eat this stuff, in strange surroundings, after all the trials and abuses of being collected and



Feeding time out of water. The claws are ready to deal with any resistance put up by the "prey"! Once the food is obtained the terrapin retires beneath the water to eat it



The author's out-door vivarium for terrapins. Its wire cover has been removed for Mrs. Guppy to feed the reptiles. The wooden box contains peaty soil in the centre of which is buried an old sink

confined to overcrowded and inadequate quarters on the dealer's shelves! In my experience all need tempting to get them to start eating. With the first two I hit by accident on a plan which worked well, at the time. I put live caddis larvae in their pan. Not only are these insects high on the terrapin's list of favourite tit-bits, but their clumsy blundering around the pan incites the reptile to seize them. I must either have kept the water a bit cooler at that time, or I had a different species of caddis. At any rate in later attempts I always found the corpses of the insects floating at the surface after a short time. Fussy feeders are more likely to co-operate if the food is dropped in front of them when they are on the bottom of the tank. But one should never assume that the turtle is eating, until it is actually seen to swallow the food. The small offering easily gets out of sight, and there is a temptation to suppose that it has been eaten. The food may be picked up and then rejected, but once that stage is reached, it is almost certain that smaller morsels will do the trick.

Once the terrapins are eating well I always hold the food in forceps, and offer it to each one in turn. This method is preferable, not so much to avoid left-over scraps (the untidy habits of terrapins make water changing a frequent necessity in any case), but so as to make sure that every animal is getting its fair share. There are always some vigorous eaters that would grab the lion's share if given half a chance, whereas others stay in the background and would get nothing to eat at all if not coaxed. Some, in fact, may go right off their feed, and refuse all nourishment for weeks on end. However, in my experience these hunger-strikers can always be coaxed into eating again in due course, by the use of such tit-bits as fish entrails or raw liver. I have tested the theory that overcrowding is the trouble, and that the smaller individuals are being affected by an appetite-retarding agent released by the others. This theory is set out by Professor Meryl Rose in *The Aquarium* (U.S.A.) for October, 1959. The results of my test have seemed to show that isolation of the reluctant feeders does not help at all.

The staple diet of my terrapins has always been earthworms and woodlice (oniscoids), with a great deal of raw fish in the summer, when it is easily obtainable. I use any kind of small fish, chop them up entire and feed all but the head. I read somewhere that sticklebacks are not good for terrapins, but nevertheless, when other fishes were not available, I have used them, after carefully removing the spines, to tempt slow feeders, and could not see that any

harm resulted. While plenty of fish was available my terrapins went off worms entirely, but would always put away a feed of woodlice, if nothing else was forthcoming. In the autumn, when the fish supply dwindled, they gradually came back to eating earthworms. They never lose their fondness for woodlice, a useful trait; many vivarium inmates do not care for these plentiful and easily obtained terrestrial crustaceans. Raw beef is easily come by and many will succumb to the temptation to make frequent use of it. I have noticed that terrapins fed largely on this diet grow about half as fast as mine.

Terrapins will eat a small amount of vegetable food, and quite probably this is necessary for their health. They eat more greenstuff in the spring than later in the season. Since their whims in this matter can never be predicted, the only way to feed vegetables is to keep them supplied at all times. It is useless to plant the tank; in a few days they will uproot and tear to pieces every green thing. It is this habit, in fact, that accounts for much of the water changing that proves necessary with these pets. But aquatic plants do last longer in warm water than lettuce and such, and so are much preferred for terrapin feeding. Duckweed (*Lemna*) is acceptable and is very useful, since the terrapins cannot make a mess with it. *Potamogeton* and almost any other tender plant will be eaten; there is no need to sacrifice your pet aquarium plants!

Since terrapins spend a good deal of time out of water, it is evident that water temperature cannot affect their lives

to the same extent as it does with fishes. In fact I think that so long as they are able to sun themselves, or some substitute for sun heat is provided, there is no special advantage in keeping the water at more than 75°F, which is warm enough to prevent them from becoming sluggish while submerged. They will sit for hours beneath a pane of glass in direct sunshine; I imagine that under such conditions their shells, at least, can hardly be cooler than 110°F. Such a toasting will sharpen the appetites of newcomers and slow feeders. Electric lights should be hung so that the turtles can nearly touch them with their backs. They will sit cheerfully within an inch of a light, the glass of which will burn a person's fingers if touched.

As I have already stated, these terrapins will hibernate without harm for 2 months at least. It is not possible to trace their exact place of origin, but despite the summer heat, the only parts of the U.S.A. which lie south of the isotherm of 50°F in January are the Florida Peninsula and a strip of the Gulf Coast. Since American terrapins are sluggish at 65°F, and will cease all normal activity at 55°F, we can be fairly sure that they do not feed all the year in their native habitat. For safety's sake, I have never let their water temperature fall below 40°F. As soon as they become chilled, they show great anxiety to hide. Broken bowls or soup plates, upside down on the bottom of the tank, are much appreciated when this urge overtakes them. They should never be allowed to remain ashore in low temperatures.

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## Treatment of Sick Fishes

by A. BOARDER

**M**ANY novices have no idea of what to do with a sick fish other than to dose it with plenty of salt. Although salt is one of the finest cures for some fishy complaints this does not mean that it can be used as a universal remedy. First of all it is important to try to find out what is the matter with a fish and what has caused the trouble, if possible. There are three main causes: pests, parasites and diseases. Pests include such creatures as leeches which cling to a fish occasionally and suck its body fluids. Parasites may be fish lice or flukes and diseases are caused by bacteria too small to see with the naked eye.

Obviously the same cure would not be effective in all cases. The salt bath, a tablespoonful of common salt to a gallon of water, will often put a fish that is out of sorts into a better shape, and as a cure for fungus disease and fin rot salt is excellent. However, some of the parasites which attack coldwater fishes in particular cannot be killed with the salt bath. It will be found that a bath in diluted Dettol will rid the fishes of the parasites named above. The solution for treatment can be a quarter of a teaspoonful of Dettol to a gallon of water, and leave the fish in this for 15 minutes; a stronger solution can be used, say the same amount in a quart of water, and leave the fish in for only a few minutes.

One or two points in the treatment of sick fishes should be emphasised. The most delicate part of the fish and that which can be most easily injured during treatment is the gills. These are protected externally by the hard gill plates, but the gills themselves are very soft parts which have the task of exchanging gases between the water and the blood. As the fish breathes it sucks in water, which is forced out through the gills when the fish shuts its

mouth. Any chemical placed in the water will have a strong effect on these gills and as they are so delicate they could be irretrievably damaged if the fish was allowed to remain in the liquid for long. No other part of the fish would be tender enough to suffer from a short exposure in a chemical solution but the mucous covering could be destroyed or badly damaged if too strong a solution was used. Even too much salt can remove much of this mucus, to the detriment of the health of the fish. Before using any chemical then it will be well to consider what its effects are likely to be on the soft gills of a fish.

Another point which should be borne in mind when treating a sick fish is that the water in its container need not be very deep. As long as the water is deep enough just to cover the extended dorsal fin then this will do. Water any deeper will not become re-oxygenated nearly as quickly as the more shallow water. It is most important to see that the water in the cure tank is well oxygenated and shallow water is the easiest way to ensure this. If you double the depth of water in a tank you immediately lessen the amount of the water likely to benefit from the atmosphere considerably.

Do not worry about feeding a fish when it is in the cure tank. Fishes do not die over-night of hunger if they are not fed every few hours. They can go for many days without food and whilst under treatment will be better without it. What often happens is that food is given which is not eaten, and this soon pollutes the water. This only causes the fish more distress and delays a cure. Once the trouble has been cured the fish can be fed, first on live foods only. White worms are an ideal food for the fish which is recuperating, but do not return a fish to an aquarium containing other healthy ones until you are satisfied that it is quite free from trouble.