

THE HARDY EUROPEAN REPTILES AND AMPHIBIANS IN CAPTIVITY

by *Andrew Allen*

1. The Smooth Newt (*Triturus v. vulgaris*)

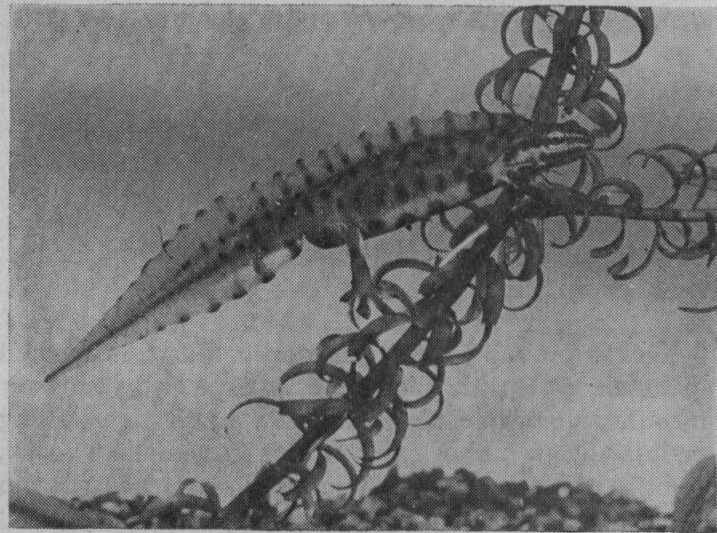
Description.—A very familiar British newt, growing to an adult length of between 9 and 12 cms., with the male larger than the female. The tail is rather longer than the head and body. The skin is smooth. The colour dorsally is in various shades of light brown, with dark brown circles in the male and smaller spots, often merging into two longitudinal dorsal lines in the female. The undersurface is from yellow to bright orange marked with darker spots. These are fairly fine in the female. The toes of the hind feet of the male are fringed, and in season the male has a high and wavy, near transparent, crest.

Distribution.—Almost throughout Northern Europe and Asia, including nearly all Britain, and in Ireland also. It is often absent from hilly or mountainous country. Various sub-species occur in Eastern Southern Europe.

Care in Captivity.—This is an aquatic species that raises very few problems. It is undemanding in captivity, breeds readily, and has highly interesting habits.

It settles down well in the indoor vivarium, where its habits can be readily observed. The ideal vivarium is a standard aquarium of perhaps three feet in length and fully waterproofed. This should be divided roughly equally into land and water areas. The water depth should vary between less than an inch and five or six inches, and should be suitably planted with coldwater aquatic plants. The land area should contain a selection of nooks and crannies and other damp hiding places. Extra heat and light are not only unnecessary, but could be dangerous, for this newt favours cool, dark habitats. If a home other than a waterproofed aquarium is chosen, a large, deep pool can be sunk into the soil, and planted with aquatics. This method is nearly as practical, but can be less sightly unless carried out with taste.

The great advantage of the indoor vivarium is that its inmates can be readily observed and studied. But it also has several disadvantages. One of these is simply the lack of space. Other problems arise as the winter draws near, for in the wild the newts hibernate during the colder periods. They can be over-wintered indoors, but this can confuse the breeding cycles of



Male Smooth Newt

the newts, and lead to eventual infertility. It also shortens their life span, which is only perhaps four or five years in any case. The alternative is to hibernate them "artificially." I have never tried this myself, but I have seen it suggested that they can be packed into a deep layer of slightly damp moss and leaves in a box. This is then placed in a cool site for the winter, but one that is totally safe from frost. It may work, but constant observation will be necessary, especially as spring draws near.

The alternative to the indoor vivarium is one of several types of outdoor vivaria. Greenhouse, cold-frame, reptiliary and garden pond are all ideal. Of

these the last two are probably preferable. Both greenhouse and cold-frame can warm up too much for the liking of these newts in the heart of summer. The reptiliary is an absolutely perfect home while the garden pond has only one disadvantage in that there are no restrictions on the wandering of the newts. However, this need act as no deterrent, for they will always return to breed. The advantages of these outdoor vivaria are numerous and weighty. They provide a natural habitat, with space to spare. Breeding will take place far more readily than in the indoor vivarium. Feeding presents no problems at all, as natural food is always available or easily supplied. Winter now causes no headaches for the newts hibernate naturally in sites of their own choosing. There is one aspect, however, from which these vivaria are less than ideal for this species. The smooth newt is a highly secretive creature and largely nocturnal. It is rarely on view in the outdoor vivarium for it spends much of the spring hidden in the pond and in the later part of the year retires to dark shady corners on land. It rarely emerges from these during the day.

Feeding is a very simple matter, both in and out of the water. In the water *Daphnia*, thin slices of red meat, small earthworms, "blood-worms" and anything else that is small and moves will be readily taken. On land small earthworms, wood-lice, maggots and baby mealworms are among the fare that can be offered. Size is just about the only limiting factor, and large insects should be avoided. On land the offerings should be slow-moving, for the smooth newt is far from a lively customer out of water.

Whether in the outdoor vivarium or the large indoor vivarium, community groupings should be chosen with great care. There are a large number of reptiles and amphibians that consider a newt of this kind to be a small, but tasty, morsel. Species that on no account must be housed with these newts are the various water tortoises and terrapins, the large lizards (from sand lizards upwards), all snakes of any description, and the marsh frog. Also there are various species that are compatible within the bountiful space of the outdoor vivarium, but may exhibit cannibalism in more confined conditions. Among these are the larger newts (crested and marbled), the edible frog, the common frog, the clawed toad (*Xenopus* spp.) and the common toad (adult females). Juvenile newts may be prey to almost any other amphibian. Obviously within the indoor vivarium the smooth newt should only be housed with species that favour much the same conditions, i.e. that are small, hardy and semi-aquatic. The range is far wider in all the outdoor vivaria. More information on this topic will be found in a previous article entitled "Reptile Communities in the Outdoor Vivarium," which is to be found in *The Aquarist* of January, 1969.

Note.—In common with all the British reptiles and amphibians the smooth newt is subject to considerable environmental pressure. Its numbers are probably decreasing rapidly, though this is hard to evaluate. This being the case, no herpetologist should aid the process. Under no circumstances should these newts be removed from healthy ponds in the wild to be kept in captivity. It is up to us to show a sense of responsibility that will help preserve the species. To this end they should be encouraged when they frequent our garden ponds. They will not harm the fish, though their effects on fry is less certain. Various sub-species may be encountered, among them:—*T.v. graecus* from Greece and the nearby islands;



Male Palmate Newt

T.v. schreiberi and *T.v. tomasinii* from South-East Europe; *T.v. meridionalis* is an important sub-species from South Switzerland, and Northern Italy and Yugoslavia.

2. The Palmate Newt (*Triturus h. helveticus*)

Description.—Similar in several respects to the smooth newt, with which it is easily confused. It is smaller, growing to a length of between 7 and 9 cms., with the male smaller than the female. Skin texture is similar. In the breeding season the male has a low, waveless crest, and a fold of skin down the flanks. The webbing between the hind toes is dark or even

black. The dorsal colouration is often greener than in the smooth newt, and finely dotted. There may be lateral rows of dark dots on the tail. In the land phase the female may have a red vertebral stripe, and there is also a tendency towards red colouration in juveniles.

Distribution.—Also a widespread British species, often overlapping with the smooth newt, both of which may be found in the same ponds. It is absent from Ireland. It occurs throughout West and South-West Europe, including France, the Iberian Peninsula, Switzerland, Belgium, Luxembourg, Holland and West Germany. It is largely a montane species, and may be absent from some low-lying areas. It

has been found at heights of up to six thousand feet.

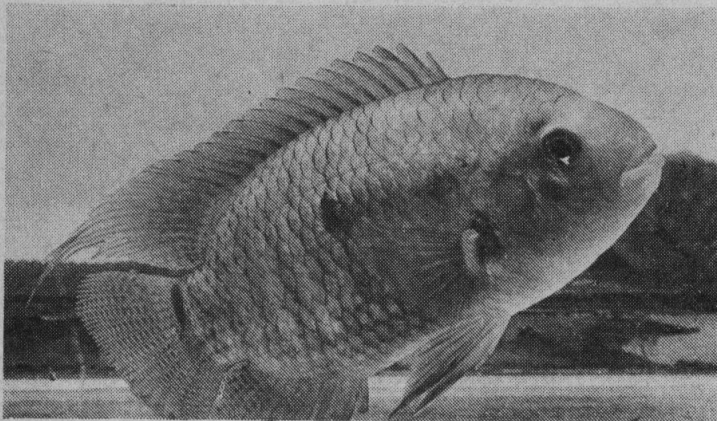
Care in Captivity.—This species can be treated almost identically in every way to the smooth newt. It will be found just as interesting and undemanding, with habits very similar to those of its close relative.

Note.—The palmate newt is in a similar position to the smooth newt, and so similar responsibility should be exercised.

A sub-species, *T. h. sequeirai* may be encountered in North Portugal.

Notes on the breeding habits of all the true newts will be found in the next article, which also deals with the crested newt (*T.c. cristatus*) and the alpine newt (*T.a. alpestris*).

KEEPING AND SPAWNING AN UNUSUAL ACARA



by David S. Saphier
(aged 14 years)

photograph by the author

EARLIER THIS YEAR I saw, in my local aquarist shop, a pair of large brown Acaras viciously defending their six hundred-odd eggs on a large rock in the tank. On enquiring as to their price, I was told that they had already been sold. I then asked the shopkeeper if he could get me a pair but was told that he could not order them but if I enquired about once a week, he might have another pair in.

So, every week, often twice, I went down there or

rang him up, and, about two months and a couple of dozen phone-calls later, he told me that he had recently got two more Acaras in, but that he was not sure if they were a true pair. Well, that afternoon I went there to look at them. It was indeed difficult to sex them as they both had fairly long dorsal and anal fin extensions and otherwise looked identical. I soon learned that nearly all Acaras seem to have these long fin extensions but when settled down, the

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by *Andrew Allen*

3. The Alpine Newt (*Triturus a. alpestris*)

Description.—Length between $7\frac{1}{2}$ and 11 cms, with the female larger than the male. Tail may be slightly shorter than the head and body. The tail has both dorsal and ventral crests, the former continuing on to the body in the male, but not in the female. The dorsal surface may be a slate-grey, or a less distinctive tone of brown, often with heavier markings. The blue-grey shade is apparent also in the dorsal crest, which may be banded with black and yellow. The male has a deep blue longitudinal stripe, and in both sexes the flanks may be flecked with a silvery-white. The undersurface is almost totally unmarked, and is a deep and beautiful orange.

Distribution.—This is far from solely an Alpine newt, though, as its name implies, it is widespread in the Alpine countries. It is also found in the Carpathians and South-East Europe, Greece, Italy, Spain, North-East France, Belgium, Luxembourg, Holland, Germany and Denmark. Though it favours the mountains, it will often be found in low country also.

Care in Captivity.—The Alpine newt is a distinctive species, rather less familiar to most of us than the Smooth and Palmate newts, and less often encountered for sale. It has similar habits to these newts, and its treatment in captivity should be similar. It makes an attractive denizen of indoor or outdoor vivarium.

There are at least six recognised sub-species of this newt, but the differences between them are not major, and need only worry the taxonomists.

Breeding Habits of the True Newts

All the European newts normally encountered by the amateur breed readily in captivity, especially in the outdoor vivaria.

The general breeding habits of all the newts are dealt with here because, unlike most other groups,

there is little variation from species to species. Vigour of courtship may vary a little, as may the duration of the mating season, but these are only slight differences in degree. Mating usually commences in March, and is preceded by an interesting courtship dance from the male. He raises himself on his toe-tips, arches his back into a crescent, and curves his tail like a bow; the tip of the tail vibrates rapidly the whole time. He produces a spermatophore package, and this is taken up by the female into her cloaca. The entire sequence takes place in the water, and is highly rewarding to watch, though this is only possible in the indoor vivarium, for obvious reasons. The female subsequently lays several hundred eggs singly on the leaves of water plants or other submerged objects. These hatch after two or more weeks, and the *larvae* undergo metamorphosis, which may occupy another nine or ten weeks according to conditions. The process resembles frog metamorphosis in several respects, but there are also important differences in the sequence of development and the manner in which the process is governed by hormones. In frogs and toads the supply of controlling hormones proceeds throughout development, but in newts it must be triggered at a certain time. If this metabolic trigger fails then the neotenus condition results. This is why neoteny is far more common in newts and salamanders than in frogs and toads. After mating has finished the adults leave the water and spend the remainder of the year on land, and the male loses his distinctive breeding garb.

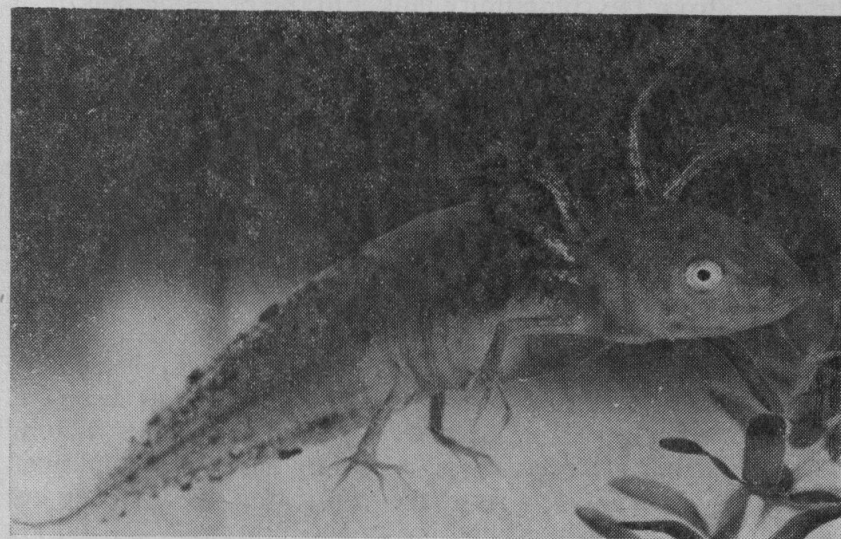
4. The Great Crested Newt (*Triturus c. cristatus*) also called the Warty newt.

Description.—Length is between 13 and 18 cms, with the female larger than the male. This is the largest common European newt. The tail may not be as long as the head and body. The skin texture is

distinctive, being heavily granulated and warty. In season the male has a high dorsal crest which is clearly separated from that on the tail. The dorsal surface is black, but there are fine white speckles on the flanks, and there may be a silvery stripe down the side of the tail. Ventral coloration varies between yellow, orange and red, with differing amounts of heavy black markings.

Distribution.—This newt is widely distributed in the British Isles, though it is absent from Ireland. It is found in much of Northern and Western Europe, deep into Russia and up into Scandinavia. See also notes on the sub-species.

Care in Captivity.—In most respects the Crested newt will demand similar treatment to its smaller cousins, but allowance must be made for its considerably greater size. Similar indoor vivaria and similar habitats can be used, but these vivaria must be larger in size, and the water may have to be deeper, and the whole scale of design may have to be modified.



Great Crested Newt Tadpole

Feeding must be governed by this same consideration of scale. The basic foods are identical, and the Crested newt can deal with food every bit as small as can the Smooth newt, though it does not always choose to do so. But it will also readily consume earthworms and the like that are far beyond the capacity of the smaller newts. As a result the range of food that can be offered is somewhat wider, and so feeding in general is a little easier. Strips of raw beef are an acceptable substitute that can be employed in times when live-foods are scarce.

Communities must also be modified to take into account the size of this newt. Because of its bulk and the nature of its skin and unpleasant secretions, it is less likely to be molested than a smaller newt, and thus can be safely associated with Clawed-toads, Edible frogs, Common frogs and Common toads. Terrapins and snakes are still taboo, though not all of them consider this newt to be a tasty morsel. The

Crested newt is himself a confirmed cannibal, and should be kept apart from the smaller newts in all but the most spacious of conditions. In general it makes a better community animal than its smaller cousins, and indeed there are very few Reptiles and Amphibians whose care is more simple.

Note.—As with the other British newts, the Crested newt is on the decline and subject to fierce pressures, notably destruction of ponds or their pollution. The amateur herpetologist should not remove them from any ponds unless, of course, these are due to be filled in, or destroyed in some other way. In this event they should be transferred to another pond where these dangers do not threaten. We should do nothing to jeopardize the status of this species, and everything possible to protect its interests. If captive newts breed, and this is very possible, the *larvae* should be transported to a suitable pond, preferably one where the species already exists.

Various sub-species may be encountered in dealers'

lists or while on holiday. In each case treatment in captivity will be just the same as for *Triturus c. cristatus*.

T. c. dobrogicus is found in the Dobrudja.

T. c. danubialis is found in the lowlands of the Danube valley, eastwards from Vienna. There appears to be some confusion between this and the above sub-species, and the position is considerably lacking in clarity. It is smaller than the great Crested newt, growing to between 12 and 13 cms, with a slender body.

T. c. carnifex is an important sub-species that is often encountered on dealers' lists. It grows as large as the type, with a compressed body and broad head, and is olive or brown in colour dorsally, with heavy black spots. It is largely a montane species found in Yugoslavia, Italy, parts of Switzerland, the Austrian Alps and Wienerwald.

The next article will deal with the highly attractive Marbled newt and the European Fire salamander.

THE HARDY EUROPEAN REPTILES AND AMPHIBIANS IN CAPTIVITY (Part 3)

by Andrew Allen

5. The Marbled Newt (*Triturus m. marmoratus*).

Description.—This is one of the most attractive and distinctive of the European newts. Length may be up to 16 cms, and in general it is rather smaller than the Crested newt. In season the male has a high dorsal crest on the body, separated from a similar tail crest by a depression. Both are absent in the female. The dorsal surface is in a variety of shades of green, with heavier, or black, marbling, and this is the only European newt to show such a coloration. The ventral surface may be grey, or a dark brown, with both black and white stippling, but shades of red do not occur, again a sure test in identification.

Distribution.—Found throughout Spain and Portugal, and in much of France, notably the West and Centre. Entirely absent from North-East France and other European countries.

Care in Captivity.—This species can be treated almost identically to the Crested newt. It takes similar food, requires the same conditions, and will prosper amidst the same communities. Breeding habits are identical to those of the other true newts, and were dealt with in the preceding article. If this species is kept in company with the Crested newt it should be noted that interbreeding may take place, though the resulting hybrids will be infertile both with respect to the parent species and to each other.

In conclusion, the Marbled newt is an undemanding inmate of vivarium or aquarium, and a gracious and beautiful addition to any collection of Amphibians.

There is one major sub-species, the smaller *T. m. pygmaeus*, which comes from the Southern parts of the Iberian Peninsula.

This deals with the five most important species of true newt in Europe, and their sub-species. The following are also hardy, and would require similar

conditions, but are unlikely to come the way of the amateur in this country:—

T. montandoni, from the Tatra, Black and Carpathian mountains, is a small species (up to 10 cms in length) that is restricted to montane habitats.

T. boscai, from limited parts of the Iberian Peninsula grows up to 9 cms in length, and has a poor reputation in captivity.

T. italicus, from Central and Southern Italy, is the smallest European newt, and closely resembles *T. vulgaris*.

The remaining members of the order *Urodela* are commonly called salamanders as opposed to newts, and characterised by the fact that they inhabit more terrestrial habitats.

6. The Spotted or Fire Salamander (*Salamandra s. salamandra*).

Description.—This is a distinctive species with a heavy, plump body, and a fairly short, oval tail. Though commonly it attains a length of 20 cms, to the South of its range it may grow to about 28 cms. The skin is smooth and shiny, but there are longitudinal rows of warts down the back, vertical warts along the flanks, and prominent parotid glands. Basic colour is pitch black, with bright yellow, orange or (rarely) red spots. In this form the spots are irregularly scattered, but there are a large number of varieties intermediate between the spotted and the striped sub-species.

Distribution.—Occurs in the Benelux countries, West and South Germany, much of the Alps, the Apennines, and South-East Europe. It favours areas of medium altitude (below about 1,000 ms), in damp and heavily shaded woodlands, particularly near streams and pools.

Breeding Habits.—These differ in most major respects from those of the true newts. Courtship takes place on land, and is a particularly clumsy performance. The male “lays” a spermatophore which the female takes up into her cloaca. Some time later the larvae are born alive in shallow water. Around twenty larvae are produced, each ready equipped with a pair of gills. Metamorphosis takes place in the water, they eventually produce lungs, and finally leave for the land as miniatures of their parents. Of great interest is the fact that birth may be delayed for considerable periods after mating, up to two years in some recorded cases.

Care in Captivity.—This is a fascinating creature, requiring substantially different treatment from the true newts. As long as its fundamental needs are complied with it will live happily for many years in captivity, demanding a minimum of attention. Basically it prefers a cool climate, a small piece of open water, moist or wet surroundings and a varied diet.

These conditions can be readily supplied in the indoor vivarium or aquarium. This should be placed away from the sun in a cool, but not a cold, room. A shallow water bowl should be provided, surrounded by a deep layer of moist soil. Suitable hiding places in the form of broken clay flowerpots or cork bark can be scattered around, and the entire area planted with thick mosses and shady ferns. The opportunities for constructive design are endless, and the results can be highly attractive.

This species presents fewer problems than most during the winter months, for it will over-winter fairly comfortably, or hibernate contentedly in a deep pile of leaves, sphagnum moss and general light organic litter placed in the vivarium, which should then be moved to a cool, dark corner of a frost-proof garage or shed.

Neither greenhouse nor cold-frame constitutes an ideal home for any salamander, for temperatures are liable to rise beyond the limits of tolerance of these animals. Much better is the outdoor reptiliary with its more equable climate and exposure to the rain. Provided this has a low wall (salamanders are no great escape artists), a reasonable pool, and a few shady corners with hiding places and dense foliage, they will potter along very happily. They will hibernate in their own good time, choose their own range of food, and, with a shade of luck, present you with a few junior salamanders. They are nocturnal, and hence are rarely in evidence during daylight hours, but may emerge after a refreshing shower of rain (or an artificial shower with a watering can). A late-night stroll with a torch will enable you to see them better.

Feeding presents very few problems. Earthworms, woodlice, slugs, whiteworms (*Enchytrae*) and a variety of insect larvae will all be taken with relish. Livelier

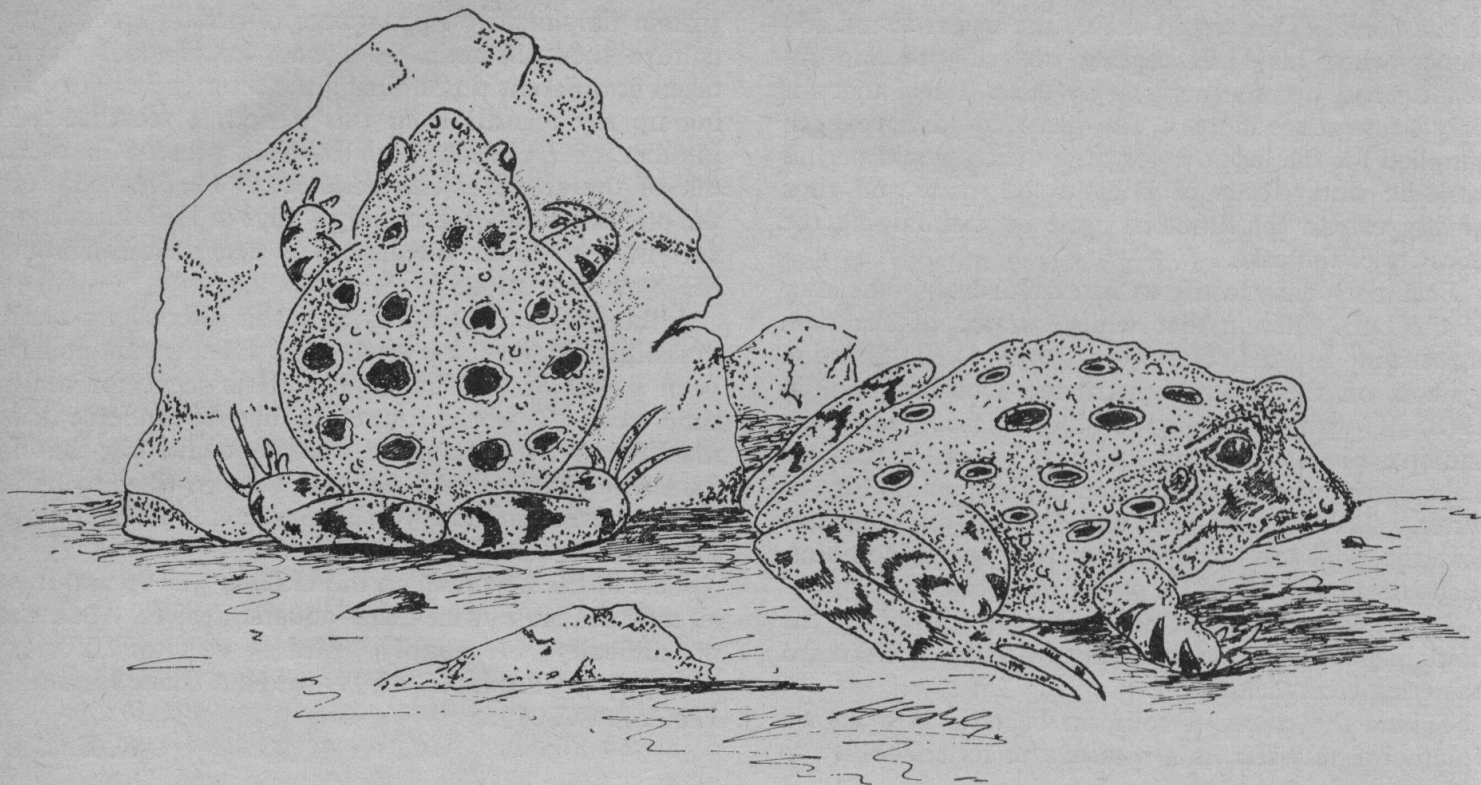
fare, such as spiders, should be avoided, as this salamander is not the speediest thing on four legs. Its ponderous movements require that all prospective prey should stay put, and even a humble beetle is likely to outdistance it over a short course. In lean times these animals will even accept raw meat, though this should always be treated strictly as a last resort.

The Fire Salamander is an admirable member of most communities in the vivarium, chiefly because few larger species will be foolhardy enough to molest it. Some snakes may eat it, as may a few courageous terrapins, but otherwise it carries its immunity in its warning colours and its milky poisonous secretion. This is harmless to humans (though it should not be allowed near exposed membranes like the eyes, or near open cuts) but is highly virulent by Amphibian standards. Because of this it can be associated with animals like the Green lizard or the Marsh frog that would enjoy a small newt or the like. But please note that juvenile salamanders are likely to be treated with considerably less respect. Within its humble lights it is the perfect community animal, colourful, with interesting habits, molesting none of its companions (unless they are small enough to be mistaken for a worm), and immune from all attack. It can be whole-heartedly recommended to the amateur herpetologist.

There are numerous sub-species of varying importance. The Striped salamander (*S. s. terrestris*) differs only in the arrangement of its markings, which tend to form separate stripes along the body. It is a montane animal, found in West Germany, Benelux, France and Switzerland. The two forms are difficult to distinguish, and interbreeding certainly takes place in many areas. Both sub-species will be encountered with equal frequency on price lists, and they require totally identical treatment. *S. s. corsica* comes from Corsica, whilst *S. s. almansoris*, *S. s. bejarae*, *S. s. bernardezi*, *S. s. bonnali*, *S. s. gallaica*, *S. s. hispanica* and *S. s. molleri* all come from Spain or Portugal.

The Alpine salamander (*S. atra*) inhabits the Alps, Albania and Yugoslavia. It is a uniform, glossy pitch black in colour, grows to a length of 16 cms, and is completely independent of free water, producing live young on land. Little is known about its care in captivity, other than that it is very demanding in its requirements and short-lived. Unless highly specialised treatment can be provided this fascinating Amphibian should be avoided as an inmate for the vivarium. But it is well worth a visit to the high Alps to observe these animals in their natural habitat.

There are several other European salamanders belonging to the genera *Salamandra*, *Proteus*, *Hydro-mantes*, *Pleurodeles*, *Salamandrina*, *Hynobius*, *Chioglossa* and *Euproctus*. None of them are likely to be imported into this country, and very little is known about their care in captivity.



PAINTED FROGS

(Discoglossus pictus)

Written & Illustrated

by H. G. B. Gilpin, B.Sc.

THE THREE Painted Frogs I have at present originally came from Malta.

I was spending a few weeks on the island towards the end of August 1970, having gone there principally with the intention of looking for lizards, and it was entirely by accident that I found the frogs. On the face of it, Malta is a most unpromising place for amphibians; in fact I understand that Painted Frogs

are the only members of the order to be found there. Throughout the summer months the island is very hot and so dry that, apart from a very few protected areas, the foliage is yellowed and sparse.

One afternoon, with the temperature in the region of 85°F., I went to Chadwick Lakes. In the rainy season this is a waterway running between high banks and sheltered by overhanging trees, but at the time of

my visit no water was to be seen and the dried up bed of the river was covered with large stones, debris and scrubby undergrowth. Even the undersides of the stones were dry and apart from a host of insects, the occasional Moorish Gecko on the steep side of the sun-drenched bank and a snake (probably the black form of the dark green Whip Snake) glimpsed as it wriggled its way into a mass of desiccated plant stems, no sign of animal life was evident.

During a fairly intensive search of the area, I noticed a trickle of water emerging from a cavity, roughly twelve inches square, at the bottom of one of the banks. Closer investigation revealed a tiny pool, about six inches deep, just inside the entrance and fed from a larger and apparently deeper pool just visible in the darkness of the interior. Both pools were absolutely packed with Painted Frogs ranging in size from $\frac{1}{2}$ inch to $2\frac{1}{2}$ inches from nose to vent. Curiously enough, the tiny frogs seemed to be confined to the smaller, lighter pool and the large ones to the dimly illuminated interior one.

My close approach threw them into complete confusion and they either dived to the bottom of the water or scrambled frantically towards the sheltering darkness. I was unable to reach the larger specimens but secured three small ones, two of them each $\frac{3}{4}$ inch in length and the third just over an inch. These travelled back to England quite satisfactorily in a plastic box packed with damp tissues and were transferred to their present quarters five days after capture.

Their vivarium measures 18 in. \times 12 in. \times 12 in. The floor is covered with a layer of small pebbles submerged in an inch and a half of water. One corner is built up with flat stones to form a platform on which stands a tray planted with low-growing vegetation. Another flat stone, resting across two more, provides an underwater tunnel into which the animals can retire.

Painted Frogs make excellent vivarium inmates and from the moment of their introduction they settled down. From the beginning they fed freely on small earthworms and tiny slugs, to such good effect that the largest one now measures $2\frac{1}{2}$ inches from vent to nose and the others $1\frac{1}{2}$ inches. They still feed mainly on slugs and earthworms but will take gentles and the occasional blowfly. Their food is placed on the planted tray. This enables the worms, etc., to survive until they are required and also makes it easier for the frogs to capture them.

My specimens are active little animals although they spend a considerable time submerged in the water, squatting on the bottom, with only their heads above water. Whilst lively on occasion, their jumping powers are much inferior to those of our common English frog. In this, as in other ways, they more nearly resemble their close relatives, the Fire-Bellied Toads.

Their pointed heads and rotund little bodies give

them a pear-shaped appearance when viewed from above. Their colours vary greatly. Basically the dorsal surfaces are reddish-brown to dark grey covered with brown patches, often edged with a lighter colour. Ventrally, Painted Frogs are more or less white, sometimes speckled with brown. On occasion they can change colour surprisingly quickly.

Recently, wishing to examine the animals in detail, I took two of them out of their vivarium and placed them on the bench. Whilst in the water their upper parts were dark, olive brown, so much so that the patches were barely visible. Whilst on the bench they remained this colour, if anything the patches becoming even less discernable. After some ten minutes they were returned to the water when immediately their ground colours changed to greyish-white and the patches stood out clearly and distinctly.

My specimens are unenthusiastic about being touched and if a hand is brought near one when it is sitting on the bench it reacts in a characteristic manner, flattening itself as closely as possible to the surface, it points its head downwards, so that the whole animal forms a gentle arc from the tip of its posterior end to the front part of its mouth. If startled when in this position, the head is turned sideways with the near side lower than the far side, as though hoping that if it does not look, the unwelcome intruder will go away. Further provocation, such as touching it with a finger, results in the frog flinging itself on its back with all four legs held tightly against the body. It remains in this position for rather less than a minute, then quickly rights itself and with a vigorous, but not very effective hop, jumps to about twelve inches away from its fancied oppressor.

I imagine *Discoglossus* would make a satisfactory community animal in a vivarium devoted to amphibians of comparable size, judging from the way my three specimens live together and the close contact they showed with many others in their native pool.

Painted Frogs are, however, strongly aquatic and require a permanent supply of water, deep enough to submerge their bodies. Mine rarely leave the water voluntarily for any length of time. In spite of the considerably higher temperature of their native habitats, they do not require heated quarters in this country. Mine remain active and feed freely throughout the year at ordinary room temperatures.

Apart from being less lethargic, they seem to be far less vociferous than their English relations. Their normal croak is infrequently heard, soft and muted but when they are removed from familiar surroundings and placed somewhere strange they sometimes express resentment with a low, grunting noise.

Although not remarkable for vivid hues, Painted Frogs are worthwhile additions to a collection. They are interesting, easy to feed and their maintenance involves neither expense nor difficulty.

a colour variation of the half-banded barb. The description and picture of *B. schuberti* certainly match our "odd-fish-out" and this seems, at present, the best explanation. It would be interesting to see if any other readers could shed some light on this subject.

T. D. KEARSLEY,
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Northants.

Slide and Tape Lectures

I have listed below three Slide and Tape lectures made by our Society which are hired out to other societies at a nominal fee. Would you be so kind to print this information at some time in the near future as many clubs wonder what entertainment to use for their meetings.

7th annual open show, 72 slides roughly.

Plants for the aquarium, 50 slides roughly.

Fishes for the community aquarium, 50 slides

roughly.

Mr. Roy Browning is the secretary dealing with the hire of these films. His telephone number is Brighton 419911.

SALLY M. CORBIN,
80, Marlborough Drive,
Burgess Hill, Sussex.

Battery-Powered Aerator

We were most interested to read the article about power filtration without the A.C. mains supply by P. A. Hickling, B.Sc.

This article gave a number of different methods of aerating an aquarium during a power failure and although all the methods mentioned were of use to the aquarist, we would suggest a far simpler method would be to employ a Battery Powered Aerator, the cost of which need not exceed £2.87½. Such aerator run for approximately 24 hours on a small, dry battery.

FANTASY PET PRODUCTS LTD.

HERPETOLOGICAL NOTES

by *Stephanie J. Peaker*

Rana

Frogs of the genus *Rana* are not very often kept by herpetologists in Britain since, unless they have a good deal of space to jump, they are liable to damage themselves. If a large enclosure can be provided then they are very interesting animals to keep. We had an indoor enclosure 4 ft. x 4 ft. and over 6 ft. in height with a pool in the bottom. The inhabitants included the Common Frog (*Rana temporaria*), Edible Frog (*Rana esculenta*), Agile Frog (*Rana dalmatina*) as well as several African forms—the Sharp-nosed Frog (*Rana oxyrhyncha*), Bent-toed Frog (*Rana mascariensis*) and Green-striped Frog (*Rana fasciata*). The temperature during the day was kept at 70-75°F and allowed to fall to 55-60°F at night. A 15 watt blue light was installed in order to observe the animals feeding in the evenings. Batches of flies were released into the cage and this evoked a fantastic display of leaping to catch flies seemingly far out of reach. Any that escaped the ranas were soon caught by Green Tree-frogs (*Hyla arborea*) which lived in tall plants. Hedgerow sweepings are an excellent source of food for such a collection of frogs.

An interesting small frog we kept in Hong Kong is the Paddy Frog (*Rana limnocharis*) and they would be ideal additions to a community of small frogs. This species, as its name implies, is common in paddy fields

and, like its larger relative the Chinese Bull Frog (*Rana rugulosa*), is eaten in China. It is very attractive, being basically green with a light dorsal stripe. The dark markings on the lips continue from the upper to the lower jaw as if paint had been applied with a brush.

Care must be taken when building up a community of frogs not to introduce ones which have highly poisonous skin secretions. The example usually given is the toxic Pickerel Frog (*Rana palustris*) from North America.

Feeding Snakes

Keepers of snakes are always faced with the problem of whether to give live or dead vertebrate food. This subject always provokes argument and emotional articles sometimes appear in lesser Sunday newspapers on the evils of giving snakes live food. Leaving emotion aside but bearing humanitarian thoughts in mind, I want to state some of the advantages and disadvantages of feeding dead or live prey.

The main advantage of giving live food is that some snakes will not accept carrion. There are, however, several disadvantages. If the prey is a rat or mouse and is not killed immediately, it may well damage the

Continued on page 13

perfectly streamlined contours known to nature. The thickest part is in front of the middle, and the width diminishes gradually to the tail. This is known to engineers to be the shape which offers least resistance, and is why a tunny is capable of high speeds. Canadian tunny fishermen equipped a line with a speedometer, which registered the rate at which a hooked fish went away. A 60 lb. specimen topped 44 m.p.h., but the large ones of around 500 lb. are believed to be capable of higher speeds than this.

The tropical sailfish, which can grow to 12 ft., is one of the fastest species. It has been times at 68 m.p.h. That remarkable phenomenon, the flying fish, is not far behind it. The ciné-camera has cast much light on its movements. It breaks surface at 15-20 m.p.h., and is almost horizontal at that moment. But it does not glide at once; instead "taxi" along the surface. It threshes the top of the water with its tail fin as this gives additional speed. Air speed has

been estimated at anything between 35 and 55 m.p.h. Then follows the glide, which may last up to four seconds, carrying the fish 50 yards or so, and perhaps more with a following wind.

One must not overlook that comparatively small, though very fast mover, the bonefish. It varies from three to 10 lb., and veteran anglers say it is one of the gamest of all species. Zane Grey, famous writer of Westerns, was an inveterate fisherman, and he had great admiration for this particular species, saying "No other fish celebrated for swift motion is in his class." One angler who had hooked a bonefish reckoned that his catch hurtled out 400 ft. of line at a speed of 40 m.p.h.

It is the habit of the bonefish, if taken close inshore, to rush for the land at top speed. Such is its velocity that it has been known to rocket out of the water and land up on the beach, unable to check its headlong career earlier.

Continued from page 132

snake by biting or gnawing it. There is also the danger in a wooden cage that the rodent will gnaw its way out leaving a hole for the snake to follow. While these objections can be overcome by removing the animal if it is not immediately eaten, there are difficulties particularly if the cage is well furnished and the rodent goes to ground. Giving dead prey overcomes these obstacles and has the advantage that once a snake is accustomed to eating carrion, food can be deep-frozen when plentiful and then thawed and rewarmed when necessary.

While I feel that the dead system has certain advantages, I have no objection to live feeding most species of snake and always revert to it if the snake will not feed on dead prey. I am convinced that many snakes can kill their prey at least as quickly, if not more so, than the mechanical methods available to the keeper.

Humidity Measurements

Humidity can be an important factor in the care of many reptiles and amphibians and a number of methods exist for its measurement. A very useful booklet on humidity and its measurement is *Measurement of Humidity* by M. J. Hickman (National Physical Laboratory, notes on applied science no. 4, 4th edition, 1970, London, H.M.S.O.).

Answers to queries on chelonians

I have two young terrapins just over an inch in length that bend their necks sideways to withdraw their heads. The shell is brown but the head has orange-yellow spots. The dealer I bought them from says they came from South America. Can you identify them?

These specimens are side-necked terrapins (Pleuro-

dira) which occur in South America, South Africa and Australia. The species you have is a member of the genus *Podocnemis*, probably *P. unifilis* which is the form usually imported and often known as the Amazon River Terrapin. They require a water temperature of about 80°F, otherwise their care is as for other baby terrapins.

Is the Matamata turtle from South America ever available in Britain?

Yes, but only rarely and then they are expensive.

Will the European Pond Tortoise (*emys orbicularis*) hibernate successfully at the bottom of a pond?

Yes, provided that they are not babies (carapace at least 3-4 in.), they are well fed during the summer and that the pond is at least two feet deep with a thick layer of mud in the bottom. However, I do prefer to bring terrapins indoors for the winter and feed them in the usual way.

Please note to include a stamped addressed envelope for answers to enquiries. Only those of general interest can be included in these notes.

Tortoises and high temperatures

Tortoises can sometimes find themselves in the open sun in deserts and under such conditions their body temperature can rise alarmingly. As an emergency measure to prevent a lethal rise in temperature, tortoises have been found to salivate profusely to cover their head and front legs. Some may also urinate to wet their hind limbs. These two measures have the effect of increasing evaporative cooling thus preventing a lethal rise in temperature. This behaviour has been studied in several species and a paper on the Ornate Box Tortoise (*Terrapene ornata*) has recently been published by M. L. Riedesel, J. L. Cloudsley-Thompson and J. A. Cloudsley-Thompson in *Physiological Zoology* (vol. 44, p. 28, 1971).

THE HARDY EUROPEAN REPTILES AND AMPHIBIANS IN CAPTIVITY (Part 4)

by Andrew Allen

7. The Midwife Toad (*Alytes.o.obstetricians*)

Description.—The general appearance is toad-like, but in fact this species is more closely-related to the Painted frog than to the true toads. It is a member of the Discoglossidae, and possesses the characteristic discoid tongue. It is small, growing to between 4 and 5.5 cms., with a compact body. The back is covered with tiny warts, and there are two longitudinal rows of larger warts down both sides. The ventral surface is granular in texture. The tympanum is partially concealed, and there are no vocal sacs. The dorsal surface is in various shades of grey and grey-brown, with a red tinge on the larger warts. Ventral coloration is cream, sometimes with grey or black spots on the throat.

Distribution.—Mainly found in South-West Europe, including Spain, Portugal, France, Belgium, Switzerland and parts of West and South Germany. Hilly country is favoured, and it may be found far from open water.

Breeding Habits.—The unusual breeding habits of this species are of great interest to the scientist, and a source of fascination to the amateur. Mating takes place on land over a period of several months, and spawning may take place more than once in the same year. The position of the amplexal grip during courtship varies widely, starting at the loins and sometimes finishing round the neck. As the string of spawn emerges from the cloaca of the female, the male winds it round and round his hind limbs. Eggs are usually produced in batches of about a hundred. For a period of two or three weeks the male maintains the eggs in a moist condition, before finally entering shallow water. The eggs hatch, and the subsequent development of the tadpoles is unremarkable. The

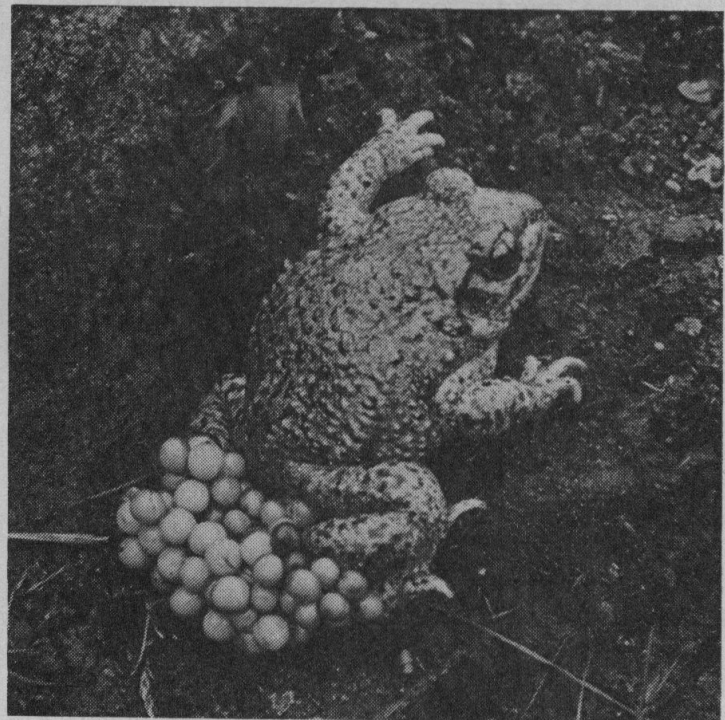


Photo: W. S. Pitt

harmonious call of this batrachian during the mating season has given rise to the alternative name of Bell toad.

Care in Captivity.—Very few species cause less trouble in captivity than the Midwife toad. All it requires is a small shallow pond, some dark, damp hiding places and an abundance of natural vegetation. All this can be easily supplied in the indoor vivarium, even of fairly modest dimensions—say three feet in length. The soil should be slightly moist and loose in texture, allowing it to dig hiding places beneath logs or stones.

But even better is an outdoor reptiliary, or, best

of all, a small walled garden. Under these conditions all worries about hibernation, feeding, and maintaining a suitable atmosphere, are relieved. The Midwife toad settles down very happily in the English climate and is thoroughly hardy. In a shady walled garden it will live and breed for many, many years from generation to generation. This being the case, the protection given by a greenhouse or cold-frame is plainly superfluous, whilst the extra heat on really sunny days may be harmful to any spawn that is being carried.

A wide range of food is taken, exclusively on land. Any small invertebrate, be it adult insect, insect larva, woodlouse, earthworm or spider, will be grist to the mill. There are no problems here.

This is a rather small species, and so it should only be associated with other small species in the balanced community. Snakes, terrapins, large lizards, and the larger frogs should all be avoided. In the indoor vivarium it is good company for Fire salamanders, Common, Green and Natterjack toads and Common, Moor and Agile frogs. In outdoor vivaria the choice of companions is obviously much wider, and size is the only important criterion. With its nocturnal habits the Midwife toad is not the most spectacular member of any community, but it is well worth inclusion for its undemanding nature and remarkable breeding habits.

There is one sub-species, *A.o.boscai*, found in the Iberian Peninsula. *A.cisternassii* is a separate species found in Southern Spain, but is similar in most respects to its more familiar relative.

8. The Fire-Bellied Toad (*Bombina orientalis*).

Description.—This is a very small toad, growing to no more than 5 cms., with all the typical characteristics of the Discoglossidae, *i.e.*, discoid tongue, no external vocal sacs and no external tympanum. There are internal vocal sacs. There are numerous small warts and a few spines on the dorsal surface, which is dark grey in colour, with some even darker patches. The ventral surface is blue-black, dominated by splashes of glorious red, orange or vermilion. There are also some white specks. This is a highly attractive species.

Distribution.—Occurs in large areas of Central and Eastern Europe, including Southern Scandinavia, Eastern Germany, Austria, Yugoslavia, Rumania, Hungary, Bulgaria and parts of Russia. It is a lowland animal, found in or near water of almost any description, ponds, ditches, puddles or wheel-ruts.

Breeding Habits.—Lumbar amplexus takes place at any time during late Spring, and spawn may be produced more than once in the same year. The eggs are laid in small batches, sometimes even singly, on the floor of the pond or amidst clumps of water weed.

Care in Captivity.—The Fire-Bellied toad is thoroughly hardy, and very undemanding in its requirements.

It settles down well in the indoor vivarium, to which it is perfectly suited because of its small size. For instance half a dozen specimens can readily be accommodated in a vivarium of four foot in length. Indeed, the sociable nature of these charming toads should always be taken into account, and fairly large numbers in a large vivarium are greatly preferable to small numbers in a small vivarium. Basic planning of the interior design should be related to the semi-aquatic habits of this animal, and is best achieved by sinking a large pool into a thick layer of soft, damp soil. Obviously a pool of irregular outline, either ready-bought or modelled from plastic sheet or cement, is more aesthetically pleasing than a plastic lunch box or the like, and also allows for the construction of a suitable slope to the sides of the pond. Abundant vegetation, and hiding places carefully harmonized into the background will complete the design. The vivarium should be placed away from strong sunlight, though indirect sunlight will cause no harm.

These toads should over-winter fairly comfortably, though their life span will inevitably be reduced somewhat as a result. The alternative is to place them at the onset of colder weather in a large box packed with moss and leaves, which should be placed, covered of course, in a frost-proof garage or outhouse. This method, though it can be perfectly successful, requires constant vigilance. It also requires delicate judgment, for the toads must be transferred to and from their winter quarters at just the right moment. Ideally this should happen when temperatures in the outhouse and in the vivarium are very similar, and so it would help if a thermometer were to be kept permanently in both places.

Greenhouse and cold-frame make even better homes, with their extra space, and with worries about hibernation alleviated. Equally good is an outdoor reptiliary or walled garden pond. As long as there is a substantial pool and some dense cover these animals will live happily for a good many years, though they may be somewhat reluctant to breed. Because they appear to be active throughout both day and night, and as a result of their fiery coloration, these toads are more prominent than most batrachians. They always seem to be in evidence, and will grow to be very tame indeed. Feeding is a very easy matter, for they will take the entire range of small terrestrial invertebrates, with size the only limiting factor.

Because of their warning colours few other Reptiles or Amphibians will molest them, and as a result they can be included in a surprisingly wide range of communities. Indeed, there are recorded instances

where they have been left in the company of voracious terrapins, and emerged to tell the tale! However, I would hesitate to take this as a precedent, and would certainly keep them well away from terrapins, snakes and the larger frogs. But most other small Amphibians, tortoises and lizards, will make acceptable companions. In their turn they are thoroughly harmless, and will instigate no trouble at all.

In conclusion, this is a very hardy species that can scarcely be bettered as an inmate for all types of vivarium, and one that will bring joy through its lively habits and sociable nature.

There are no sub-species.

9. The Yellow-Bellied Toad (*Bombina.v.variegata*).

Description.—This species is very similar to the preceding one, growing to the same length, having the same build, and a similar dorsal coloration. The major difference is in the ventral coloration, for the orange or red markings are replaced by bright yellow ones, and there are fewer white dots, if any at all. In addition it has no vocal sacs of any type.

Distribution.—The Yellow-Bellied toad replaces *B.bombina* in Western Europe, being found in nearly

all of France, most of the Alps, Belgium, Holland, West Germany, and parts of the Balkans. In addition it is not a creature of the plains, but occurs often in hilly, or even mountainous country, up to an altitude of about 2,000 ms.

Breeding Habits.—Except for minor differences in timing these are identical in outline to those of the preceding species. The call note is similar.

Care in Captivity.—This species can be given identical treatment to the Fire-Bellied toad. It is thoroughly hardy, will breed with greater readiness in confined conditions, and may live for many years in the outdoor vivarium. A number of these toads are on record as living for sixteen years in a reptiliary, and this may be by no means a maximum figure.

There are three sub-species:

B.v.pachypus is widespread in parts of Southern Italy.

B.v.scabra and *B.v.kolombatovica* both come from the Balkan countries.

The next article considers the two European members of the Pelobatidae, namely the Spade-foot toad and the so-called Mud frog.

SPAWNING THE THICK-LIPPED GOURAMI

by Michael D. Rose (*aged 15 years*)

AFTER A YEAR of keeping tropicals and breeding the usual livebearers I decided to try to spawn some egglayers. Whatever the species I didn't really care as long as it was to be a medium-sized pair of cichlids or gouramies. I foolishly bought a breeding pair of 4½ inch Blue Acara which I found were too old to spawn following the donation of a huge clutch of eggs—infertile. I therefore pass this message on to fellow aquarists: when buying a breeding pair of fish always enquire about their age as they may be too old to spawn successfully.

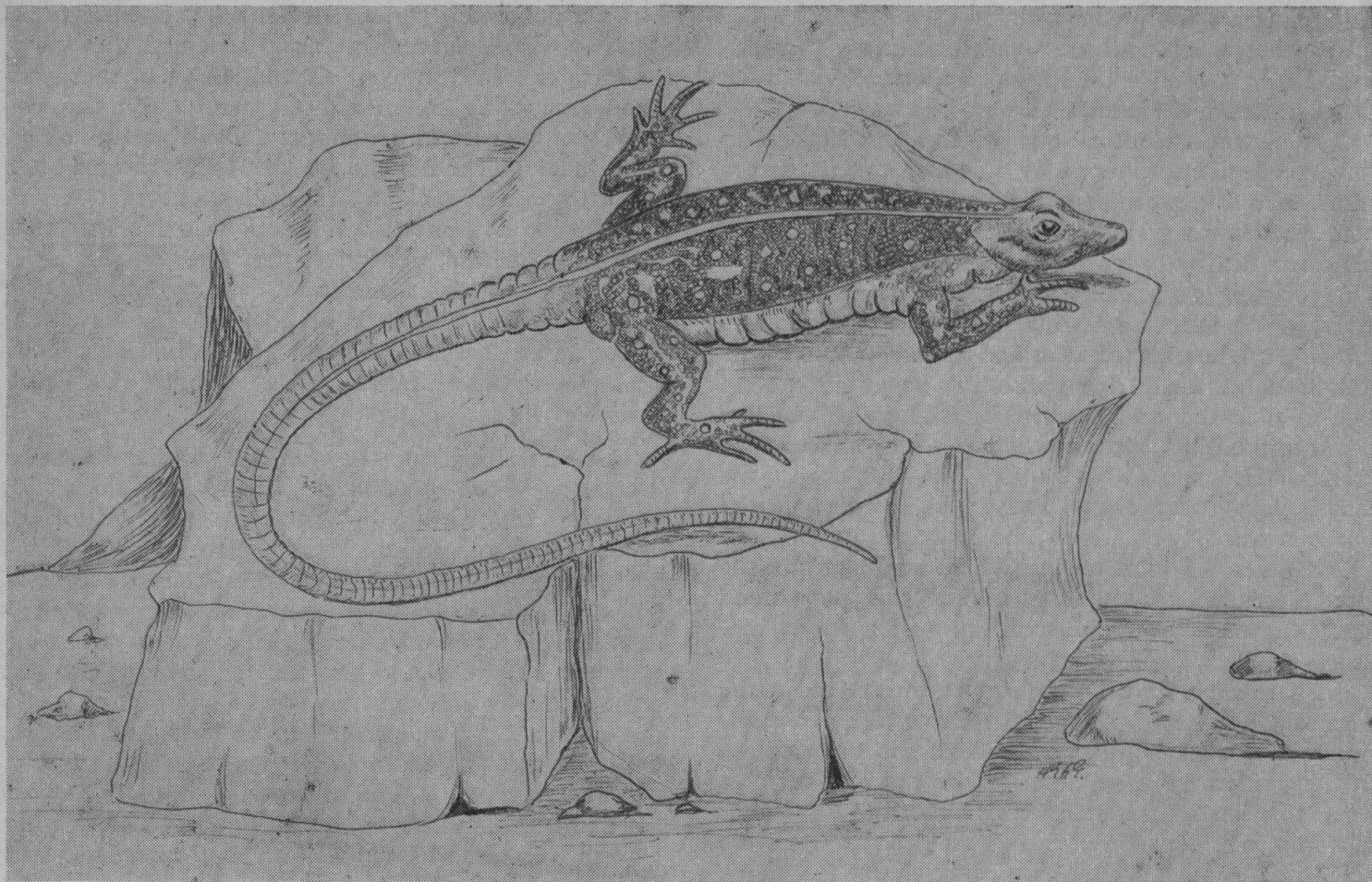
When obtaining a pair of Thick-Lipped Gouramies, one must make sure that the fish you buy are *Colisa labiosa* and not the Giant Gourami, (that not being *Oshphremus gorami*) *Colisa fasciata*. According to Pinter, *Colisa fasciata* has an elongated body and a dorsal fin which is quite distinct from the caudal fin and it is red at the top. It grows larger and the anal fin is pointed at the tip with a metallic blue

colour and a red edge.

The thick-lip is native to Burma, Indo China and Assam; water composition is no great problem with this species and a temperature of 74°-78°F. is suitable for maintaining them. For breeding 78°-85°F. is ideal.

Its basic coloration is greenish brown overlaid with eight or nine reddish-brown vertical bars. The tips of the blunt-edged anal and dorsal fins are blood-red as are the thin ventral fins of the male. Just recently a giant Thick-Lipped Gourami has been brought on to the market. Specimens can grow to 5 in. and the colours are much more opaque and brighter than the ordinary thick-lip.

When I bought mine, the male was a giant thick-lip, and the female was ordinary, but she was well rounded. She was about 2½ inches long and he was about 3½ inches long. I bought them on the 11th March, 1972. I took them home and put them in a 24 in. × 8 in. × 8 in.



Platysaurus minor

by H. G. B. Gilpin

I HAVE ONLY KEPT a single specimen of this handsome little lizard. Native to S. Africa and commonly known as the Red-tailed Rock Lizard, the species has rarely come my way, so that when a chance to acquire one arose I hastened to take advantage of the opportunity.

It arrived, safely packed in soft moss in a canvas bag, a form of transport I have always found satisfactory for lizards. Although active enough, it seemed in rather poor condition, an impression heightened by the extreme flatness and relatively considerable width of these animals.

Red-tailed Rock Lizards are beautiful little creatures. Mine was five and a half inches long from its nose to the tip of its slender tail, which equalled the combined head and body length. Its head, narrow in comparison with the width of its body,

was sharply pointed and the eyes slightly protruberant. The width and shallowness of the bodies of these animals adapts them admirably for life amongst bare, rocky surroundings, enabling them to take refuge from their enemies in crevices and fissures so narrow as to baffle further pursuit.

In colour my lizard was particularly attractive. The dark brown dorsal surface was relieved by a lighter central line. The throat, a vivid blue, matched the bright blue areas on the insides of the legs, contrasting with the mottled brown of their outer surfaces. The flanks and tail were an ostentatious orange-red. One would have thought that this colourful combination of hues would have made this lizard sufficiently conspicuous to attract the attention of any prowling predator in search of a meal. In actual fact, however,

when startled, the lizard, in the absence of a convenient retreat, pressed itself tightly to the ground, hiding the revealing patches of bright blue. One could easily imagine how well the brown and orange areas still exposed would merge with the surfaces of sun drenched rocks.

On arrival, the lizard was placed in a glass-sided, angle iron tank, 32 ins. × 14 ins. × 17 ins. high, equipped with a raised metal cover carrying slots for two electric light bulbs. By varying the wattage of the bulbs—two of 25 watts in summer, replacing one or both with 40 watt bulbs in cold weather—a steady temperature of 75°F. was maintained. This temperature appeared to suit the animal very well.

The floor of the tank was covered with two inches of fine gravel. A number of large stones was scattered around, some overlapping and some piled into small heaps, to provide niches and crevices into which the animal could retreat when so inclined. At first it used these hiding places with some frequency, vanishing into incredibly small gaps with surprising ease. It soon became tame, however, and ignored the presence of humans outside its quarters, only disappearing if a hand was introduced and brought too close to it. Most of the time it spent in the open, basking in the heat of the electric light bulbs with intermittent spells of activity when it scampered over and around the various obstacles, moving with considerable speed.

An essential feature of the vivarium was a shallow vessel of water. Experience over many years has suggested that newly acquired lizards, at least those of such species as will drink from a container or will submerge parts of their bodies in it, is a supply of water. This seems to be particularly true of lizards accustomed to a dry environment and which probably absorb water in the form of dew through the skin. Such lizards often become dehydrated for one reason or another during the time, which may amount to several weeks, between capture and their arrival in one's vivarium. In these cases immediate access to water is more important than an opportunity to feed. Indeed, some show no inclination to feed until the water content of their bodies has been restored to normal.

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mouthed the anal fin of the male. She then laid two bright yellow eggs about $\frac{1}{8}$ in. diameter on the slate; she picked them up in her mouth and then mouthed the anal fin of the male again. During this time the male put on a display of quivering, every fin rigid and his eyes nearly bulging out.

This continued for some two hours and during this time only four eggs were seen to be laid, but the mouthing of the male's anal fin continued practically without a break.

I invariably keep newly acquired lizards under fairly close observation until I am satisfied they have settled down and have started to take nourishment. On this occasion I was relieved to see the *Platysaurus* drinking in less than half an hour. Although supplied with plenty of small locust hoppers, blow-fly maggots and mealworms, it was slower to take food and it was not until it had been in my possession for almost a fortnight that I saw it attack and eat a maggot. Having made the initial attempt, it followed the usual pattern with these animals and fed readily on all three forms of food provided.

If the species as a whole behaves similarly to my specimen, *Platysaurus* makes a good community animal. When it was first introduced to the vivarium, it found itself in the company of several wall lizards, *Lacerta sicula*, and a large grey Gecko, *Tarentola mauritanica*. The latter animal, inclined to be aggressive towards adult members of its own species, took no notice of the other inmates, neither did they disagree amongst themselves. This state of amity continued even when the wall lizards came into breeding condition and deposited several eggs on the gravel.

I imagine the Red-tailed Rock Lizard is reasonably long-lived in confinement. Mine survived for two years in perfect health and only succumbed then as a result of an accident. At the time I was rather short of accommodation and placed two young home-bred Ocellated Skinks in the vivarium with the *Platysaurus* and its companions. I thought the skinks, bulkier but scarcely as long as the wall lizards, were small enough to ensure the safety of the others. All went well for a few weeks and then the Rock Lizard was found to have lost a foreleg. This appeared to have been bitten off close to the shoulder. On balance, it seemed one of the skinks was responsible and after their removal no further damage was suffered by the remaining lizards. It showed no signs of being inconvenienced by the loss of a limb and moved around almost as freely as it had done prior to the injury. However, it is probable that more harm was done than the behaviour of the Rock Lizard indicated and some three weeks later it died.

After two hours she lost interest and swam off to hide in a cave. The male was returned to his half of the tank. The female has not eaten since, so we now await results.

Water conditions during both of these spawnings was: temperature 72-76°F; pH 7.1; DH4 (German scale).

The second lot of fry are now free swimming at about $\frac{3}{8}$ in. long. They feed on finely grated beef-heart. Only three have been seen.

The incubation period was 25 days this time, but the temperature had been raised to 80°F.

THE HARDY EUROPEAN REPTILES AND AMPHIBIANS IN CAPTIVITY (Part 5)

by Andrew Allen

10. The Spade-foot Toad (*Pelobates f. fuscus*)

Description.—This is a compact toad of medium build, growing to a length of 8 cms. in the case of the female, somewhat less in the male. The back is smooth, perhaps with small warts, and the male has a prominent gland on the outside of each upper arm. There are no vocal sacs, and the tympanum is invisible. Webbing on the feet extends to the tips of the toes, and there is a distinctive, horny digging spur on the underside of each hind foot. Dorsal coloration varies between brown (male) and grey (female), with olive spots and red or brown dots. Ventral coloration is a dirty cream, speckled with grey or brown.

Distribution.—Widespread throughout much of Europe, including France (except the South-West), the Benelux countries, Denmark, Sweden, Germany, Austria and South-East deep into the Balkans and the Caucasus, to the Urals and the Aral Sea. It is only found in lowland areas where fairly soft, often sandy, soils are encountered, but, being purely nocturnal, will rarely be seen during daylight hours even in regions where it is very abundant.

Breeding Habits.—Courtship takes place during April and May, with a lumbar amplexus. Eggs are laid in a single, thin string. The tadpoles are slow to develop, and grow to the remarkable length of 18 cms.

Care in Captivity.—The requirements of this batrachian are unusual, but can be complied with fairly easily. The Spade-foot toad is a compulsive burrower, digging with considerable rapidity and power. The indoor vivarium should be filled to a depth of about ten inches with moist, soft soil, preferably sandy in composition. A few green plants will improve the aesthetic appeal of the vivarium, but probably make but little difference to the toads themselves. A small,

shallow water bowl should be sunk into the earth, but will only be used at rare intervals. Access to a greater area of water should be ensured during the breeding season, possibly by transferring the toads to a different vivarium normally inhabited by semi-aquatic species. Hibernation is a fairly simple matter, for the vivarium needs only to be moved to a frost-proof outhouse, and extra insulation provided by a layer of leaves, moss and organic litter.

The Spade-foot toad is reasonably hardy and will survive in reptiliary (in Southern counties only), greenhouse or cold-frame. Its sole requirements in these vivaria are a deep pile of soft earth and a few shelters (and make sure that the foundations are deep enough, for these toads really can dig).

Feeding is simplicity itself, for most small invertebrates will be readily accepted. Earthworms are probably best as a basic diet, supplemented by woodlice, centipedes and all kinds of insect fare. It fits into most communities with ease, provided that you can afford the luxury of nearly a foot of soil in the vivarium. It will only molest very small companies such as juvenile frogs and newts, whilst the strong garlic smell it produces when disturbed should not be relied upon to protect it from predators like snakes or terrapins.

Certainly this species is undemanding in its requirements, but otherwise it can scarcely be recommended to the amateur. It spends nearly all of its time hidden beneath the surface, and only emerges after dark. A vivarium filled with such a depth of soil is scarcely ornamental, and in addition is quite a weight. When on view it is drab in appearance and moribund in habits. In the outdoor vivarium it is a complete non-starter. You would be lucky to see your specimens

more than two or three times in an entire year. This is not to say that the Spade-foot or Garlic toad is without interest, but it certainly lacks many of the positive virtues of other livelier, more colourful Amphibia.

P.f. insubricus is a sub-species found in Northern Italy, from the Alps down to the Apennines. It is very similar in its habits.

P. syriacus balcanicus is a separate species found in the extreme South-East of Europe, and is unlikely to be encountered on price lists in this country.

P. cultripes is an important species from Spain and South-West France. It grows to a greater size than *P. fuscus*, but demands similar treatment.

11. The Mud Frog (*Pelodytes punctatus*)

(Note that the name "Mud Frog" is not official nomenclature. However, it appears to be widely used when referring to this batrachian, and is generally accepted, as also is the name "Mud Toad." Outside of the families Ranidae and Bufonidae the terms "Frog" and "Toad" have no strict taxonomic significance. Thus within the Discoglossidae we have the Painted "Frog," but also the Midwife and Fire-Bellied "Toads." In fact, these three animals are far more closely related to one another than to either the true frogs or true toads.)

Description.—This is a slender frog which grows to a length of about 4 cms. The dorsal surface is covered in small warts, webbing on the feet is restricted to the base of the toes. The male can be distinguished from the female by his more swollen condition, and the dark nuptial pads present during the breeding season. Vocal sacs are internal. Dorsal coloration varies between grey, brown or muddy green, with greenish spots, whilst the ventral surface is white or cream.

Distribution.—Widely distributed throughout Spain and Portugal, much of France, and parts of North-West Italy. It has been recorded for Belgium, but is unlikely to be encountered there.

Breeding Habits.—In parts of its range this frog may mate twice in the same year, both in the spring and the summer. Amplexus is lumbar. Spawn consists of thick strings, and the tadpoles are large, growing up to 6 cms.

Care in Captivity.—This species could not be more different from its close relative the Spade-foot toad. It is aquatic and very lively. Considering its abundance in South-West Europe, it has received little attention in the literature of the subject.

It is well suited to the indoor vivarium, preferably of fairly generous dimensions (more than four foot in length). Probably the best such type of home is an aquarium divided fifty-fifty between land and water. The water should reach a depth of about seven inches in fairly gentle steps, and the terrestrial half should be planted with suitable mosses, ferns and the like. Ideally, the flooring in the aquatic half should be a good

thick layer of mud, with a generous growth of sturdy coldwater plants. The frogs will certainly favour such an arrangement (in Germany this frog is known as a "Mud Diver"), but you may not. A murky mixture of mud and water obviously impairs visibility, and does not help the decor in an average living room or lounge. The alternative is to use a traditional substratum of sand or gravel, and hope for the best. In any event delicate aquatic plants are to be avoided, for they are unlikely to enjoy a very long life. Almost equally good for accommodating this species is a vivarium with a large pool sunk into the soil.

Outdoor vivaria of all the major types (greenhouse, coldframe or reptiliary) are to be preferred to indoor aquaria and vivaria. This species is tolerably hardy, and will survive our winters with ease, at least in Southern parts. But the extra protection from extreme conditions afforded by a greenhouse is a wise precaution. In outdoor vivaria natural hibernation can take place, a process highly preferable to over-wintering, especially as this is an aquatic species with all the hazards so-implied. All that it demands are a good sized pool of fair depth with a considerable layer of mud on the bottom, and a surrounding region of dense greenery.

Feeding is a matter of supreme simplicity. Most invertebrates of appropriate size will be taken, provided that they show sufficient movement. Unlike some of the animals that we have considered, notably the newts and salamanders, Midwife and Spade-foot toads, this is an extremely active species, and thus can capture a wider range of prey.

The Mud-frog is very small in size and lacks protective coloration or virulent poisons. As a result it can fall victim to a large number of more bulky reptiles and amphibians, both in and out of the water. Indoors it makes a good companion for all the newts and salamanders. Midwife, Fire- and Yellow-Bellied toads and the Painted frog. Outdoors it can safely be housed with most small newts, frogs and toads, and the smaller lizards. But remember that the juvenile frogs may fall prey to even such inoffensive members of the community as these.

Pelodytes punctatus has both virtues and faults as an inmate of the vivarium. In its favour are its lively and vivacious habits, the readiness with which it breeds, and the simplicity of its requirements. On the other hand it is unspectacular in appearance and dull in coloration, is largely nocturnal, and can be rather nervous when first imported. But I believe that unless it is intended to be purely ornamental, the amateur will find it to be an interesting and rewarding species, and one that will amply repay the attention devoted to it.

There are no sub-species.

The next article will consider the European Tree frog, perhaps the most spectacular of hardy batrachians.

THE HARDY EUROPEAN REPTILES AND AMPHIBIANS IN CAPTIVITY (Part 6)

by Andrew Allen

12. The European Tree Frog (*Hyla. a. arborea*).

Description.—Grows to a length of about 5 cms, with little difference in size between male and female. The dorsal surface is smooth and glossy, whilst the ventral surface is granular. Skin folds are present in the male only, when at rest. There is a very prominent tympanum. On the feet webbing extends to about half-way down the toes, which end in small adhesive discs. The male has a large yellow-brown vocal sac which can be distended considerably when croaking (to rather more than the size of the head). Dorsal coloration is a very delightful leaf green, or in certain rare cases a pastel blue. However, these shades are very variable, for the Tree frog can modify its colour in response to environmental conditions and background to several tones of grey, green and brown. Indeed, its powers of colour-change can be compared very favourably with those of the much vaunted Chamaeleon. A fine white line flanked by black very clearly separates the dorsal surface from the ventral. The latter is pure white or cream, except in the throat region of the male where the vocal sac occurs. This, the only European member of the *Hylidae*, is a very attractive and distinctive frog that offers no identification problems.

Distribution.—The Tree frog is found throughout every part of Southern and Central Europe, including Spain, Portugal, most of France, Belgium, Holland, Italy, Austria, Switzerland, Germany, Southern Scandinavia, and eastwards through the Balkans into the Caucasus and Asia Minor. Attempts to introduce it into this country have been failures. It favours a wide range of habitats, both wet (marshes, etc.) and dry, though nearly always on or near trees, shrubs or bushes.

Breeding Habits.—Courtship takes place during much of the Spring and early Summer in short, sharp bursts. The chorus of male frogs is quite noticeable! Axillary amplexus is in the water, and the female produces spawn in small clusters each containing up to a thousand eggs. The tadpole is olive coloured, and

easily identified because the hind gut is on the right of the body whilst the opercular opening is on the left, a situation different from that in both true frogs and true toads.

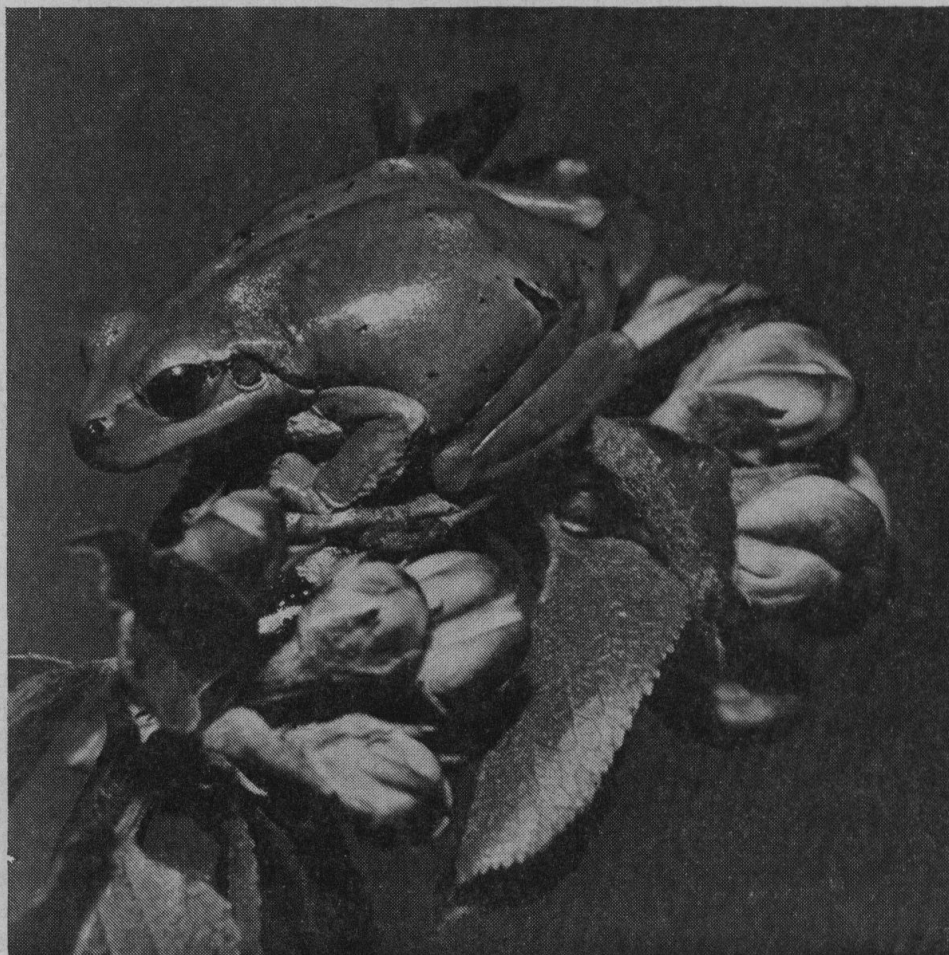
Care in Captivity.—The needs of the Tree frog are entirely different from those of all the other hardy Amphibians that we are considering, because its mode of life is so different. The Tree frog, with its adhesive pads, is a magnificent climber and leaper, and treats a sheer sheet of glass with contempt. As a result all vivaria must be totally escapeproof, and designed to accommodate the acrobatics of this species. The indoor vivarium should be both large and tall. Dimensions of four feet long by two feet wide by four feet high would be ideal for a group of four or five Tree frogs. Obviously this presents some problems, as standard aquaria and vivaria do not come in such sizes. But it should not be beyond the ingenuity of the enthusiast to cope with this situation and build himself a vivarium that meets these requirements. The options involved in designing the interior of such a vivarium are very wide, and the completed arrangement can be highly attractive, well fitted for a niche in lounge or hall. There should be a small pool, as these frogs enjoy a periodic bathe, especially in warm weather. In addition there must be a variety of tall plants with large leaves, preferably ones that last all year. Ivies, especially the decorative variegated varieties, can be trained up the back and sides of the vivarium, and will add to the luxuriant wealth of greenery. The position of the vivarium should be chosen with care. Unlike most Amphibians, Tree frogs enjoy a certain amount of sunlight, and will bask for long hours in its rays. But, though they should be exposed to the sun, it is also imperative that they should not receive too much, for, like all other Amphibians, they dehydrate very rapidly.

Under these conditions it is perhaps better to over-winter the frogs, rather than hibernate them artificially in a deep pile of leaves and moss placed in a cool out-house. But if you do over-winter them please remem-

ber to maintain the temperature at a suitable level. If the temperature falls too much, and in many houses there is a sharp drop each evening, then the Tree frogs will become semi-torpid, probably with fatal results. They should be kept in a room whose temperature is maintained at around 70°F both day and night, or else provided with a bulb of low wattage (25 watts would be ideal in a small vivarium). In larger arrangements several bulbs of 25 watts each should be preferred to a single bulb of high wattage, for the frogs will invariably sit on the warm surface, and a 60 or 100 watt bulb can become dangerously hot. If such bulbs are

both cases I have had a good measure of success, though in the latter instance the Tree frogs tend to spend much of their time hidden beneath ivy leaves near the ground.

Feeding is easy enough, though, if you over-winter this species, it can be rather difficult to find the requisite fare in mid-January. All flying insects will be gleefully taken, and best in this category are Houseflies, Bluebottles and the commoner moths. Old-fashioned fly-traps can be used to capture flies and their relatives, or they can be raised from the *larvae*. Neither method is particularly likely to endear you to the family! Sweepings from a grassy field or verge,



utilized they should be protected by a small cage of zinc gauze.

It should be self-evident that these frogs cannot be housed in an outdoor reptiliary. But they can be safely accommodated in both greenhouse and cold-frame—indeed these provide the most desirable of homes. Rampant vegetation and a hot, moist atmosphere can both be attained with ease, while the insulation provided in cold weather ensures safe hibernation. If kept in company with lizards, drier conditions and more ventilation will obviously have to be provided. But this need not be a deterrent, for I have accommodated Tree frogs in a very hot, damp cold-frame in company solely with frogs and newts, and in a fairly dry greenhouse with Green and Common lizards. In

using a fine-mesh net will supply a wide range of small moths and flies. Another useful idea is to place several gnat *larvae* in the vivarium water bowl and leave them to mature at their own rate. The athleticism and grace with which the frogs pursue and capture their prey will prove a constant source of entertainment and interest. When these favoured morsels are unavailable, less appetizing substitutes can be employed. Mealworms are enjoyed by some Tree frogs, but others seem to find them most unpalatable and will take them only as a last resort. Earthworms, beetles, blowfly larvae and woodlice also come into this category of food that will be taken when choicer fare cannot be offered. Variety must always be the key word, even more so than with most other batrachians.

The Tree frog is an inoffensive customer, and will cause no trouble in the community. Indoors it will safely accompany most of the newts, Fire- and Yellow-Bellied toads, Midwife, Common, Natterjack and Green toads, Common, Agile and Moor frogs. Outdoors the range is wider, and the above species can be supplemented by small and medium sized lizards, Spade-foot toads and tortoises. Snakes and terrapins are absolutely taboo. Marsh frogs and Clawed toads should be avoided. I have kept them successfully in the company of Edible frogs, but it is not a practice that I would recommend. If you do so, remember to keep the Edible frogs fully fed the entire time.

Follow these instructions and you will have little cause for complaint. This is one of the most attractive and unusual species that can be readily obtained by the amateur. It costs not too much (and only a fraction of the cost of its cousins from North America and Africa), and its habits are lively and engaging. It rapidly becomes tame, and has a reasonably long life-span in captivity. The only disadvantage that I can think of at short notice is its penetrating call-note, usually produced after a shower or on warm and thundery evenings. Please do not place the vivarium in your bedroom, or, if you welcome communal harmony, next to a thin partition wall separating yourself

and your next-door neighbour. Wars have been started on lesser pretext. You can do nothing to stop the frogs croaking, but it is wise to limit the number of males, and have a ratio of perhaps one male to every three females. But this notwithstanding, the Tree frog is an admirable species that will bring joy to all those who observe it.

The most important sub-species and one that will be encountered as frequently as the type, is *H.a. meridionalis*. It is found in much of Spain and Portugal, Southern France and North-West Italy, especially along the Riviera, the Balearic islands, the Canary islands, Madeira, and North-West Africa. The dark stripe is largely absent, extending solely from the snout to near the tympanum.

H.a. molleri is found in Calabria and Portugal. It is distinguishable from the type largely through differences in the length of the leg.

H.a. savignyi is found on islands like Corsica, Sardinia and Elba, and through Asia Minor deep into continental Asia. The stripe down the side is considerably broken, and the hip-sling is absent.

The next article deals with the Common toad, most familiar representative of the great family of the true toads.

WHAT IS YOUR OPINION?

continued from page 251

who lives at 10 Lammerview, Tranert, East Lothian, Scotland, and he asks about the red piranha. He looked up its scientific name in a variety of books and magazines, and found *four* different versions. He wonders what its correct name is. (Can readers give any suggestions?) When he was 13 years old, Mr. Copland kept a goldfish alive in a bowl for one and a half years. He thinks that my Discus is shy because there is too much plant life in the tank. He hopes to keep Discus or Red Oscars in the not too distant future. (I see that I could have written Master Copland, as Malcolm is only 15 years old.) Malcolm ends his letter by saying: "Keep up the good work with W.I.Y.O.!"

Photograph 3 shows the only surviving Discus from the original four young fish which I purchased at £1.00 each one year ago. The third fish of the quartet, which grew very big, died some weeks ago. You have no idea how many hours I spent with camera and flash poised to take this photograph! However, I finally got it! I was so tired of the shy Discus that I added a number of other different Cichlids to its tank. This seems to be working a "cure" as the Discus can now be seen quite often out amongst the other fishes—although it is still shy enough to hide in the plants if I approach the tank without being very quiet. The Discus is growing

well and is now a really beautiful fish. It doesn't mind its companions at all, and this morning, when I added a chunk of freeze-dried *Tubifex* to the tank, the Discus was quickly out in the midst of the other fishes tearing away at the worms. A pair of *P. kribensis* in the same tank have just laid a batch of eggs on the underside of a large stone, under which they dug a pit. I'm very interested to see what evolves! Meantime, as I'm visiting London next week for a few days holiday before school reopens, I hope to be able to buy a couple more Discus to keep mine company. Perhaps this will finally "cure" its shyness. I have reached the conclusion that it may be better to buy Discus which are not too young, as I think that they would probably settle down better in a new home. I'll keep you informed.

For the next edition, please send me your opinions on the following topics: (a) What have been your experiences with the keeping and breeding of the dwarf pencilfish—*Nannostomus marginatus*? (b) Are terrapins easy to keep and look after? (c) What are the advantages and disadvantages of breeding traps? (d) What "extra" items of equipment, etc., would one need if one wanted to convert a tropical freshwater tank, with a nylon-coated frame, into a tropical marine tank? Would this be an expensive conversion, excluding the cost of fishes? (e) Which aquarium plant—either tropical or coldwater—do you find the easiest to propagate artificially, and what is your technique?

THE HARDY EUROPEAN REPTILES AND AMPHIBIANS IN CAPTIVITY (Part 7)

by Andrew Allen

13. The Common Toad (*Bufo.b.bufo*)

Description.—This is rather a thick-set animal growing to a length of about 14 cms. in the female, but considerably less in the male. The broad back is covered with large warts, and there is a very prominent parotid gland. The tympanum is almost invisible, there are no vocal sacs, and very little webbing on the feet. In season the male possesses nuptial pads. Dorsal coloration varies through yellow and light brown, to red, grey and black, but always in subdued tones and with no particular sets of markings. Ventrally it is off-white in colour, flecked with greys and browns. It is the type species of the family Bufonidae, and also its most familiar member.

Distribution.—The Common toad is found almost throughout the whole of Europe, including Britain but not Ireland. Beyond Europe it extends through the entire temperate zones of Asia to the shores of the Pacific and even Japan. It can be encountered in a wide range of habitats, notably fields, woods and gardens, generally, but not always, in moist locations.

Breeding Habits.—Mating takes place during late March or early April. The toads migrate to suitable ponds from considerable distances, the male giving a highly repetitive croak that is high in pitch but low in volume. Amplexus is axillary. Up to seven thousand eggs are laid in long strings that are wound around aquatic plants, usually in fairly deep water. The tadpoles are small and black, and undergo a normal metamorphosis.

Care in Captivity.—This toad poses few special problems in captivity, settles down rapidly and will live to a ripe old age.

It will do very well in the indoor vivarium, though it is surely superfluous to keep it under such conditions. The amateur can readily observe its habits in the wild, or in the ideal conditions of the various types of outdoor

vivarium. Though the ordinary herpetologist will not want to keep this species indoors, it may be necessary to do so in educational or scientific institutions. In such cases the first requisite is a vivarium or aquarium of about four or five feet in length, well ventilated and placed in a shady, but not a dark, corner. It should be provided with a shallow water bowl, several caves and shelters embedded in a flooring of deep soil and moss, and planted fairly heavily with sturdy vegetation.

Troubles will come with the winter. Do you over-winter the toads or do you hibernate them? In the natural state these animals always undergo a period of hibernation, and this is closely integrated into their behavioural and physiological life cycles. To disrupt these can be dangerous, and will certainly be highly unsettling to the toads. Any possibility of successful breeding activity at the normal time will be destroyed. In general over-wintering is harmful to the toads, but is the easy alternative for the vivarium keeper. To hibernate these animals is far more desirable, but is also a rather bothersome business. Either a great big heavy vivarium must be half filled with leaves and moss and moved en bloc to a suitably cool, frost-proof outhouse, or the toads must be transferred to an insulated box filled with the same materials and placed in the same location. The first of these ways requires the aid of several strong men, the second is again unsettling to the inmates of the vivarium. Both require a fine sense of timing, and careful observation of judiciously situated thermometers.

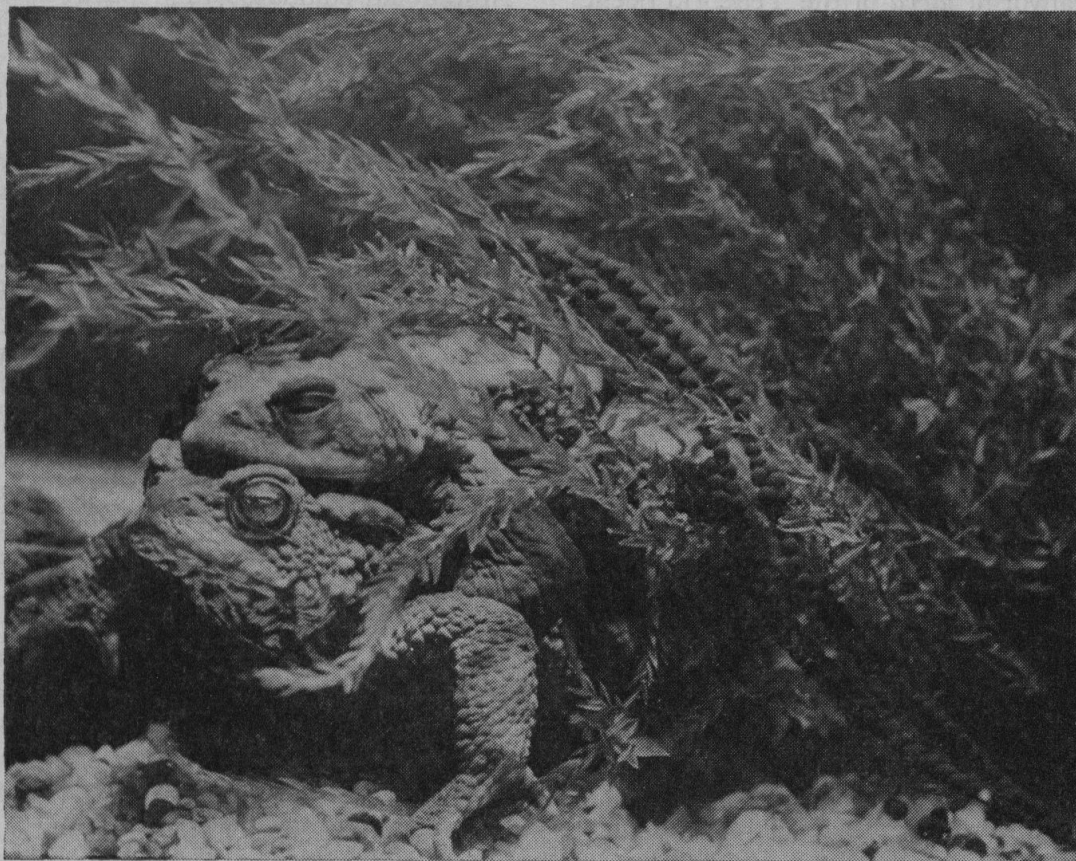
Once winter is successfully past, the breeding season is upon us. The toads may or may not wish to breed, depending upon just how much their reproductive cycles have been disrupted. If they do show signs of wishing to mate, they should be moved to another vivarium containing a very large pool, possibly

one that is normally inhabited by aquatic species like newts or Fire-bellied toads. Obviously this arrangement is far from ideal, and if the toads' vivarium is sufficiently large it should contain a substantial pool of its own. If tadpoles result, the majority should be moved to a nearby pond (preferably one where toads are known to breed), and only a small number retained for display or experimental purposes. Though they are quite well suited to a role as a display animal in the indoor vivarium, there are far better ways of keeping this species.

Supreme among these is simply a walled garden. Toads will settle down magnificently in an "old-fashioned" enclosed garden with a suitable pond, a rockery and a wealth of weeds and shady shrubs.

the point of view of the toads, but places no restrictions on their wanderings. However, if the conditions are good enough, they should stay. The only disadvantage to giving these toads the run of the garden is that they are principally nocturnal and emerge but rarely during daylight hours. Probably the best way to observe them is to stroll out on a suitable evening with a torch and a plate full of mealworms. With a little luck they should pick up the idea fairly quickly and become reasonably tame, especially if you make your visit at the same time each night.

For those who wish to keep their toads under closer supervision and observation, the best alternative to a walled garden is a reptiliary, which could well be described as a "mini walled garden." Here again the



Common toads in amplexus and depositing spawn

Under such conditions they should breed regularly each spring, and remain for a good many years. There are several recorded instances where toads have lived in the same garden for twenty years, and they can survive to well beyond this figure. A few broken clay flowerpots scattered around will be much appreciated as shelters. They will choose their own hibernacula and find all their own food—helping to control your slugs and woodlice in the process. Obviously they should not be enclosed in a garden that also contains such arch enemies as Grass snakes or Hedgehogs, and Cats, Rats, Rooks and Seagulls should also be discouraged. An unwalled garden is equally good from

toads should settle down with perfect equinamity provided that their modest requirements of a pond and some cool, shady corners are met. It should be remembered that, though rather clumsy in appearance, toads possess considerable determination and are adept at escape. A containing wall of about three feet in height and an overhang of about nine inches are both essential features of a reptiliary designed to house the Common toad.

Cold frame and greenhouse can both be converted into excellent homes for this species. But it is essential to ensure that deep shade is readily accessible, as no toads enjoy the heat and both these forms of accom-

modation can warm up a great deal on sunny days. I have kept *B. bufo* in a fairly dry greenhouse and a very damp cold-frame, and it has prospered in both cases, though it is more often on view in the latter.

Comments upon the feeding habits of the Common toad need not detain us very long, for its dietary requirements are perhaps the simplest of all the hardy Reptiles and Amphibians. Nearly everything that is small and moves will be taken with an instantaneous, eye-deceiving flick of the tongue, be it earthworm, spider, slug, woodlouse, beetle, fly, caterpillar, blowfly larva, ant or many other minor invertebrate. Large Southern specimens are perfectly capable of dealing with a small lizard or a young mouse, though they will readily accept traditional insect fare. Most toads consider the mealworm, larva of the Tenebrio beetle, to be the *piece de resistance* among invertebrate foods, and in general they show more discrimination in their diet than do the rather less intelligent frogs.

The ordinary sized toads of Northern Europe make excellent community animals and can be kept in company with a wealth of other hardy and semi-hardy Reptiles and Amphibians. Their poisonous secretion and medium size makes them safe from all but the snakes and larger terrapins. On the other hand, it will molest few or none of its smaller companions, except perhaps juvenile frogs and newts in the first few weeks after they leave the water. This means that it can comfortably accompany all the lizards, tortoises, frogs, toads, newts and salamanders. These observations must be modified somewhat when considering large specimens from Southern and Eastern Europe, and the "giant" sub-species that we will describe a little later. Such specimens could perhaps be kept with small Dice, Grass and Viperine snakes, though it is not an arrangement that I would recommend. These toads are well able to eat small snakes, indeed I came across a case in France where a fat female toad had happily consumed a whole family of young Adders! Another drawback is that the snakes may eventually grow to a size where they regard the toads as a well-timed

addition to the larder. The balance between these snakes and the largest toads is always a rather delicate matter. "Giant" toads should not be associated with small lizards, Slow-worms, any newts, or the lesser frogs and toads in any vivarium, however spacious. Suitable companions would be land tortoises, Green, Eyed and Schrieberi's lizards, Clawed toads, adult Common frogs, and Marsh and Edible frogs.

The Common toad makes one of the worthiest possible members of any collection of Reptilia and Amphibia. If anything it is almost too tolerant, and will survive for long periods in indifferent conditions. It is far from being a spectacular or glamorous creature, and is quiet and unobtrusive in its habits. But what it lacks in looks, it makes up for in character. By Amphibian standards this species is very intelligent, and those who know their toads find them a constant source of fascination. They tame rapidly and have none of the nervous flightiness of the majority of frogs. There are few more appealing animals, and they can be recommended wholeheartedly to any vivarium enthusiast, young or old. But please remember that their numbers are on the decrease, and do nothing that could jeopardise their already shaky status. Injudicious collecting has done much to bring Sand lizard and Natterjack toad to the brink of extinction in this country, and it could yet do the same for the Common toad.

B.b.gredosicola comes from the Sierra de Gredos in Spain, and has very prominent parotid glands.

In the preceding paragraphs we have mentioned the so-called "giant toads." The sub-species that qualifies for this rather dubious title is *B.b.spinusus*, which is found in Southern Europe, Asia Minor and North Africa. Old female specimens grow to considerable sizes, with recorded lengths of 20 cms., which may make this sub-species the largest batrachian in Europe. On old specimens the warts bear noticeable spines.

The next article will consider the two other European members of the Bufonidae, the Natterjack and the Green or Changeable toads.

MY CLIMBING PERCH

by *S. Haill (aged 15 yrs.)*

ABOUT eight months ago, I was doing my weekly rounds of the pet shops, when I came across a tank

with climbing perch marked on it. On enquiring, I discovered to my surprise that they cost a meagre

THE HARDY EUROPEAN REPTILES AND AMPHIBIANS IN CAPTIVITY (Part 8)

by Andrew Allen

14. The Natterjack Toad (*Bufo calamita*)

Description.—This small toad grows to a length of between 5 and 8 cms, with the female larger than the male. The body is short and thick set, though not rotund. It is readily distinguished from the Common toad through its unusually short hind limbs, and also the fact that the male bears a single, large vocal sac. He also possesses dark nuptial pads on the first three fingers of each hand. The back is covered in shallow warts, and coloured brown, olive or olive-green. There is often a distinctive bright yellow mid-dorsal line, and the warts may sometimes be tinged with red. Ventral colouration is cream spotted with grey, whilst the throat of the male is dark grey.

Distribution.—*B. calamita* is essentially a Western European toad, inhabiting Portugal, Spain, France, Switzerland, Holland, parts of Germany, Poland, Czechoslovakia and Southern Scandinavia. It is also found in Britain in a number of localities and in County Kerry in Southern Ireland. It can be found in many different habitats, though it prefers soft, sandy soils. Dry localities are tolerated, and it ascends to altitudes of 1,000ms in mountainous country.

Breeding Habits.—The mating season starts around April and may continue throughout the Spring and Summer. Amplexus is axillary, the croak of the male is both loud and distinctive. The eggs, usually a smaller number than in *B. bufo*, are laid in a double string that is wound around submerged vegetation. Breeding may take place in mildly brackish water.

Care in Captivity.—Notes on this subject should be preceded by a few words of warning. The Natterjack toad is under extreme pressure throughout Britain, its numbers have declined rapidly, and give

serious cause for concern. Herpetologists should avoid any action that could cause further deterioration in the status of this species. No Natterjacks should be collected from any site in this country whatsoever, even if superficially they appear to be abundant. Neither should they be bought from dealers that cannot give an absolute guarantee of their origin—not all are as scrupulous in this respect as they could be. Irresponsible collecting, both on a large and a small scale, has undoubtedly played a major part in the decline of this species, in company, of course, with various environmental pressures.

It makes a fairly good inmate of the indoor vivarium, which should be quite large (four feet or more in length) to allow for its lively habits. There should be a small pool, and a good depth of soft soil, preferably a light, sandy loam, for the Natterjack is an accomplished burrower. A few shelters should be provided, and a certain amount of plant cover, but less than is necessary for the majority of batrachians. A little indirect sunlight will cause no harm at all. The onset of Winter causes the standard dilemma, which has been fully discussed in the previous articles of this series.

As with all of the truly hardy Amphibia, the best home for the Natterjack toad is one of the main types of outdoor vivarium. Reptiliary, greenhouse and cold-frame are all ideal, though in the case of the latter two forms of accommodation it should be remembered that *B. calamita* does prefer rather drier conditions than the frogs and newts that may accompany it.

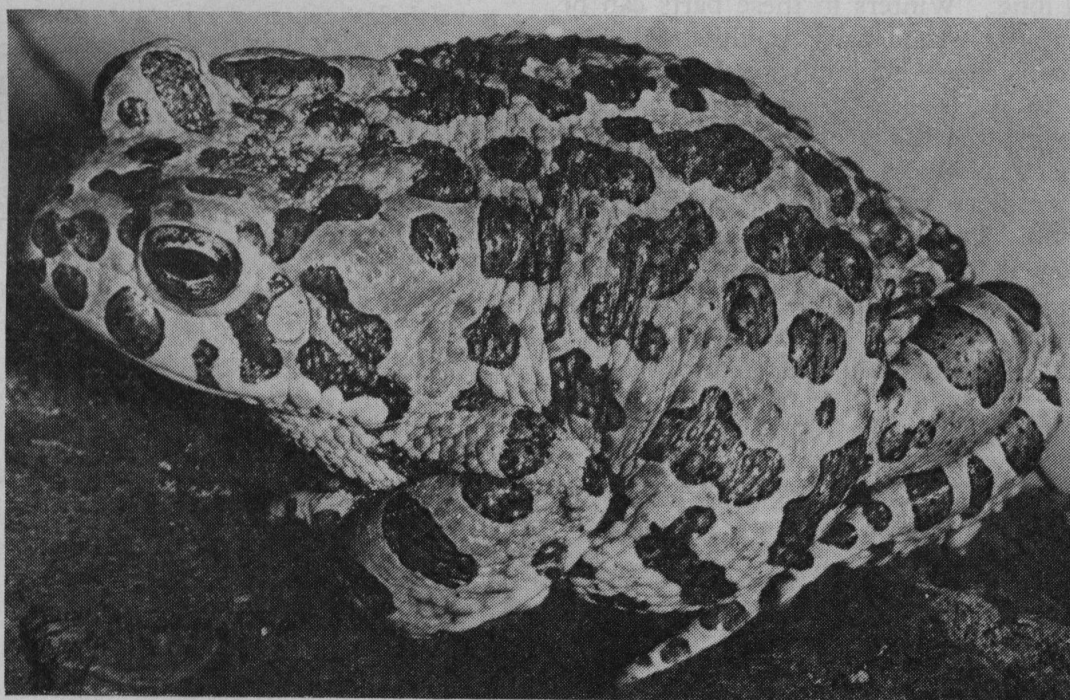
The dietary requirements of this species are unremarkable, for it will take almost the full range of invertebrate foods. Mealworms and spiders are much appreciated, but most of the familiar live foods will be accepted with alacrity.

In so far as it has no offensive tendencies, the Natterjack toad makes a good community animal, especially as it is fairly immune from molestation by others. Standard villains like snakes, terrapins, and the largest lizards and frogs, should be regarded with jaundiced eye, but otherwise few restrictions need be imposed. It will happily accompany all the smaller frogs, toads, newts and salamanders, provided that it has access to reasonably dry areas. Equally it can comfortably be housed with all the small lizards if it is supplied with a pool and a few damp, shady corners. In practice this means that it can be fitted into just about any community of moderately sized Reptiles and Amphibians where the habitat is not over specialized.

This is a good species for the amateur who can devote a little time to its requirements. In return it

There are numerous warts on the skin, but these are rarely pronounced. Dorsal coloration varies somewhat between male and female specimens. In the male the ground colour is dark grey or olive with pale green patches. In the female the ground colour is lighter, but the patches are a much deeper green. In both sexes the warts may carry a reddish tinge. The smooth ventral surface may be a clear or dappled grey.

Distribution.—The Green toad is very widely distributed, and in general replaces the Natterjack in Eastern localities. It is absent from Spain, Portugal and much of France. But it is found in Belgium, Holland, High Savoy, Switzerland, Germany, South Scandinavia, Italy, the Balkans, Africa North of the Sahara, and right across Central and Southern Asia to the Himalayas and Tibet. It occurs in a variety of habitats, including areas of extreme aridity and, in



The Green Toad

will reward through its readiness to tame and its lively habits. But please remember my opening remarks—this interesting animal is very rare, and indiscriminate collecting could just push it beyond the point of no return.

There are no sub-species.

15. The Green or Changeable Toad

(*Bufo v. viridis*)

Description.—This beautiful species grows to a length of 6-9 cms, perhaps rather more in Southern regions. In contrast to the Natterjack and Common toads the female may be smaller than the male. General proportions of the body are more similar to those of the Natterjack than the Common toad. The male has nuptial pads inside the first three fingers of each hand, and a single, very considerable vocal sac.

Asia at least, of high altitude. It is perhaps even more tolerant of brackish water than the Natterjack, and certainly more so than any other European Amphibian.

Breeding Habits.—Mating commences in late April and may continue until September. The croak of the male is loud, but also more harmonious than that of most other familiar frogs and toads. A very large number of eggs, sometimes up to twenty thousand, are laid in two long strings.

Care in Captivity.—In rough outline this toad demands similar treatment to the Natterjack. Its size is almost identical, and in the wild it occupies the same environmental niches. It takes the same range of foods, has to avoid the same predators, and hence will fit into the same communities. But it is a distinct species with habits of its own, and it would be

a mistake, albeit not a serious one, to give it strictly identical care and conditions.

In the indoor vivarium excessive humidity should be avoided, and adequate ventilation is a must. The soil should be loose in texture and neither sodden nor parched, but just faintly damp. A small pool should be available, as should several caves and shelters. But plant life should be restricted, for the Green toad always tends to avoid forested areas. Indirect sunlight causes no trouble, and may even be mildly beneficial.

In considering this species as an inmate of the outdoor vivarium I must confess to some doubts concerning its hardiness. Many of the specimens imported come from North Africa or the extreme South of Europe, can survive intense heat reasonably well, but have rarely had to endure long winters. I stress the word long. Winters in these parts can be very cold, but rarely last many months. But in England the toads may be confronted with cold weather for up to six months in any year, and this could prove beyond the limits of their tolerance. I know of an instance where this species has been housed with complete success in a reptiliary in Southern England. Probably it would do well in a suitable reptiliary in most localities South of a line from Bristol to London. But I do not believe that would prove hardy enough to prosper in the rest of the country, except in certain mild and sheltered localities.

This being the case, greenhouse and cold-frame certainly constitute better homes. Both can provide the extra measure of warmth throughout the year that could prove vital to the well-being of this species. In any of these three forms of accommodation the Green toad requires a similar habitat to the Natterjack. It also demands a little open space—not for *Bufo viridis* the luxuriant mass of rampant vegetation that so suits the majority of Amphibians. But these requirements are easily complied with, and it fits comfortably into most communities of small lizards and batrachians.

The Green toad qualifies as one of the most attractive and vivacious of hardy Amphibians. Though principally nocturnal it sometimes emerges during daylight hours, and can always be tempted into the open with a maggot or a choice mealworm. My specimens have never become very tame, but have nevertheless been a constant source of interest and enjoyment. It can be safely recommended for indoor vivarium and for most types of outdoor vivarium, provided that the limits to its hardiness are accepted and understood.

There are no European sub-species, but *B.v.-arabicus*, from much of Africa North of the Sahara, may often be encountered on price lists. It requires identical treatment to its European cousin.

The next article will consider the Marsh frog and the Edible frog, two of the most spectacular and colourful of hardy Amphibians.

RELICS OF THE OCEAN'S LIFE

by Huw Collingbourne

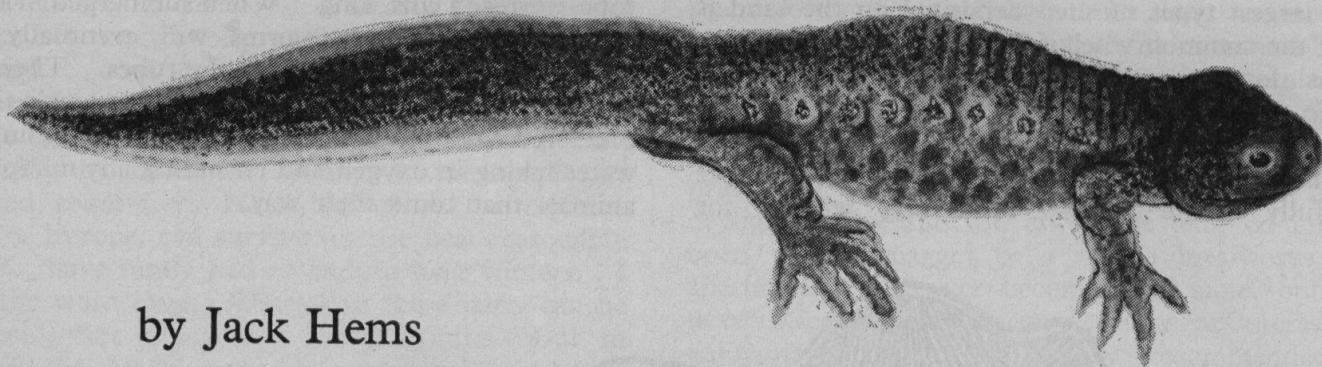
THE strandline is the divide between sea and shore; it is where we find great brown fronds of bladder wrack drying in the sun. Occasionally, among the driftwood we find hermit crabs, oysters, anemones, sea urchins and starfish. Invariably there will be hundreds of little sandhoppers hidden among the weed. The sandhopper, *Talitrus saltator*, is a shrimp-like creature up to 16 mm. in length. It is found in profusion in just about all moist, shady places close to the sea. Pulling back a clump of damp

seaweed recently washed up, you will almost certainly find scores of sandhoppers hopping in all directions. Surprisingly, sandhoppers can jump to heights of more than 30 cms.

Some interesting sponge skeletons can be found cast ashore. The yellow or green breadcrumb sponges are far from rare.

“Cuttlebone” is sometimes washed ashore and this is generally a seasonal occurrence. The “bone” is in

THE SPANISH RIBBED NEWT



by Jack Hems

Pleurodeles waltl is again included in the latest list of reptiles and amphibians sent out by a well-known Cheshire dealer. The Spanish ribbed newt, to give this member of the Order Urodela (Salamanders and Newts) its popular name, is native to the southern and western parts of the Iberian peninsula and the coastal regions of Morocco.

Understandably, in these days of feverish building and the vanishing countryside, it is rarer in these places than formerly. This largely explains, I fancy, why its selling price has rocketed up to £5.00 a pair. (Before the war, a pair could be obtained for as little as 25p). Yet even at £5.00 a pair, I consider *P. waltl* is a good buy. For given the right sort of food and the right sort of environment, it will make a most interesting and durable aquarium pet.

Alfred Leutscher is an authoritative writer on the herpetofauna of Europe. In his *Vivarium Life* (Cleaver-Hulme, London, 1952) he tells us that this newt has lived 20 years in captivity. My own three specimens, that appear to be in the best of health, have already spent seven years in their small but well-planted aquarium.

Let me say at once that the Spanish ribbed newt—the popular name is derived from the fact that the pointed rib-joints push out, thorn-like, and, in some cases, penetrate the skin on the sides—is the largest of the European newts. The maximum length cited is 12 in. But exceptionally it may grow larger. 'Specimens have been found up to 40 cm.' So says Dr. Walter Hellmich, Chief Keeper of the Zoological Collection in Munich, in his *Reptiles and Amphibians of Europe* (Blandford, London, 1962).

The general colour of both sexes is olive-brown to black, shading to greeny-grey to greyish yellow on the belly. Innumerable dark spots adorn the lower part of the body. The fore and rear limbs are strong and,

like the rest of the body, covered with tubercular skin. The tail is fleshy in the middle but ribbon-like (compressed) along the margins. In most specimens the bottom edge is orange. The eyes are set wide apart on the broad but rather depressed head. The mouth is wide enough to gulp down a small fish or a young frog. Therefore *P. waltl* should not be kept with any other newt smaller than itself.

Sexing is carried out by comparing tails. The tail of the male is longer than that of the female. Also, during the breeding season (spring to early summer) small protuberances are developed on the underside of the forearms of the sexually mature male. Again, a female full of eggs shows a fuller belly and sides.

The Spanish ribbed newt is not a very active creature. But when it does go on the prowl, it moves in rather a bouncy manner, as though it has miniscule balloons attached to its toes. When it scents food, it either thrusts its head searchingly into the submerged vegetation or pushes its mouth shovel-like over the bottom. Contact with food (alive or dead) results in wild snapping of its jaws.

A tank 18 in. by 12 in. by 12 in. will make a suitable home for a pair. The floor should be covered with the usual carpet of well-washed sand. This in turn should be planted with some easy-growing plant such as *Elodea densa*, that will help to keep the water wholesome and clear. There is no need to include an island in the set up, for this newt, unlike our native species, shows no great desire to climb on to land. Usually, the nearest it gets to viewing this troubled world, apart from what it can make out through the glass sides of its tank, is to sprawl in or on the submerged vegetation and stick its head out of the water. But be this as it may, all newts are clever climbers and a glass cover, raised slightly off the top of the aquarium, will prevent escape. A temperature below 55°F (12°C) but above

45°F (7°C) is advised for a few months every year, that is from late autumn to early spring. For this seasonal lowering of temperature results in a slowing down of the bodily functions and is more in accord with what takes place in the wild. For general maintenance, however, a temperature range in the sixties or low seventies (°F) is perfectly satisfactory.

Feeding is no trouble at all. Earthworms, mealworms, strips of raw white fish or red meat go down well. All the same, this newt is not an ever-ready feeder. After a meal, it will usually go several days without eating again.

It is a good plan to feed *P. waltl* from the ends of forceps or from the fingers. For then one can be certain that there are no left-overs to foul the water.

Even so, every so often a dip-tube must be used to clear away accumulated sediment.

I have never bred this fine newt over all the years I have kept it, but knowledgeable writers tell us that it can be persuaded to breed in captivity. According to what I have read, the male takes the initiative in the breeding ceremony and there is quite a performance as he attempts to make close contact with his mate. A responsive female will lay eggs, singly or in clusters, on stones or among the plants. A change of water or an abrupt change in the temperature (within reason) will sometimes trigger off courtship and mating. The gilled *larvae* metamorphose in about four months. Seemingly they (or rather the adult form) are not ready for mating until about two years later.

JAVA FERN

by Jorgan & Pamela Hansen

THE first time we heard of Java fern, *Microsorium pteropus*, was from an old experienced aquarist, who recounted what happened when he attached a small specimen of the plant to a tree-root in his 150-litre tank, which already contained a large and sturdy Amazon sword plant. In the course of the following year the fern covered not only the whole root but had also spread all around the rest of the tank, and the Amazon sword plant completely disappeared. This gives an idea of how well Java fern can thrive under the right conditions.

Microsorium pteropus is particularly interesting for two reasons. First, it exists in nature on dry land, in swamp, and underwater, and can thus be called amphibious. It is available to aquarists in two forms, the underwater form with spear-formed leaf, and the swamp form with cross-formed leaf. When the latter form is placed in an aquarium it begins to produce spear-formed leaves.

The swamp form of Java fern reproduces, in common with most other ferns, by means of spores, which are expelled on to the damp ground, where they sprout and strike roots. When the fern grows underwater, however, the spores are not expelled.

This brings us to the fern's second interesting feature, namely, that when underwater it is adventitious, i.e., the young plants form themselves on the leaves or stem of the old plant, instead of from the regular root system. First, the new leaf appears, then the roots develop, and eventually the old leaf will disappear.

In nature, the plant grows underwater for 4-5 months of the year and prefers a shady niche, usually the root of a tree. The roots of the fern do not descend into the ground, and when placed in the tank should not be pushed into the gravel but should instead be

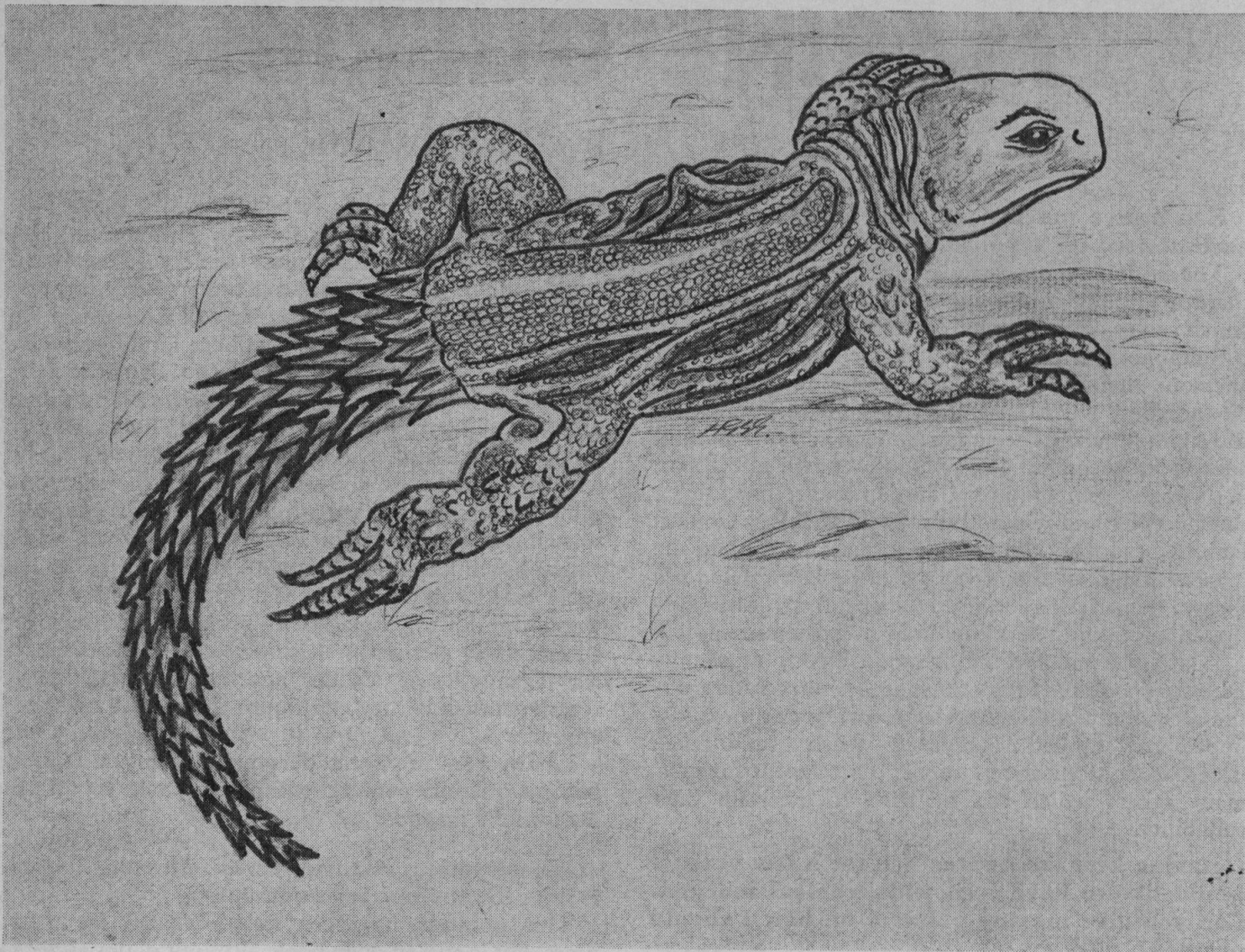
anchored to a tree-root or stone with an elastic band or the like. The plant thus takes its nourishment from the water. If left undisturbed it will spread, as previously described, over the whole root or stone, which can then be moved to another tank, if so desired.

Java fern can grow up to 50 cm. high in nature, but in the tank it doesn't exceed 20 cm., and the leaves are at the most 4-5 cm. broad. Young leaves are light green in colour but grow darker with age. The leaves are hairless, and both leaves and stem are very stiff and firm. The leaves form a bush-like appearance; the rhizome or root-stem is dark brown and tightly covered with root hairs, and grows in a creeping fashion. Dark brown attachment organs called holdfasts, which grow to a length of 1-1½ cm., develop from these root hairs, and are so strong that if one attempts to lift from the tank a plant attached to a tree-root, the latter comes out too.

Microsorium pteropus is found in soft water; tank water should not exceed 14° DH. It prefers a temperature of at least 20°C. It was first described by Von Blume in 1829 as *Polypodium pteropus* but was not introduced to the European aquarist until 1957 when P. Clupaty obtained the plant from Frankfurt, whence it had been imported from Java. It was then distributed in Germany and England under the name *Gymnopteris* species. It has also been described as *Leptochilus decurrens*, *Gymnopteris variabilis*, *Cinnophtheria*, and *Gymnophtheria*. It belongs to the Family *Polypodiaceae*.

The plant is to be found not only in Java, but also throughout S.E. Asia, in Southern China, Malaysia, Indonesia, India, the Philippines and Ceylon. A small form with a short leaf stalk and smooth leaf, described as var. *minor*, is to be found in India.

All in all a beautiful and interesting plant which shouldn't have too much light, requires slightly acid water containing adequate nourishment, and generally needs to be left in peace. It is not very commonly seen in trade, so if you do see it and feel tempted, then buy it at once.



THE EGYPTIAN SPINY-TAILED LIZARD

by H. G. B. Gilpin

Uromastix aegyptius, the Egyptian Spiny-tailed Lizard, is one of the Mastigures and is a striking animal, particularly interesting in its defence mechanisms and adaptations for survival in its own particular environment against the hazards of predators, water shortage and peak temperatures.

My specimen was brought into the country by a student from Kuwait, on the Arabian Gulf. He tells me that locally it is called the "Thub" or "Dhab" and states that in the wild state the adults reach a length of twenty-four inches. This is confirmed by a friend of mine who has seen a number of the species approxi-

mating to this size. Some authorities quote twenty-six inches as the maximum overall length.

My animal was caught in dry, sandy, desert country and reached me three weeks after capture, including ten days in England before it came into my possession. During this period, unfortunately, it endured considerable fluctuations in temperature. This was particularly regrettable as Mastigures require a high temperature to keep them active and in its absence decline to feed. On occasions when it was exposed to sufficient heat, I am told it was observed eating dandelion blossoms.

When I first received the lizard, it was extremely lethargic, so much so that I brought it home unconfined in any way. In fact, it clung to my knee in the car throughout the entire journey, without showing any inclination to wander. Under the influence of sunlight streaming in through the windscreen full upon the animal's body, it brightened considerably, giving a clear indication of the effect of heat upon the species.

Uromastix aegyptius, if not beautiful, is a most arresting animal. Mine holds its rather tortoise-like head well above the line of the body and has a wide, much flattened body fifteen inches in overall length, six inches of which is made up by a stout tail, heavily armed with twenty rows of sharply spiked scales. It is three inches across the shoulders and two inches across the widest part of the head. The eyes are small, bead-like and piercing, giving the animal an appearance of determined aggressiveness. The dorsal surface, covered with small, granular scales, is olive brown, spotted with yellow rings and crossed with six zig-zag yellow bands. Ventrally it is a uniform yellow. The basic colour of the back is variable and at times it pales to a yellowish brown hue, again darkening within a few hours.

Although the legs are powerful and the hind toes slightly fringed to enable it to deal with the loose, sandy ground of its native terrain, naturally it has a slow, lumbering gait, too slow to enable it to escape from a man if encountered at a reasonable distance from its burrow. If found near its burrow, however, the story is very different. It will allow the intruder to approach within a dozen feet or so and then disappear with unhesitating celerity.

The burrows are deep, some eight to nine feet long and four to five feet below the surface, excavated by the lizards under piles of stones and, although they feed and move about above ground by day, they sleep in them at night, closing the entrance when the temperature is unduly low. They are also used during hibernation and to retire to during the hottest part of the day as, like other lizards inhabiting arid or semi-arid regions, they require some means of controlling their body temperatures in an environment of thermal extremes. When pursued, they retreat to

the burrows, blocking the entrance with their spiny tails.

Apart from man—the Arabs are said to eat them—the main enemies of the Egyptian Spiny-tailed Lizards are birds of prey and small, carnivorous mammals. They rely upon their cryptic coloration to protect themselves from the former whilst their defence against the latter is to lash out vigorously with well armoured tails. If freshly taken into the hand, they adopt this measure but, whilst rearing upwards in warning, rarely use their powerful jaws, capable of inflicting a severe wound, to bite. In captivity they soon become tame and will learn to take food from the hands of their owner.

Feeding Mastigures in confinement presents real problems unless the temperature is maintained at between 85° and 95°F. At 70°F they are sluggish and show no interest in food.

Food is taken into the mouth by the oval, fleshy, unforked tongue. The broad, spatulate teeth of the adults, adapted to cutting off suitably sized pieces at a time, suggest that the mature animals, at least, are herbivorous. Certainly they will eat pieces of apple, flowers, berries, dandelion and lettuce leaves but they undoubtedly prefer crickets, locusts and grasshoppers. The young ones are almost certain to be far more exclusively insect-eaters than the adults.

If persuading the animals to feed in captivity is difficult, it is infinitely harder to get them to drink. They invariably decline to drink from a vessel, nor will they lap drops of water from vegetation. The problem was surmounted in the case of my animal by squeezing drops of water from a sponge on to the back and tail. The skin darkens immediately on contact with the water which is as instantly absorbed. In the wild state Mastigures probably take in water, condensing from the air when the temperature falls, through the media of their skins. Even in desert conditions, damp areas occur below the surface and the Mastigures reach these regions by way of their burrows, so that for a considerable period out of the twenty-four hours they are in close contact with moist sand.

When this method is adopted in confinement, care must be taken to limit the water to the actual skin of the animal and avoid allowing the vivarium to become wet. If the surroundings do become too wet the lizard will die.

Moisture on the skin is also important during the skin changing process which does not take place satisfactorily if the animal is allowed to become too dry. Mastigures are not the only lizards to take in fluid in this way. Most probably other desert dwellers, such as the Australian Bearded Lizard, *Amphibolorus barbatus*, obtain their moisture, at least partially, through the skin.

THE HARDY EUROPEAN REPTILES AND AMPHIBIANS IN CAPTIVITY (Part 9)

by Andrew Allen

16. The Marsh or Laughing Frog (*Rana. r. ridibunda*)

Description.—With lengths of 12-17 cms., this is certainly the largest frog in Europe, and adult specimens from Southern areas can be really impressive. The feet are fully webbed, the skin is smooth, sometimes with small warts. There are very large and prominent vocal sacs. The back may be various subdued shades of olive, green and brown, with few or no markings. The thigh is grey with olive or brown bars, and there may be a faint green mid-dorsal line. Ventral coloration is white or cream with grey patches.

Distribution.—The type form is found in Holland and much of Germany, and through Central Europe to the Urals and Iran. This is an aquatic species that particularly favours large bodies of water like lakes and marshes, though in the South of its range it also inhabits small ponds and ditches. The introduction of this animal to parts of South Kent and Sussex has been accompanied by a considerable measure of success, and it is fair to regard this species as a member of the English herpetofauna.

Breeding Habits.—Mating takes place in April or May, when the stentorian croak of the male can be heard from afar off. Eggs are laid in several large clusters of spawn, each of which may contain several thousand eggs.

Care in Captivity.—The great size of this frog and its aquatic habits create many problems for the herpetologist who attempts to keep it in captivity.

In general terms it cannot be recommended as an inhabitant of the indoor vivarium, a characteristic that it shares with most other large members of the Ranidae. It jumps considerable distances, requires a large amount of room, and is unlikely to prosper in a vivarium with less than twenty-four square feet of floor space—e.g., one of 6 ft. × 4 ft. Obviously

this is rather beyond the scope of most living rooms or hallways! Even when given such spacious conditions it is still likely to damage itself against the walls of the vivarium, for it is nervous of temperament and settles down very slowly. Damage so caused, especially to the delicate nose area, is likely to lead to probably fatal infections. If an indoor vivarium is used, it should be divided equally into areas of land and water. The aquatic half should contain water at depths of between an inch and a foot, and should be planted with sturdy coldwater vegetation. The terrestrial half should be fairly open, but with one or two densely planted areas. The vivarium should be exposed to the sun, for this commodity is absolutely essential to the health of the Marsh frog. Without it the frogs will languish and their colours will deteriorate to a muddy, unpleasant brown. Winter is a difficult time, for the frogs must either be transferred to a specially constructed hibernating box (a very dodgy business), or the vivarium can be moved to a suitably cool location (which is impossible if it is of decent size), or they must be over-wintered, never a course of action to be recommended. It would be a brave person indeed who could contemplate housing this species indoors, especially when we add to the other faults of this frog a croak of stunning proportions. Keep a couple of male Marsh frogs in the bedroom and you will soon be sleeping at a suitably distant hotel, or facing legal proceedings from your next-door neighbour.

It is better from every point of view to relegate these animals to an outdoor vivarium in the garden. A reptiliary, so often a perfect answer to the herpetologists' problems, cannot however be wholeheartedly recommended. These frogs could comfortably leap out of the average reptiliary, especially if under the added stimulus of panic. Exterior walls of perhaps four feet in height would be necessary,

and these would only prove practical in a very large reptiliary, on account of the shade that they would shed. By far the best form of accommodation for this species is a large greenhouse, where the hot, humid conditions and the bountiful jumping room will prove greatly to the taste of the inhabitants.

Unless nervousness causes them to go on a hunger strike, these frogs are fairly easy to feed, capturing their prey both on land and in the water. All the normal invertebrate live-foods will be accepted, with earthworms an excellent basis for the menu. A variety of foodstuffs should be offered, in very substantial quantities, for this frog has a distinctly healthy appetite. In essence anything that moves is fair game for *Rana ridibunda*, and this includes small vertebrates such as lizards, newts, goldfish, minnows and fledgelings.



Half-grown Marsh Frogs photographed *in situ* on Romney Marshes

Naturally this latter characteristic is not welcome in the community vivarium. The Marsh frog will fit into very few communities for there are only a handful of Reptiles and Amphibians that are totally

safe from its rapacious jaws. Amongst these are the Eyed lizards, fully adult Green lizards, land tortoises, large Common toads, Clawed toads and adult Edible frogs. Snakes and terrapins should be avoided as companions for they are natural predators upon this species.

Thus the Marsh frog cannot be recommended to the amateur, for it is a difficult animal that requires specialised attention. But this should not disguise the fact that it is highly attractive, with interesting and unusual habits.

There is a very important sub-species, *R. r. perezi*, which is similar to the North African forms of this species. It is very widely distributed in Portugal, Spain and Southern France.

17. The Edible Frog (*Rana esculenta*)

Description.—This frog is very similar to the last, indeed many herpetologists regard the Marsh frog solely as a sub-species of the Edible frog. However, *Rana esculenta* never attains the same bulk, with males growing to about 8 cms. and females rarely up to 12 cms. in length. General build is slightly slimmer than in the Marsh frog, and the hind limbs are a little longer. The back may be beautiful, clear grass-green or a rather muddy brown, with black spots and patches. There is a yellow mid-dorsal line. The belly is white, sometimes flecked with grey.

Distribution.—It inhabits much of Western Europe, including France, Belgium, Holland, Germany, South Scandinavia, West Russia, Hungary, Rumania and Italy. Introductions to Southern England have not been notably successful, colonies tending to survive for some years before declining and eventually dying out. It frequents freshwater of any kind, including ponds and ditches much too small for the tastes of *Rana ridibunda*.

Breeding Habits.—These are similar to those of the Marsh frog. Mating commences in May, when choruses of males begin to croak lustily.

Care in Captivity.—The Edible frog is slightly more amenable to captivity than its close relative, but still poses a number of tricky problems.

Though it requires rather less space than the Marsh frog, it is otherwise every bit as difficult to keep in the indoor vivarium. Ample jumping room, a large pool and bright sunlight must all be provided, but even so it is unlikely to prosper.

However, it does make an excellent inhabitant of the outdoor reptiliary, if this has high walls, generous pond, abundant greenery and an open, sunny position. Greenhouse and cold-frame are even better, and the frogs will revel in the hot, moist atmosphere and the life-giving sun. I have specimens of this species both in an outdoor pool and a cold-frame, and they have thrived in each case, though their colours are slightly more glorious in the latter and

they spend longer hours on view.

Their diet should ideally be midway between that of a typical small frog or toad and that of the Marsh frog. They have a greater appetite than most, and can cope with the largest worms and beetles, or even with a newt or baby mouse. Their rapaciousness should be taken well into account when planning the community vivarium. Because of their smaller size and reduced appetite they will fit into more communities than the Marsh frog, but their companions must nevertheless be chosen with immense care. They can safely be housed with Eyed and Green lizards, tortoises, Common, Moor and Agile frogs, Common and Clawed toads, Crested and Marbled newts and Fire salamanders. Needless to say, all of their companions should be fully adult in view of their highly antisocial cannibalistic ten-

dencies.

In conclusion, *Rana esculenta* cannot be recommended for indoor vivaria of any description, but it does make an excellent inmate of all the outdoor vivaria. Its glorious colours will add life and light to any community of drabber batrachians, for there can be few more splendid sights than a proud Edible, resplendent in vital greens, basking in the full rays of the sun, or leaping agilely after some distant prey. At times like this you forget utterly its many faults, for it is truly one of the most beautiful and attractive of all the Reptiles and Amphibians available to the amateur.

There are no sub-species.

The next article deals with the familiar Common frog, and the less familiar Italian, Greek and Iberian frogs.

LAMPREYS

by Bill Simms

THE LAMPREYS of our streams and coastal waters belong to the class Cyclostomata, and are so primitive that they are not considered to be true fishes. They appear to be direct descendants of the jawless Ostracoderms, which were among the oldest known vertebrates of a period many millions of years ago. Because of this they have been studied intensively to see if they can provide any clues to the prehistoric scene so long ago.

The interest of aquarists is on a different level, but nonetheless serious for that. We know that lampreys can live well in an aquarium, and because of their strange form and manner of feeding they make fascinating subjects.

There are three species of lamprey in Britain: the sea lamprey; the lampern or river lamprey; and the pride or brook lamprey. Some authorities think that these three species are actually one only, and that their living conditions have modified them to show the obvious differences between the three.

Sea lampreys live and grow in the sea, but towards the end of their lives they ascend rivers to spawn. The lampern spends a little more time in freshwater, and has been known to overwinter there, but essentially is also a creature that grows in the sea. The pride lives almost entirely in freshwater, but does at times visit the sea, and can occasionally be found in estuaries.

These are mainly differences of habitat, and because of them there are differences of diet. Life is more prolific in the sea, so that there is a greater abundance and variety of food, and this always enables any creature to develop fully. Because the differences of these three lampreys fit into this pattern of more development in the marine species, and less in the freshwater kinds, the theory of one main species is upheld. There are arguments the other way, though,

and here we will deal with the lampreys as three distinct species.

The sea lamprey can reach a length of over 3 ft., and has a ridge down its eel-like back that is a cartilaginous substitute for a backbone. The scale-less skin is dark grey-brown in colour, mottled with a lighter shade. Its eyes are set so far at the side of its head that this fish can look straight down as well as up, and therefore can see whatever it wants to fasten on.

There are seven gill slits along each side of the body just behind the eyes, and these suck in water as well as expelling it. This is necessary because when the sucker mouth is fastened on to anything it would not be possible to draw in water for oxygen through the mouth as other fishes do.

Because of its difference from the mouths of true fishes, the sucker mouth of the sea lamprey is its most interesting feature. Situated under the snout end of the lamprey ahead of its eyes, it is a circular orifice, fringed with soft white flesh that can fasten on to anything with the aid of the suction created by the lamprey.

Inside the mouth is fish-white flesh liberally studded with sharp red teeth, fashioned from a horny substance that renews itself. These teeth are arranged in a regular pattern, and are supplemented by smaller teeth growing on the tongue. All of them rasp the flesh of any creature the lamprey fastens on, but the tongue-teeth, although smaller than the others, are extremely mobile, and so do more of the scraping. The constant suction from the throat ensures that all particles and fluids extracted from the victim are disposed of quickly.

Fish of all kinds, but particularly cod, herring and mackerel, form the bulk of the sea lamprey's food. It fastens on to some fleshy part, and cannot be shaken or scraped off until it has satisfied its hunger. There is

THE CARE OF BABY TERRAPINS

by Stephanie J. Peaker

I HAVE HAD several requests from readers asking me to deal with the care of baby terrapins since of the large numbers bred and shipped from the southern U.S.A. few survive for more than a few months. This is usually due to two causes. The quality of stock shipped is often poor and secondly there is often a lack of knowledge of their requirements on the part of the owner rather than a deliberate lack of care. Unfortunately, information is not easy to find. Only one book that I know of has dealt with the correct care of young terrapins and this is now many years old. Furthermore, since these animals are often purchased from a local pet shop, the prospective owner does not have the benefit of the advice of an experienced reptile dealer and the average pet-shop owner is often blissfully unaware of the type of treatment needed.

In essence, and with very few exceptions, all baby terrapins need to be treated somewhat like tropical fish with a prevailing high environmental temperature, correct housing and food. They must never be kept in the plastic "turtle-bowl" often seen in shops because these are the most effective method of ensuring that the inhabitants die that I know of. Similarly, dried ant *pupae* sold as "turtle food" are completely useless as a diet for these reptiles.

In this article I am following English usage and calling freshwater-dwelling chelonians terrapins although it should be remembered that the term "turtle" which is reserved for marine forms in England is used for all except land tortoises in America. Since the shippers use "turtle" to describe terrapins, the wholesalers and retailers have copied it and usually this term is seen advertising these species.

Undoubtedly the most important factors in rearing young terrapins are temperature and cleanliness. English outdoor or indoor temperatures are not sufficiently high for these reptiles and, therefore, the tanks used to house them must be artificially heated. Since most of the specimens imported as hatchlings are from the southern U.S.A., examination of climatic data from these regions is useful. Summer shade temperatures range from a mean minimum of about 75°F to a mean maximum of about 90°F. Since the water temperature is usually below the maximum air

temperature, I suggest a water temperature of 75-80°F is suitable. However, in the wild basking in the sun allows the body temperature to rise to a preferred optimum level. Above this temperature the animals dive back into the cooler water. During the daytime it is therefore necessary to provide a radiant source above the water under which the animals can bask. Incandescent lamps are the most convenient way of doing this. However, these should be turned off at night in order to allow the land area and air to cool since it is now firmly established that continuously high temperatures have a deleterious effect and that a nocturnal period of relief is necessary. This method of maintaining a constant water temperature and raising the land temperature during the day follows the pattern in the wild and cannot be more highly recommended.

Maintenance of water temperature is a simple matter if a submersible, combined heater-thermostat is used. These units are more convenient than two separate parts since they are more easily cleaned. A time-switch is the most reliable method of ensuring that the lamps are turned on and off regularly and a "day-length" of twelve hours or a little longer is ideal. Thermometers (I prefer the stick-on dial type) should be placed in the water and in the air space above the water. The wattage of the lamps should be determined by trial-and-error. The lamps should not be so powerful that they cause a marked change in water temperature. A thermostat to control them is undesirable because the animals would then be subjected to light and dark periods throughout the day.

An ordinary aquarium tank is suitable for housing baby terrapins. Although the 12 in. × 8 in. × 8 in. size is suitable for several specimens, a 24 in. tank provides more space, is more pleasing to look at and the water temperature will be less likely to rise significantly when the lamps are turned on. Aquarium gravel may be added but it is not necessary although again it improves the appearance of the set-up. If it is used it should be thoroughly washed each time the tank is cleaned. Large, clean, non-porous rocks should be positioned to allow the animals to leave the water easily, dry off and bask in the artificial sunlight. Flat

rocks in the bottom of the tank are also useful to vary the depth of the water. The maximum depth of water should be about four inches. Heaters, etc., should be installed and the temperature checked for at least several days before the animals are installed.

Other methods exist for housing these specimens. A small indoor pool with an enclosed land area over which can be suspended an electric lamp is fairly convenient. Heat can also be supplied to a small outdoor pool during the summer months and, although it may prove a little expensive in electricity, this method is successful especially when the terrapins have grown a little. Natural, direct sunlight is certainly beneficial although shade must be provided. A wire-mesh lid over such an enclosure may be a necessary protection against the neighbourhood cats. The electric wire to the heater may be run in conduit piping beneath the garden and the usual safety measures should be employed. I have found that a 150-watt aquarium heater controlled by a thermostat is sufficient for a very small garden pond. If a small shallow pool is used then it must be built so that the water will drain away quickly during cleaning out operations because ease of cleaning is essential. In the wild some of the terrapins hibernate but it is not safe to permit this to happen.

Young terrapins are best obtained from a specialist dealer. Only on several occasions have I found healthy stock in an ordinary pet-shop. Many I have found to be suffering from "soft-shell" due to dietary deficiencies. This can easily be detected because the shell is leathery and can easily be bent out of shape. Eye diseases are also common. On the other hand the good dealer usually has some healthy specimens during the summer months and they are best purchased as soon as possible after their arrival in Britain.

From four to six half crown size terrapins can be kept in a 24 in. tank and this will allow growth to occur without the animals becoming overcrowded. It is preferable to introduce all the specimens at one time and then watch carefully for any sign of disease. It is very unwise to add non-quarantined stock to those already established.

Correct feeding is another very important aspect of their care. In the wild, many terrapins are omnivorous, eating quantities of both plant and animal matter. I use a varied diet consisting of pieces of meat, liver, earthworms, *tubifex*, small soft-bodied mealworms, lettuce, water plants, etc., supplemented with vitamins and minerals. Water plants in the tank can therefore serve three purposes—food, shelter and decoration. An adequate supply of vitamins and minerals is essential for these animals to remain in good condition. Calcium together with vitamin D are most important in this respect. I usually prepare an emulsion consisting of cod or halibut liver oil, a few drops of a multivitamin preparation and bone meal (sterilized) or calcium

phosphate. This is then shaken and mixed with the small pieces of meat. It must be ensured that not too much oil is used or the terrapins may refuse to feed. Another excellent source of food is herring cut into very fine pieces complete with fine bones. I also provide calcium in the manner suggested by A. Loveridge (*Copeia*, page 136, 1947). Plaster of Paris is mixed with water and allowed to solidify. Lumps are placed in the tank and the animals will then nip off pieces and swallow them.

Excess food quickly fouls the tank and it is often recommended that a small feeding tank should be used in which to feed the animals and which can be cleaned out after every meal. I have never really found this method to be practicable if more than a few animals are kept. At high temperatures digestion is rapid and I am inclined to feed perhaps three times per day for six days each week. Some species are nervous and can be put off their food by moving them to a strange tank. However, it is particularly important to keep the tank clean especially if the terrapins are fed where they normally live. If faeces and excess food are siphoned off every day, cleaning will be necessary about every week. Filters of the mechanical trapping type are useful but still the water must be changed regularly since breakdown products still pollute the water, albeit invisibly. Perhaps the best filtration method is one in which the water also passes through an ultra-violet sterilizer on its way back to the tank since then the bacteria which thrive in terrapin tanks will be kept under control more easily.

In order to replace some of the beneficial effects of sunlight, the animals may be exposed to a weak source of ultra-violet light for a short period each day. From a few minutes this period can be extended to 15-20 minutes within a few weeks.

A disease which can conveniently be called rickets, or "soft-shell," must be prevented by ensuring that a good diet is given, for once in an advanced state it is almost impossible to cure. In later stages of the disease the eyelids may become thickened but sometimes an animal will be found to be suffering from an eye disease not connected with rickets. A milky exudate may even seal the eye. If the eyes are cleaned with a piece of gauze soaked in a boracic solution and then smeared with an ophthalmic antibiotic preparation (obtainable only on veterinary prescription), recovery can be very rapid. If it is not, then treatment should be repeated regularly. Eye infections of this nature usually occur in newly-obtained stock or in unsanitary conditions and should not occur at all frequently in established specimens in good environmental conditions. The precautions concerning infection with *Salmonella* organisms which are responsible for food-poisoning in humans have already been dealt with in another article (*The Aquarist*, vol. 32, p. 301, February 1968). Occasionally, an individual will be found which

ceases to feed under ideal conditions. These runts should preferably be humanely destroyed if the condition persists.

The majority of baby terrapins imported into Britain arrive from the south-eastern parts of the U.S.A. They can be identified with a fair degree of accuracy from Conant's Field Guide to the Reptiles and Amphibians of North America. If the description of a particular sub-species almost, but not quite, fits a particular specimen it should be remembered that inter-gradation occurs and that exact description is impossible. The most commonly imported type is the Red-eared or Elegant Terrapin (*Pseudemys scripta elegans*) which occurs from Ohio and Iowa to New Mexico, and which is bred on "turtle farms" in the southern states for the pet trade. In the east it is replaced by Troost's or the Cumberland Terrapin (*Pseudemys scripta troosti*). All these forms have attractive "hieroglyphics" on the plastron although it is most attractive in the Elegant sub-species. In the Florida Cooter (*Pseudemys floridana floridana*) the plastron is unmarked. Other species that are often available include Mud (*Kinosternon*), Musk (*Sternotherus*), Map (*Graptemys*) and Painted (*Chrysemys*) terrapins.

Some South American species are also sometimes available including again different sub-species in the genus *Pseudemys*. An attractive terrapin of a completely different group of chelonians, *Podocnemis unifilis*, is also commonly available. Terrapins of this group (Pelomedusidae) cannot draw their head into the shell vertically but fold their necks sideways to imperfectly hide the head. I have successfully kept this species using similar methods to those I have described except

that I provided deeper water (about six inches) and maintained the water temperature at 80°F.

Baby European terrapins (*Emys orbicularis*) require just as exacting care as their American counterparts but in this case I have kept the water at 70-74°F. From the Far East, Young Reeves's terrapins (*Chinemy reevesi*) can be recommended. Although it occurs as far south as southern China, most specimens reaching Europe are from Japan. Indian species belonging to the genus *Kachuga* are also available occasionally. These can be fed lettuce and other greenfood and it is often stated that they seem to be purely herbivorous although I doubt whether this applies to the babies.

Provided that the temperature is kept sufficiently high, a good diet is supplied and the terrapins are in good condition when they arrive, growth should be rapid. Many different species can be kept but it should be remembered that their care is not simple and a little effort in the right direction produces an adult specimen of which the owner can be justly proud.

Summary of recommended temperatures for terrapins from different localities. This does not deal with specific forms which occur at high altitudes.

Locality	Temperature	
	Water	Air*
Northern U.S.A.	70	80-85
Southern U.S.A.	75	85-90
Northern South America	80	85-90
Northern Europe	70	80
Southern Europe and North Africa	75	80
Southern Asia	80	85-90
Japan and Taiwan (Formosa) . .	70-75	80

* Maximum during the light period.

PRODUCT REVIEW

Zoobeko Top Filter, distributed by Hillside Aquatics, 29 Dixons Hill Road, Welham Green, Nr. Hatfield, Herts. The country of manufacture is not given on this new filter, but I assume it's Germany. I do not know the price at the time of writing.

I have seen and used a good many outside filters over the years, but the Zoobeko Top Filter is one of the largest—if not the largest—which has come my way. It is also one of the most sturdily constructed, and has a very large water turn-over rate for an air operated filter. Although I do not know the price of it, for the above reasons I should imagine that it would be quite expensive; however, as its water output is greater than a number of motor power-filters, and it has no "moving parts" which might need to be replaced at regular intervals, this filter would appear to be the answer for those aquarists who want a filter which has a

high turn-over rate, but which is not motor powered. The manufacturer's aim was to produce an outside, air-operated filter with a water turn-over which is better than some power filters, but which would not depend on an electric motor in the filter: the idea being that it is comparatively easy to have an air pump repaired or replaced.

The filter consists of a rigid, plastic container, green in colour, but transparent so that one can see when filter wool needs cleaning or changing. The filter container is cylindrical in shape, and has a diameter of approximately 5 in. at the top, and 4 in. at the bottom. Its lid is tightly secured in place by three round nuts which can be easily tightened or loosened with a finger and thumb. An air line is fitted to the base, where the air inlet is situated, and the air is broken up into smaller bubbles when it passes through the appropriate section

THE HARDY EUROPEAN REPTILES AND AMPHIBIANS IN CAPTIVITY (Part 10)

by Andrew Allen

18. The Common Frog (*Rana t. temporaria*)

Description.—This is the most familiar Ranid, of medium build, and growing to a length of 10 cms. The skin is smooth, rarely with very small warts. The male develops a nuptial pad on the first finger of each hand, but has no external vocal sacs. A well-developed skin fold passes down each side of the back. Dorsal coloration varies extensively, being in various shades of red, brown and yellow, usually with darker markings and black spots. Ventrally it is cream in colour, speckled with grey or brown.

Distribution.—*Rana temporaria* is the most widespread and successful of hardy frogs, with a range that extends throughout the temperate zones of Europe and Asia. This includes Britain, all West and Central Europe, Scandinavia (to well beyond the Arctic Circle), and Asia right across to farthest China and even to Japan. It favours moist locations in fields, woods and gardens, and ascends to two thousand five hundred metres in montane country.

Breeding Habits.—Mating commences very early in the year, from February onwards; the male produces a low, growling croak. The large masses of spawn, each containing up to four thousand eggs, are laid in shallow water. The subsequent development and metamorphosis of the tadpoles has been oft studied, and has its rightful place in every elementary textbook of biology.

Care in Captivity.—Thanks to its position as a classic laboratory animal the requirements of this species have been established in some detail.

Like most members of the Ranidae, the Common frog does not do well in the indoor vivarium. However, it is less nervous, and requires less space, than Marsh or Edible frogs, and hence is correspondingly easier to keep. But surely few vivarium enthusiasts will need to house this species indoors when it can be seen to much better advantage in outdoor vivarium or garden? For those who do, a vivarium of about four feet or more in



Common Frogs In amplexus

length is the first essential, and this should be placed in a quiet, shady corner. A small pool should be sunk into the loose, damp substratum, and surrounded with mosses, ferns and other dense, moisture-loving vegetation. The frogs should have access to deeper water in the breeding season, and should be hibernated rather than over-wintered.

The best idea in every respect is to liberate some of

these frogs in a garden pond that lies amidst suitable rockery and shrubs, and whose sides are not unduly abrupt. Both tadpoles and adults should be introduced, so that an appropriate succession of inhabitants is established. During the year the frogs will wander about the garden eating unwelcome pests, but will return to the pool each spring to spawn. They and the tadpoles will readily coexist with goldfish and most other coldwater fish, though not, for obvious reasons, with sticklebacks, pike or perch. For those unequipped with a garden of the necessary dimensions, a reptiliary will make an equally acceptable home. As long as it is provided with a small pond and some humid, shady

a sound basis for any diet sheet. It is equally easy to fit this frog into a wide range of communities. It may be guilty of molesting baby frogs, toads, newts and lizards, for its eyesight is not of the very best, and it should not be associated with snakes, terrapins or Marsh frogs. But otherwise it can be housed with the vast majority of medium-sized Reptiles and Amphibians, and makes an excellent community animal.

Those who keep this species should remember that its numbers have declined drastically of recent years, and that its status is still deteriorating. No herpetologist should take any action that could further imperil its parlous position. This means that no specimens should



Tadpoles at the pond's edge in the shallows

corners, the frogs should prosper for a good many years and breed regularly every spring.

Greenhouse and cold-frame are also ideal for this species, assuming that they are managed with due care and discretion. Abundant, deep shade is absolutely essential, for the Common frog detests the heat and will rapidly perish in a climate suitable for lizards, snakes or even for Marsh and Edible frogs. However, I have specimens of *Rana temporaria* in both these types of accommodation, as well as in the open air, and they have done well in each case, demonstrating their tolerance of a wide variety of conditions.

The Common frog is a hearty eater which exhibits few particular preferences, and indulges itself in no awkward habits such as hunger strikes. All the standard live-foods will be taken readily, and earthworms form

be collected in the field, nor should they be purchased from dealers who have thus obtained them. Equally, if captive animals breed, much of the spawn should be distributed around suitable ponds, or introduced to the garden pool. By so doing herpetologist and aquarist alike can play a part in ensuring the survival of this unobtrusive member of our native fauna.

Rana temporaria is a very tolerant and interesting animal in captivity, and the amateur should find it rewarding despite its muted colours, unspectacular appearance and quiet, nocturnal habits. It is undemanding and will cause few problems, though the limits to its brainpower should be accepted—the Common frog, though less nervous than many other members of the Ranidae, never becomes as tame as do the majority of toads.

R. t. parvipalmata has few markings on the body, and comes from North-West Spain.

In Southern Europe occur three separate species of frog, each occupying a different peninsula. All resemble *R. temporaria* in some measure, and all may rarely come the way of the amateur in this country.

19. The Iberian Frog (*Rana iberica*)

This is a small species growing to 5 cms. in length, with a bright mid-dorsal line. It may be yellow, red or brown dorsally, with large, sometimes spiral, patches in these colours. It may be found in the Pyrenees, North-West Spain and Portugal, and is a montane species that rarely wanders far from water.

20. The Italian Frog (*Rana latastei*)

This is an even smaller species, with a slender body, and grey or red in dorsal coloration. It is distributed in the Southern Alps of Switzerland, North and Central Italy, and may often be found in upland woods near to water.

21. The Greek Frog (*Rana graeca*)

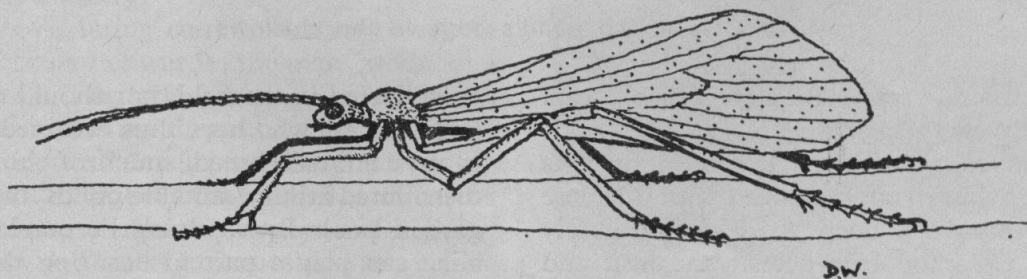
This frog grows to be rather larger than the two preceding species, with lengths of up to 7.5 cms., though it is still rather smaller than *Rana temporaria*. The legs are very long, and the feet are fully webbed. Another distinguishing feature is that males of this frog possess an external vocal sac. Dorsal coloration is usually brown, red or grey, often with paler yellow patches. It is far from being exclusively a Greek frog, and can also be found in Bulgaria, Yugoslavia and parts of Italy. Though not especially aquatic in its habits, it has often been recorded from in or near water.

All these three species require fairly similar treatment to each other, and to the Common frog. In the indoor vivarium they need a large pool surrounded by damp, mossy soil, with many shelters and thick, shady vegetation. The vivarium should be kept cool and away from the sun, but equally should not be allowed to

become cold. I would not care to comment too dogmatically upon their chances in the outdoor vivarium, for I have no practical experience of their hardiness. Comparison with other Ranids from the same zones, notably the Common and Agile frogs, would suggest that they could be successful in the garden reptiliary. But I would consider it more prudent to house these animals in a greenhouse or cold-frame, and so play for safety. These two types of accommodation provide what could be crucial extra insulation against the worst excesses of the English climate. Indoors or out these three species will thrive upon the standard invertebrate fare, having tastes typical of most of the medium-sized batrachians. However, they are rather smaller than the majority of European frogs, and this should be taken well into account when composing their diet sheet. Size must also be carefully considered when planning their inclusion in balanced communities of Reptilia and Amphibia. They will enjoy the same habitats as Common, Moor and Agile frogs, but not necessarily the same companions. The above three frogs, Green and Natterjack toads, all the newts and salamanders, Common, Wall and Sand lizards are all suitable co-inhabitants, but Slow-worms, Green lizards, Edible frogs and Common toads are all to be avoided, along with the regular villains.

These three unfamiliar frogs pose interesting challenges for the amateur. Little enough is known about their behaviour and habits, so the herpetologist who attempts their care will in some small measure have to venture into the unknown. But they should create no insoluble problems, and in essence are as tolerant and undemanding in captivity as Common or Moor frogs.

The next article will deal with the remaining European members of the Ranidae, the Moor and Agile frogs.



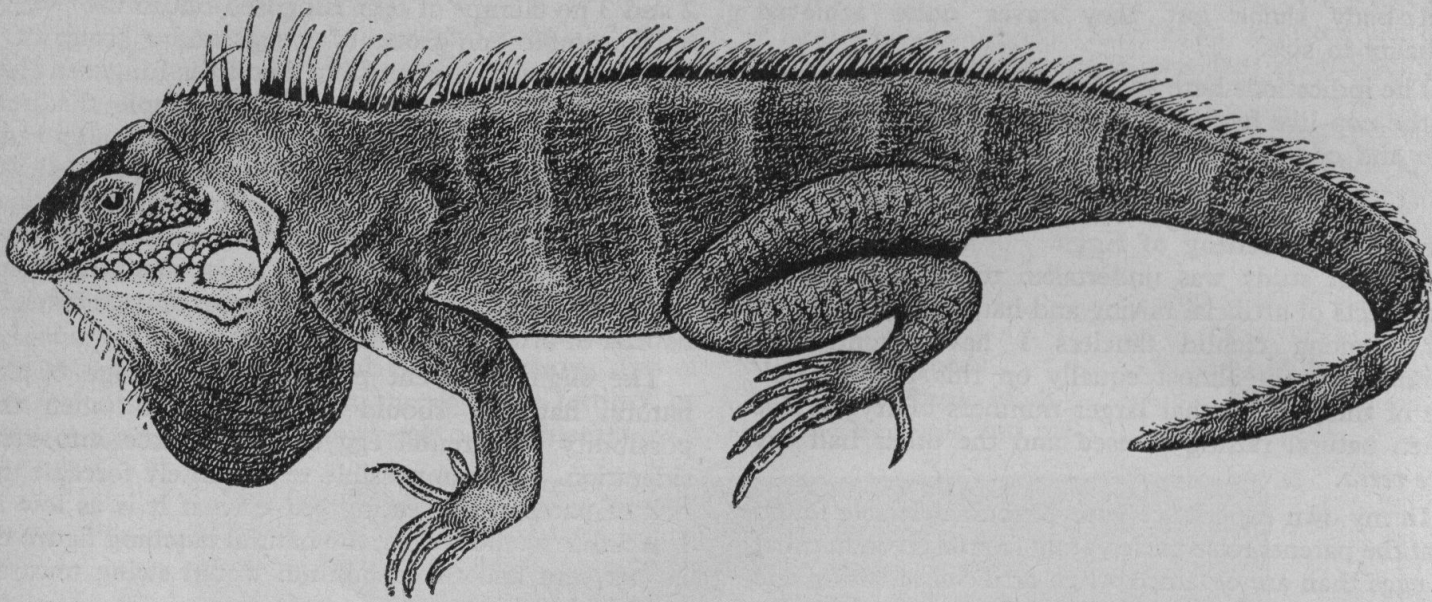
CADDIS-FLIES

by David C. Wareham

CADDIS-FLIES, of the order Trichoptera, form an interesting group of insects which are found living in the vicinity of ponds and streams. They occur through-

out the world, and altogether there are about 3,000 species, with some 190 occurring in Britain.

In its adult form the caddis-fly resembles at first



THE GREEN IGUANA

by Jennifer Martin

It is now seven years since my family, in a state of considerable shock, learned that they were awaiting the arrival of a dragon. This fierce reptile, we were informed, could boast a length of six foot, whiplash tail and an appetite for nestling birds.

In fact, Ignatius, the Common Green Iguana (*Iguana iguana*) proved a cold and wan little creature measuring sixteen inches from nose to tail-tip (which latter bore close resemblance to a damp bootlace).

When he first arrived Ignatius was a rather nasty grey colour all over, but as he grew and became more healthy, he developed into a lovely golden-green lizard with turquoise stripes around his tail, a hanging dewlap under his chin and a most impressive row of thorns the length of his back, although these are actually quite soft and completely harmless.

At first Ignatius seemed to be all big eyes, coughs and sneezes, and I soon discovered the main enemy of these lizards—cold. Since they inhabit the tropical regions of South America, Iguanas need a temperature of at least 85 degrees in the daytime, at least when young, but this is easily provided with a sufficient quantity of light bulbs. I have found one ordinary 100 watt bulb successfully heats a cage measuring 3 ft. × 1 ft. × 1 ft. At night the minimum temperature is 65 degrees, and a child's low wattage night-light appears to be the most effective way of maintaining this. Warmth is extremely important to the

Iguana, as one unpleasant effect of cold can be the loss of circulation in the toes, which are over three inches long. This can result in gangrene and the beginning of a fatal infection. Iguanas can also be susceptible to chest complaints and pneumonia, but an infra-red bulb, plugged into a socket in the cage and lit for a few hours a week gives excellent results in this respect.

The adult Iguana is indeed quite capable of stalking a fledgling, and ours has been caught merrily eyeing a friend's budgie, but the staple diet should consist of every available type of fruit, including tinned, and vegetables. The leaves and stump of cabbage are among my Iguana's favourites, as are water cress, banana, orange and pineapple. The weekly diet should also include some maggots, mealworms or whatever form of live food you feel able to provide, and I believe that a wide variety of household titbits are also essential in order to ensure a balanced diet. For instance, a little buttered bread, cooked and raw meat, egg and some sugar will be very much appreciated.

The fully grown Iguana does measure about six foot, and although this is a misleading statement in that two-thirds of this are tail and an Iguana is easily held in the two hands, they are also very athletic, and mine was able to jump clear across a room at an early age. This means that a large cage is really necessary, and I found that 4 ft. × 6 ft. × 6 ft. was essential. However,

this problem will be overcome as the lizard gradually gets tamer. This can be a slow process, and involves much leaping about the room by all parties, and also some tail-thrashing by the Iguana. In a small specimen this is not dangerous provided you keep your eyes well clear of your pet, and it is a reflex action rather than one of deliberate malice, and will disappear once the animal is tame.

Quite soon an Iguana will become a charming and rewarding pet, since it will sit on the shoulder or lap, and screw its face up in delight when stroked. An Iguana is perfectly safe in a room with the windows and doors shut, and will soon learn to snuggle up in a chair just like a cat.

Obviously, the problem of housing has to be adjusted according to private means, but I would suggest that unless you can offer a full grown iguana a conservatory or a similar sized cage or run to live in, then it is best to train him to join the family in the evenings, which incidentally, takes a lot of patience and hard work but is worthwhile in the end (it may also be necessary to train your family to join the Iguana).

The cage, of whatever size, should be provided with plenty of sand which these lizards love to scabble about in; in the wild state they would lay their eggs in loose gravel and it is also wise to place a small heater in some accessible position where you can put the food. If this is always laid down in some chilly corner, the Iguana may refuse to emerge and eat. Remember, too, that he will become acclimatised only gradually to our weather and will be more susceptible to cold at first. I have found that a tropical animal does not become really used to our weather for about three years.

There should also be a large pan of water provided,

since as well as needing to drink, Iguanas love the water and will spend hours sitting in the bowl.

Another much appreciated decoration is a log of branch, preferably protruding so that he can perch precariously over the edge, and some flat rocks arranged under the heater will be welcome as a basking-place.

When including plants, be very careful, since some animals do not seem to have the sense to avoid the dangerous ones such as ivy, oleander, privet and laburnum.

The cage should, of course, be light and airy and unless you have extraordinary means, something built from wood and glass is probably the best. A good ironmonger's shop will prove invaluable as a source of supply of such items as catches for doors, light fittings, perforated zinc and its modern equivalent, perforated plastic.

To my mind, it also goes without saying that any animal should be given two things: privacy and companionship. To be isolated among vast numbers of alien creatures, especially at first, must be a terrifying experience for any animal. Also, in these days of environmental awareness, I think it very wrong for anyone to keep any animal singly. Although the chances of your breeding an Iguana are remote, that is no excuse for not at least trying, and anyway, the lizards will fare better in the initial stages of taming if there are two of them.

An Iguana is not an easy pet to keep. But it is a fascinating creature, and by no means impossible to maintain in the home with a little thought and imagination. And at least your dinner parties will never lack for topics of conversation!

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