

SNAKES *in the* GARDEN OF EDEN

by
Capt. ERIC HARDY,
F.Z.S.

Secretary, Jerusalem Naturalists' Club

WHEN I was in the Army Pigeon Service we used to say that Noah was the first loftman, because he kept pigeons (doves) in the Ark and sent a bird out after the Flood subsided! Adam and Eve then would be the original amateur herpetologists, and as Biblical historians place the site of the Garden of Eden somewhere in Asia Minor between Transjordan and Iraq, I was truly searching for the snakes in the Garden of Eden this sunny March afternoon when I crossed the Jordan at Jericho and climbed the hills through Transjordan, passed through the ancient Arab capital of Amman, which Lawrence captured in the Turkish War during Allenby's campaign, and went on towards Iraq in search of snakes and other specimens.

For in Palestine alone there are about 30 different snakes, although only seven of these are poisonous and the remainder harmless. Two of these are cobras, one being *Naja haje*, a straw-yellow, two yards long serpent of the southern deserts, which is the snake used by the Egyptian snake charmers and was probably the "deaf adder" of Psalm 58 (a deaf adder being a cobra unfit for training by the snake charmers). It does not inflate its neck so much as the Indian cobra. But when studying "snake charming" in Egypt I might add that I learned that the music has no charm whatsoever upon the snake: the snake's eye follows the tip of the reed in the swaying musician's mouth. By moving his body and the reed, the "charmer" holds the snake's attention, and thus it does not strike, and he keeps it at a safe distance. The snake may be "charmed" with a silent reed. On V-E Day I saw in the Biological Institute in Tel Aviv a cobra just discovered



[Photo by Jerusalem Naturalists' Club.]

A new variety of Sand Boa, *Eryx jaculeus* (L), from Palestine, with a zig-zag band instead of blotches down its back.

new to Palestine and not yet named; my friend Mr. Jacob Hoofien, one of the leading herpetologists of the country, had it. These are the only dangerous snakes in the Holy Land, although *Pseudocerastes fieldi* of the great Syrian desert and of the Negeb and Sinai is also poisonous, as is the Horned Cerastes, a plump, brownish-yellow snake common also in these deserts, identified by the two "horns" behind its ears, but best by the protruding shiny black tail tip which by day warns one of its presence hidden in the desert sand (for, like so many snakes, it is nocturnal).

The only common poisonous snake in these parts, however, is the oriental form of the Levant Viper, a light grey snake with dark spots and a broad zigzag line down its back, an inhabitant of several Mediterranean countries, living amidst stones or even resting on the trees during the day and hunting for small birds

and rodents at night. There are cases of natives dying from its bite, for it reaches about three feet long.

The Sand Boa (*Eryx jaculus*) not only inhabits the deserts but the sand dunes, as at Tel Aviv on the coast, but it is seldom more than a couple of yards long although, like the boa constrictor in the adventures of the Swiss Family Robinson, it strangles its prey before swallowing it. Normally coloured with dark dapples, blotches or spots on a lighter background, Mr. Hoofien drew my attention in the spring of '45 to a new variety with a brownish, zigzag line of symmetrical pattern down its neck and back, together with brown lateral stripes and a broad chevron on the head, which made it resemble a viper. The same coastal dunes hold a beautiful

swift snake called the Four-Lined Snake (*Psammophilis schekari*).

A large snake which may be watched chasing and catching lizards is the Montpellier Snake (*Melopoton monspessulanus*), which is common in many parts of Palestine, its greenish-yellow body being marked with dark spots. It hisses loudly and has a large venomous gland behind its eye, although its bite is not poisonous. I have seen specimens of this kept at the vivarium in the Biological Institute at Tel Aviv. On the dunes near the Yarkon River dwells the sandy-brown Crowned Sand Snake (*Lytorhynchus diadema*), a vestige, like many other reptiles around the coast towns, of the comparatively recent days at the beginning of the century when lonely, almost barren, deserts occupied the present sites of Tel Aviv, largest city in modern Palestine, and the orange grove settlements. It is to be hoped these desert reptiles continue to survive and do not meet the fate of "development" which exterminated the rare sand-lizard from the west Cheshire dunes of England in my youth.

The large Syrian Black Snake—which is often olive-brown—is one I have found not only in the Lebanon and around Damascus but in northern Palestine around Lake Huleh (the Biblical Waters of Merom), which is very wild country. It is one of the many Colubers of these parts, feared with dread by the Arab felaheen although it is harmless and a useful destroyer of field mice and grasshoppers. It has been observed climbing trees for eggs, while the migrating flocks of white storks in spring will feed on it, as the secretary birds of Africa feed upon snakes. The elegant Black Head Snake is common amongst the damp stones of the Jordan valley and at historic Petra in Transjordan, near Lawrence's famous campaigning city of Ma'an. Its head is a really handsome metallic blue, turning black in the museum's bottles of alcohol. Graceful Whip Snakes with black collars and white marks on the neck, and the Water Snake which may be found in most of the lakes of Palestine, are very interesting to us, while the rarer Tessellated Water Snake, or Ringed Snake, is the serpent of which I have a two-headed specimen.

Bluish-grey Cat Snakes are probably named from the large brown spots on their backs as well as their nocturnal habits when they creep from under the stones to search for lizards. Most bad-tempered of our snakes is the Efa, a foot or two long, which is ever ready to attack and bite humans inquisitive enough to examine the snake at close quarters. It is a common serpent of the sandy deserts of the Near East, doing useful work preying upon small rodents and the many scorpions; its colour is light yellowish-brown with black spots on the back.

The Hooded Snake of the southern deserts is one with which I am not familiar.

When I was in Egypt I discovered that more important amongst the felaheen than the famous snake charmers of India who play strange flutings to their cobras, are the Egyptian or Arab snake-charmers, who earn their livings by ridding buildings of snakes. Many small snakes infest the old, dilapidated stone or wooden buildings of Cairo's slums, and when they are declared a nuisance, the native snake charmer comes along, performs some strange incantations to impress his clients, and then suddenly makes a short run to tap some recess behind the ancient woodwork with his stick, and from the dark interior he appears to withdraw a snake.

I spent some time trying to find what it was all about when I was stationed outside Cairo; maybe the fellah can locate the tracks of the serpents and thus their daytime retreats, but it is also alleged that his servants "plant" the place with snakes before his visit, or that by sleight of hand conjuring he "produces" from a hole in the building a snake he has had with him all the time. This because a snake examined in such circumstances was a desert sort not normally found in houses in town. Others examined were harmless species. I think the native has a very good knowledge of the ways of snakes, and their haunts are easily detected by the experienced eye. His Arabic songs and chantings, and any flutings on his reed, have only an advertisement value with his customer—like the beflagged, illuminated Cairo of fete days which bring the struggling populace great jubilation and keep their minds off the growing inflation and the increasing poverty of the 94 per cent. who own next to nothing of the nation's wealth. When in Cairo one can see in a crowd one white-smocked native carefully picking the pocket of a European or upper-class Egyptian, and the other people stand by, looking on without a sign of disapproval, then the snake charmer cannot be expected to ignore earning his living by a little fraud too.

The snake-killing mongoose or ichneumon is, of course, one of the commonest animals in Palestine, and snakes are not nearly so abundant in the hills or away from the deserts as in the hot, dirty cities of Egypt. I would not venture to say what snake appeared in the Garden of Eden here in the Transjordan hills two thousand years ago: all I know is that my snake-hunting expedition this day with a couple of members of the Jerusalem Naturalists' Club was in a rocky valley, glorious with wild flowers massed yellow with chrysanthemum, blue with lupin, cream with scabious and white with anthemis, and if the Garden of Eden was like this in spring, there was much to be happy about.

The SPOTTED or FIRE SALAMANDER

by

C. W. R. CREED, F.Z.S.

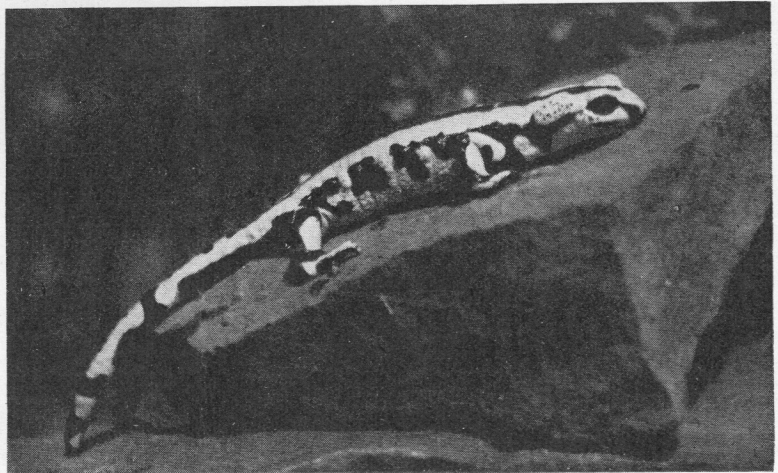
RECENTLY some Spotted Salamanders (*Salamandra salamandra*) have been placed on exhibition in the Reptile House in the London Zoo, as a welcome portent of a renewal of our acquaintance with this attractive species. Formerly this interesting batrachian was often to be seen in dealers' shops, but it is not so easily obtainable at the moment. Anyone lucky enough to get one, however, will find it well worth the keeping.

Spotted salamanders are native to central and southern Europe, north-western Africa and south-western Asia. They were at one time known as Fire Salamanders, as they were believed by the ancients to be able to withstand great heat without harm; but in fact they are happy only in the most moist situations. In misty or stormy weather they will often emerge in great numbers. They pair on land, the male clasping the female by the forelimbs, and it is not until long after this, sometimes months, that the living young are deposited in the shallow waters of springs or cool rivulets. These larvæ may vary in number from 10 to 50, and are very much like those of newts, and have feathery external gills, enabling them to breathe the oxygen dissolved in water, after the manner of a fish. As growth proceeds the lungs develop to the point when they can take over the breathing function, after which the gills wither and the animal begins its terrestrial life.

A full-grown salamander is about eight inches in length, and is generally very attractively marked; the best specimens are those in which the black and yellow patches are about evenly distributed on the body, but there is a good deal of variation, ranging from nearly all-yellow to nearly all-black specimens. The skin has a smooth, shiny appearance as though it were covered with one of the new plastic materials. Incidentally, this bright livery, so attractive to us, serves as a warning to other animals, for the skin has large glands which secrete a milky poison as a

defence against enemies. This poison is harmless to human beings, however, though rough handling occasionally produces an irritation like nettle-rash.

A water-tight vivarium, or aquarium, is advisable when preparing a home for the Spotted Salamander, so that the whole base can be flooded to a depth of three inches or so; the land portion can then be built up from this, thus ensuring that the soil will remain moist—a point which appears to be much appreciated. The land portion should occupy about half the tank, a lawn or beach spreading up from the water to the rockery, which should form



little caverns; salamanders like shade, and definitely do not like bright sunlight. If the vivarium is placed in sunlight, the creatures soon show their disapproval by scurrying into the caves. In captivity at least, they show no tendency to bury themselves in the soil.

As the salamander is used to the clear, fresh waters of mountain streams, it will not tolerate any fouling of the water, and care must be taken to remove scraps of food and so on; aeration will also help in this respect.

Feeding is simple, and variety can easily be introduced, as practically any garden insect will be taken, either in the adult or larval stage. Also acceptable will be worms, slugs, spiders, small snails and woodlice; small pieces of raw meat, fish

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THE BING BOYS AGAIN!

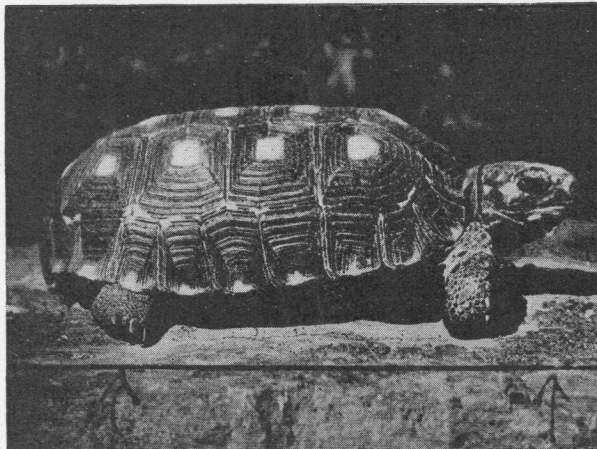
by _____ WINIFRED BAKER

WILL there be any readers of the new *Aquarist*, I wonder, who will remember anything about the "Bing Boys," Grandpa, Cousin and Rio? They are still "going strong," three "tabulated" tortoises (otherwise called Brazilian—*Testudo tabulata*), but have suffered some disfigurement owing to a sad accident, quite unconnected with the War.

They and their amusing little ways were fully described in the issue for June, 1938—the three Bachelor Boys—each with a "character" quite his own and different from the other two. Grandpa came first, about the year 1931 or 1932 and has remained boss ever since, although he is now the smallest of the three. Next arrived Cousin, quite a tiny fellow who grew so rapidly that he soon outstripped Grandpa in size and weight. Last to come was Rio, a quiet little fellow with gentle, alluring ways. All have been with me at least 10 years and things went well with them until a sad evening early in November.

I had been trying out a new heater lamp, ready for the really cold winter nights, it being rather more powerful than the ones they were having during the autumn. All seemed to be well; it burned steadily for several hours at a time, so I deemed it safe to use under the cages. I placed it under the vivarium occupied by Cousin and Rio—Grandpa had another less difficult to warm—about five o'clock and went into the house for tea.

About seven o'clock our next door neighbour knocked urgently at the door, asking me if anything could be wrong in the outhouse, as the window was all alight with a vivid, golden light she had never seen before! I rushed into the garden and a terrible sight greeted me—there was undoubtedly a fire blazing there. On opening the door I was just in time to see Cousin's and Rio's cage crumbling to pieces at my feet and flames leaping to the ceiling!



A Tabulated Tortoise

I felt it must be too late to rescue them so I hurried through the scorching heat to rescue Grandpa and two other small tortoises sharing his cage. Once these were safe (the flames had not reached that corner of the outhouse) I hunted for what I feared would be the mere "remains" of the other two Brazilians. They were alive, however, so I rushed them all back to the house and then tried to deal with the fire. I was still alone, as my neighbour had gone to ring up our village N.F.S. and to bring her own stirrup pump. I just had to rush backwards and forwards with pails of water from our outside butts. It was hard work and the heat almost overpowering. Later I found my hair was all singed and my face scorched (I had not even waited to put on a hat). I was wearing a loose-fitting swagger overall and how I escaped being burned alive remains a mystery to me!

By the time help arrived the worst was over, but the flames had started to encroach on the eaves and I could not get at anything so high up with mere pails of water. Before long the news spread with the rapidity common to villages and soon our drive was fuller of folks than it had ever been since we came to the house, 13 years ago! The buzz of talk attracted people walking near and they, too, joined the throng to see "what was up."

After a time, the fire being under control, the folks departed, leaving the outhouse a blackened, sodden wreck. The fabric, however, was mercifully intact—my promptitude had caused the flames to remain in the one corner where they started. But oh! the dirt and the wet!

However, I next wanted to examine my poor pets. They were a sad sight. Rio's shell—the carapace—was burned back and front, but evidently not very deeply. The pretty yellow markings had turned quite brown and, worst of all, both his and Cousin's

feet were so badly burned that the thick skin was peeling off like pairs of boots! Poor little things! They must have had a terrible time trying to get out of their roasting prison.

That they *did* make furious efforts I saw a little later, for their noses looked as if they were bleeding under the skin, what time the poor little creatures had, no doubt, been beating them against the sides of the glass.

As the days went by I noticed a dark sort of scab formed on their nose ends and the poor tortoises could no longer breathe through their nostrils—indeed, these seemed to have quite disappeared! I was dreadfully worried, not knowing what to do for the best. If I broke the scabs, their poor noses would only bleed again and make more trouble. I decided to let them alone—as they were hibernating more or less, they would have to breathe through their mouths, which they kept opening, poor things, for the time being. I bound up their feet, put oil and boracic ointment on their shells and noses, and “hoped for the best.”

After a very long time I was able, very gently, to scrape off the hard little pieces of skin from the tortoises' nose ends, releasing first one nostril, then the other. Now both are free on both tortoises, and they seem very much better.

Their feet, however, are not healing as I should like; the hard, sharp marginals of the carapace tear at the new, tender skin as it forms. Cousin's feet are the worst—I have had them bandaged up until the last few warm days, but I now feel they will never harden unless they can be exposed to the air. With the advent of warm, sunny days the tortoises are beginning to feed well and to bask in the sunshine, so I hope that kindly Nature will come to the rescue and complete the cure.

Brazilian tortoises, being tropical or semi-tropical, will not hibernate. They must be kept warm and feeding throughout the winter. I find that mine sleep a good part of the time and I usually leave them in darkened cages, allowing them to come out two or three times a week to have a drink and some food. They soon run into a corner to sleep again, so I then put them back into their cages again. During very cold spells they scarcely move.

This winter, however, after their “accident,” they would hardly feed at all. I think this was due to their nostrils being blocked—they could not *smell* their food first, as all animals seem to do—and seemed unable to swallow easily. Now that spring weather has come again, I am delighted to see them eating well and I hope their wounds will soon heal again.

Grandpa, of course, is free from all these troubles. His cage did not get burned and no glass was broken

—but it must have been pretty warm *anywhere* in that outhouse for a short time!

Tabulated tortoises should be fed chiefly on fruit—they love bananas, cherries and plums (these should have the stones removed) and—just try them with green figs! Before the war I generally bought a box or two of Turkey figs as a “treat” for them (9d. or 10d. a box of 12 in those far away, happier days).

In the winter I give them the Insectile bird food sold for soft bills, slightly moistened in the same way as for birds—indeed they will eat this freely all the year round. All mine love dandelion, but they do not seem to care much for lettuce. Occasionally I spare a tiny piece of orange and, as we have our own trees, they get plums in the season. Tabulated tortoises make delightful pets—but at least two should be kept, as all tortoises, land and water, are really gregarious and show off their amusing little habits much better when several are kept together.

Grandpa, Cousin and Rio are no exception. Often I find them in the garden, noses nearly touching, tails out, heads nodding, as though they really must be discussing some urgent question. At times they will follow one another up and down the garden and occasionally they will fight—two together and the third looking on, evidently acting as referee!

My pets are great fun and well worth the small amount of work involved in looking after them.

THE SPOTTED SALAMANDER

(Continued from page 42)

and shrimp, cut to the size of a small slug and dragged across in front of the nose will be snapped up, and once the flavour has been appreciated further pieces will be taken readily.

The species can be bred in the aquarium, the young being born usually in the spring. While in the larval stage the best food will be *Daphnia*, mosquito larvæ, bloodworms, etc., but scrapings of raw meat and chopped earthworms will also be taken. The rearing of a brood from the grey-black larval stage to the brilliant coloration of the mature salamander will amply repay the small trouble involved.

FOOTNOTE

The Spotted Salamanders mentioned in the above article have been bred in the laboratory of the Reptile House at the London Zoo by Mr. J. W. Lester, the new Curator of Reptiles. They had already left the water and were assuming their bright livery when we saw them the other afternoon. Mr. Lester, by the way, has made his knowledge and experience available to our readers by joining our Advisory Board.—EDITOR.

All Done by KINDNESS

by L. R. BRIGHTWELL, F.Z.S.

WHILST no one would expect to feed a lion on live meat, the offering of living prey to reptiles was until relatively recently a commonplace in zoological collections. All snakes, crocodilians, and many lizards and tortoises normally live on animals which they capture and devour at leisure, and in private ownership there is possibly little reason why their natural tastes should not be indulged. But that this practice is no longer permitted in public is all to the good and the history of this Zoo reform (in this country at least) is of great interest, if only as an answer to those pessimists who, embittered by recurrent wars, seriously question our claims to humanitarian advancement.

From the first the London Zoo followed the practice common in menageries of giving its snakes, etc., living goats, rabbits, ducks and frogs. At a time when public executions and animal fights were still permitted, the spectacle of a guinea pig's or frog's struggles amid the coils of a snake were naturally a draw. And so they were long after executions and beast fights had been cried down. But during the 1850's, the first objections were heard. Charles Dickens, in his periodical "Household Words" made a most detailed report on feeding time in the Reptile House—less on behalf of the small beasts and birds involved than because of its undoubted appeal to the basest instincts of the general public. That morbid trait which draws crowds to a street accident found here full vent.

From thence onwards, at regular intervals, attacks were made upon this feature of Zoo curriculum. This is typical of the correspondence that ensued:

To the Editor of "The Times":—

"Sir,—Having paid a visit to the Zoological Gardens during a recent sojourn in London I was invited . . . to see the reptiles fed. I shall never forget the debasing spectacle that opened before me . . . We have a law against cruelty to animals and frequently read in the papers of persons being heavily fined for ill-treating horses, etc. I would like to know if the law is inoperative here?"

It was. It was and still is inoperative against many worse matters—some "sports," for instance, and will remain so, so long as the wealthy practitioners of such sports subscribe to certain animal

defence societies, which still profess to be opposed to scientific zoological collections.

About 1880 these bickerings in the Press blew up into a gale. Mr. P. L. Sclater, the then secretary, put up a notice outside the Reptile House announcing that at feeding time—5 p.m. every Friday—the doors would be shut, and no one would be admitted save by special request. But nothing was said against those already present remaining, and the public soon getting to know this, feeding time played to a full house throughout the year. One excited correspondent referred to "Sepoyism in Regent's Park," and compared the snakes' dinner hour to the Cawnpore massacre.

By far the best protest was the detailed, unbiassed account in "The Times" of September 3rd, 1880 by F. Anstey (J. M. Guthrie), the famous author of "Vice Versa." Here are a few plums. He describes the well dressed, "refined" crowd, and its reactions. "The schoolgirls present protest they dare not look at anything. Paterfamilias observes that is is 'not a sight for children,' but they all stay, telling one another that they 'can always go away when they have had enough of it.' . . . The women are pitiful and outspoken in their indignation, denouncing it as cruel, horrible, and wish they had never come, though, as they are here they compel themselves to see everything, and soon gain command of their feelings. . . . We strain over the rails to watch him (the keeper) coming back with a box, said by somebody to contain guinea-pigs, an announcement which elates us in a wholly unaccountable manner."

Of the alligators being fed . . . "This is expected to be one of the most horrid sensations of the afternoon and there is consequently much competition for the best places. If you take the trouble to retire to an angle at which the plate glass front of the case reflects plainly the ranks of faces before it, you will perceive an undeniable resemblance to the front rows of the pit, during the eccentricities of a lively farcical comedy. So undisturbed by its adventures does the bird (a pigeon) look that a clergyman gives it as his opinion that owing possibly to some providential arrangement, death by slow strangulation possesses peculiar attraction in the eyes of pigeons, a theory which is received with favour."

who miss this practical work. It may be that the way one can plan these practical lessons encourages initiative which, in turn, is carried over into other lessons. I am not so dogmatic as to say that this general improvement could not be effected by a similar course of study applied to other animals or plants but as it is impossible to transplant the farm-yard or the jungle into our classroom the aquarium remains the handiest and most practical way of introducing reality!

(4) *Economy and simplicity.* We must consider the holidays and the objection to any kind of pets or plants that need special care during the teacher's absence from school. A properly stocked and well balanced aquarium can get on without attention for several weeks. Thus there is no need for anxiety on the score of "who is going to look after it?" Again the cost need be little, in fact we can beg, borrow or scrounge most of the materials. This aspect of the art of aquarium keeping will be dealt with later!

Thus, you see, there is no need for hesitation, but every reason to join the glorious company of aquarists. Certain it is that your pupils will raise a cheer, for every child knows that there is nothing so good as messing about with water.

WHY NOT A MARINE AQUARIUM? (Continued from page 101)

the tank. Out of water they seem pretty dull and uninteresting, but once in the aquarium they open out their multi-coloured tentacles, which wave about in the water in a fascinating way. They do not often close up, except when digesting food.

Some aquarists chip off the rock and the anemone as well, but this is not necessary. The anemones can be prised off rocks and breakwaters with the fingers, and taken home packed in damp seaweed. They travel best in cold weather.

These creatures only require feeding about twice a week, and all you have to do is drop in some tiny scrapings of fish, or chopped mussels, etc.

There are three species of sea anemone on our shores which are suitable subjects for the marine aquarium. The best-known is the Beadlet (*Actinia mesembryanthemum*), which is extremely variable in colour—from crimson to dark brown, olive green to emerald, and usually spotted with golden. The Plumose Anemone (*Actinoloba dianthus*), is an upstanding, graceful species, in which the expanded tentacles resemble ostrich feathers, while the Dahlia Anemone (*Tealia crassicornis*), is another variable and attractive member of the family.

Anemones moult their skins from time to time, and these casts should be taken out of the tank,

VENOM AT FULL STRENGTH AGAIN

DURING the war no poisonous snakes were kept at the Reptile House in the London Zoo for security reasons, their place being taken by such un-reptilian creatures as rabbits and ant-eaters. Under the direction of its new Curator, Mr. Lester, however, things are rapidly returning to normal, and already a fine collection of venomous serpents has been brought together—in some respects as good an exhibition as any in the past.

Three kinds of Rattlesnake are shown, and some fine examples of the River-Jack, a close relative of the Gaboon Viper. Among the Puff-Adders exhibited is the largest specimen the Society has ever possessed.

Both the green and the black varieties of the deadly tree-living Mamba are shown, as well as four different species of Cobra, two of which, the Black-necked and the Ringhals, have the frightful habit of spitting quantities of venom, with deadly accuracy, at the eyes with intent to blind.

One of the harmless species, the Bull Snake of North America, has just laid a clutch of 14 eggs, remarkably similar in size and shape to those of the domestic fowl. These, together with some terrapin eggs (like half-size ping pong balls) and some crocodile eggs, are being incubated hopefully.

otherwise they are liable to pollute the water. Anemones breed in a curious manner. The young are formed within the hollow interior of the parent, and discharged from the mouth. They appear in the free state as miniatures of the parent.

If you desire to keep fishes, choose only those which are genuine shore kinds. The Blenny, Goby, Rainbow Wrasse and Rockling in their varieties all do well. The Fifteen Spined Stickleback is another interesting little fish which thrives in the aquarium. It builds a nest like the common species of our ponds. It is about 5 ins. long and silvery yellow mixed with a dash of green. It has a long tail and a projecting under-jaw.

Shrimps and prawns will live well in a tank, as also will small shore crabs. The crabs need only very shallow water, and they should have a rock on which they can climb out of the water. Do not put marine fish into the same tank as anemones, for the stinging-cells of the latter will kill the small ones and cause the larger ones much discomfort.

After a time the rocks and sides of the tank will develop a growth of slimy, brown algæ. This should not be disturbed, for it is a healthy sign and will bring you as near to achieving a natural balance as it is possible to do at present in the marine aquarium.

YOUR PAGE

BREEDING AXOLOTLS AT THE BRISTOL ZOO

IN the aquarium at this Zoo we have had no difficulty with breeding axolotls. Six fully grown axolotls are kept in a show tank 18 by 18 by 18 inches, with anacharis weed growing in the middle. At any time from January until March the females spawn, and the eggs are deposited on the weeds. They are fertilized by free-swimming milt from the males, but there is very little chasing or excitement as when fishes spawn. The ova are like frog-spawn in appearance, though not in clumps but spread out all over the weed and adherent to it. When the spawning is over, the weeds and attached eggs are removed and put into separate tanks, though the parents have no tendency to eat the eggs. The eggs take from 7-21 days to hatch, according to the temperature of the water. Then when the tadpoles are free-swimming they are fed at first on sifted daphnia and cyclops and later on large ones.

We are fortunate in having an almost unlimited supply of daphnia in the duck-pond, which makes it very easy.

The axolotl tadpoles do not eat vegetable matter as frog tadpoles do. When they are about 1 inch long they will take small pieces of minced-meat and chopped worms. Some grow faster than others and there is a risk of the large ones taking to cannibalism. Some years ago we put about a hundred axolotls of 1 inch in length into a tank, the water became green and we could not see through it. In the autumn when we emptied the aquarium, we found that the only inhabitants were two enormous axolotls. They had eaten up all their companions. So it appears that the best diet for growing axolotls are the young ones, but it is not advised.

As a general rule they take about two years to be fully grown. The white ones are the albino variety and will breed true on Mendelian principles. When the axolotls are well grown a feed of one tablet of thyroid, given them forcibly, will turn them into tiger salamanders, their tails become round, they lose their gills and become terrestrial amphibians.

WM. M. PAYNE.

BIRTH OF THE BLUES

One of my Blue Acaras spawned, and I hatched 969 fry, which are now three weeks old and growing very fast. This seems a very large number to me, and I wonder if any of your readers have exceeded it in a single spawning.

The female concerned is fully grown, and is about three years old.

R. J. WHITWELL.

IF YOU HAVE ANY OBSERVATIONS, EXPERIENCES OR IDEAS TO RECORD, THIS IS THE PLACE FOR THEM.

CHINESE PUZZLE

THOSE readers of *The Aquarist* who breed Fighting Fish (*Betta splendens*) will no doubt be interested in the following passage extracted from the *Yu Huan Chi Wen* (Record of What an Official Heard on His Travels):

In the streams at San-shan little fishes are found which are ornamented with alternate stripes of red and black. The boys of the village keep them, and the fish fight for their entertainment. From old time there have been fighting birds, but I never saw fighting fishes before; and they are a fine sight too. I hear that they also existed in Yung-chia.

The author of this passage is Chang Shih-nan, who lived in the first half of the thirteenth century. Yung-chia, to which he refers, is not a town or a district, but a period. There are two Yung-chia periods; one 145 A.D., the other 307-312 A.D. We cannot be sure to which the author is referring but, either way, it takes us back a long time. Also, we cannot be sure if these fighting fish were Bettas or some other species, but if they were Bettas, it is undoubtedly the first mention of them in history.

G. F. HERVEY.

NINE DAYS' WONDER

I do not know if the following experience is unusual—if it is I should like some knowledgeable reader to explain.

I put a pair of young ordinary Guppies in a community tank about six months ago, and the female has produced her young at about monthly intervals. In mid-March last the male guppy died and the female produced at the end of that month and again on the 30th April. By May the only survivor of the February birth, a male, was sufficiently adult to be interested in sex, and on the 31st May the female produced more young.

Now comes the interesting part of the story. On the 22nd June I introduced a pair of young golden guppies, both about $\frac{3}{4}$ inch, into the tank. On the 30th June the original female again produced and of the couple of dozen youngsters seven were quite gold. The first four born were gold, followed by an ordinary, then a gold; I did not observe when the last two golds arrived.

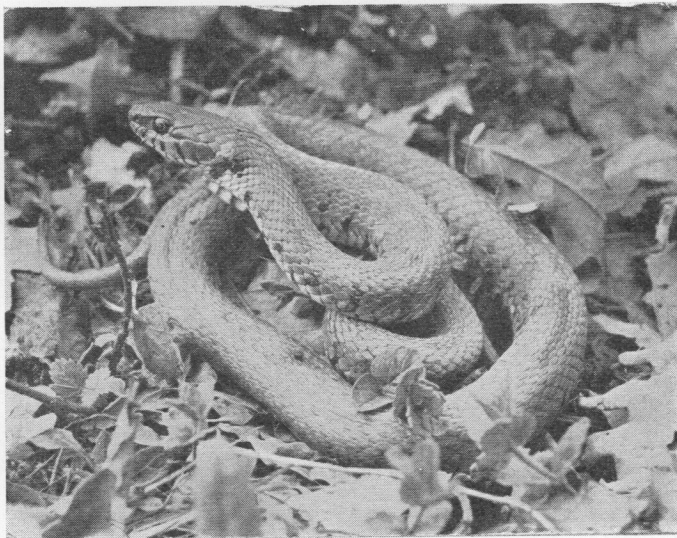
The question is, how could the introduction of a golden male only nine days before the birth influence the colour of some of the young?

W. DARKIN.

SNAKES AS PETS

By

CLIFFORD
BARNET



[Photo: Walter Murray]

The harmless and beautiful Grass-snake

READERS who would like to keep snakes may do so successfully if suitable conditions are provided and means of keeping everything scrupulously clean are established. In the first place, it is useless to attempt keeping snakes unless a sunny position for the case they are to inhabit is available; and at the same time provision has to be made for shade and a certain amount of darkness. All these are essential, and failure occurs if they are absent or neglected.

The first necessity is a well-made case for the vivarium, which must be of dimensions ample enough to accommodate the snake or snakes in every way, according to size of individual. The case must be well ventilated at the top, with a suitable door at the back for the purposes of cleaning and feeding. A glass front, of course, is most essential, in order to watch the movements of the

reptiles. One of the greatest and most imperative essentials, however, is security. Everything about the snakes' dwelling must be close fitting—nothing whatever must be loose or likely to become loose, for snakes can get through a crevice or hole that most people would imagine perfectly safe and impossible to admit of the passage of a snake's body. Neglect to make the case safe in this direction will result in the loss of the snake!

Another strong point is cleanliness. The floor should be of clear sand or gravel and must be renewed frequently. Every particle of matter that would cause an unclean condition must be removed promptly. A vessel filled with clean water for the snake to lie in as often and as long it likes must be provided; and it must be kept filled with clean water.

PLATYFISHES (continued from preceding page)

spinach can be used as substitutes. To promote full growth and to encourage reproduction, some animal food is also essential, either in the form of live daphnia, bloodworms or finely chopped earthworms. A peeled shrimp or piece of fish suspended on a thread is excellent.

When breeding time comes, there is no necessity to remove the heavy females. All that is needed is a fair thicket of plants to give the female privacy and some *Myriophyllum* or similar fine-leaved plants

floating on the surface to provide shelter for the newly born fry. If the adult fish are well fed, particularly with daphnia, they will not attempt to molest their offspring once they are able to swim and the fry can be reared satisfactorily in the same tank. Indeed, the young of all livebearers need considerable room for their early development if they are to grow into respectable fish and the practice of transferring them into small containers "to save them" defeats the aquarist's good, though misguided, intentions.

Heat is another important necessity—not a fluctuating warmth, but a steady temperature. This is best provided by a small water-tank fixed underneath the case, and the water therein heated by means of a small lamp. Heat provided by hot water is the best, because the water retains heat after the lamp has gone out, whereas the lamp alone might allow the temperature to fall, with disastrous results. The correct degree of heat can be maintained or modified by good ventilation and attention to the needs of the lamp.

The feeding of snakes is undoubtedly a great drawback to the otherwise attractive keeping of these reptiles as a hobby. The *supply* of food may not present any difficulties, but the *giving* of the food to the snake may not be so easy, because *everything* has to be fed to the reptile *alive*, and many people would not appreciate the sight of living creatures being swallowed alive! Yet this is the *only* way of feeding snakes with a certainty that they will be kept in perfect health. If this difficulty can be surmounted the feeding of snakes is quite simple—the food is placed where the snake can see it and left there with the certainty that it will be taken and swallowed in due course. There is the question as to whether the live creature feels pain or terror in being swallowed. It strikes the writer that in the act of seizing its food, the snake kills its prey, or paralyzes it, seeing that the fang (or tooth) of the snake strikes into the head or neck of the animal or bird that is the victim, and thus pierces a vital spot which results in instant death.

The snake will eat frogs, mice, newts, small rats, voles, fish, and various birds; but the food must be alive and thus perfectly fresh—the snake does not touch food even only just killed, and nothing whatever is acceptable that is in the least tainted or

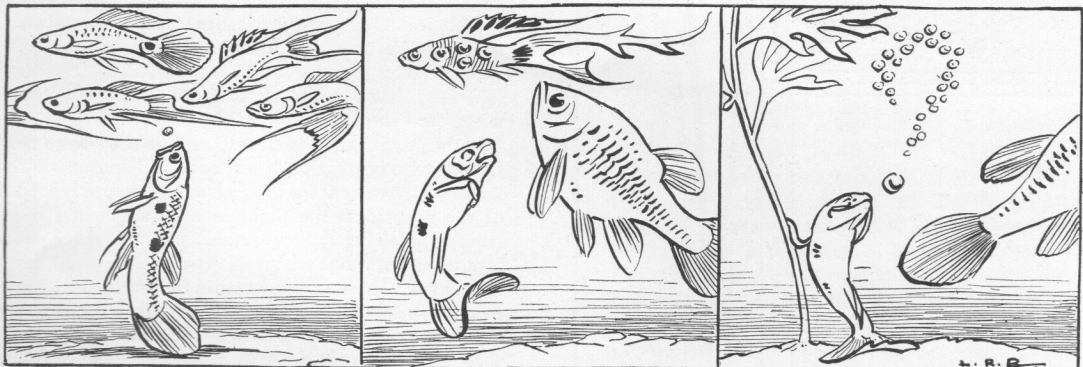
stale. Feeding, however, is infrequent—once a week in some cases; in others at two or three weeks intervals.

It is possible to feed snakes with prepared “dead” food, forcibly administered by being rammed down the throat of the reptile; but this is an expert’s job for the process is most likely to injure the mouth of the snake, which may prove fatal.

There are several kinds of small snakes that are suitable for keeping in a vivarium of average dimensions, including some very handsome Continental species; but the British snakes are more easy to procure. There are three species in this country, including the adder or viper, which is venomous and therefore dangerous, and precautions will have to be taken against its bite, which can prove fatal or cause serious illness. It may be better to content oneself with the two harmless British snakes. The Smooth Snake is a very graceful, slender reptile with close scales like shining metal. Its colour is a yellowish or brownish green with brown spots down the back; it is about a couple of feet long. It is viviparous (i.e., hatches its eggs in its own body) and will eat almost anything it can swallow alive. The Grass Snake, on the other hand, eats only frogs, small fish and insects and will not touch birds and most animals. It is olive green in general colour with a yellow ring around its head, and is three or more feet in length. It lays its eggs in manure or rubbish heaps, so that the heat from decaying vegetation will help to hatch the eggs.

It is easy to determine whether a snake is in good health or not, because a healthy snake sheds its skin periodically, and all in one piece. When the skin comes off gradually in small pieces it is a sign of ill-health or wrong treatment.

GUSSIE the GUPPY. No. 5.



???

Well, I'm glad you can see them too, dear

I thought at first it was that new fish-food our bloke's trying on us!

A tentative enquiry on my part and I was granted that most distinguished privilege of all—a conducted tour “ behind the scenes.”

There I saw the large number of reserve tanks kept, and the cold freshwater circulatory system worked by fifteen pumps. An interesting feature was the provision of three large refrigerating machines. Work space behind the tanks is particularly roomy and very light, there being glass panels let into the roof above all exhibition tanks.

The breeding of many tropical species was in full progress and I was particularly struck by the large numbers of Angel Fish in all stages of growth. Since I have always regarded this fish as a rather difficult species to breed (and I think its present price and availability now that imports are banned here—bear me out in this). I promptly requested that the secret formula of their success be handed over. I was met with a look of astonishment and

elicited that they experienced no trouble at all in breeding and rearing these fish, using ordinary methods.

My visit was rounded off with a long talk with the Director who told me of some interesting trips made by the staff of the Aquarium for the purpose of maintaining and furthering the collection.

I left feeling enriched by my visit and indebted to those whose work and interest had made the Aquarium a fine example of all the science of fish-keeping should be.

The value of an aquarium in attracting visitors to a city is obvious, and it is my belief that such buildings play an important part in the cultural life of the community. Their inclusion in the plans of large blitzed cities here, now undergoing redesign, should be an ideal at which all naturalists and educationalists should aim.

LETTERS—

TRIALS OF A SHOW SECRETARY

Re Potters Bar Show I should like to make a few comments.

I was criticised before the Show day for not allowing more than one entry per class per person! Conversely, the Editor mentions that the staging was somewhat inadequate. It should, perhaps, be made known that I received prior notice of only 15 entries in the open classes and many of these were guppies. Consequently means of placing all the other entries near the radiators had to be improvised on the evening. It would not have been friendly to refuse entries brought from afar. Similarly, when people travelled long distances they could not be kept out in the rain until the advertised time of opening at 7 p.m. Naturally they hampered the arrangements so that judging was delayed. It was intended that it should be finished before the throng arrived. The crowd exceeded the wildest expectations and cut our lines of communication. How I longed for a microphone, so that I could contact my helpers! The lighting would have been adequate for the entries notified, but the additional exhibits, if fully illuminated, would have blown the fuses. The electricity problem was the greatest headache, and will be for any future shows of like size, if an attempt is made to light and heat the tanks. Few premises are wired to cater for such a current consumption. I cannot foresee that in the near future it will be possible to hire a hundred or so tanks from a dealer, and so it seems that loans from clubs will be the only source of supply during the next year or so.

I suggest that each club has its own distinctive colour to facilitate sorting out after the show. Future organisers will have much more data now that this post-war pioneer effort has been made. It will be found advisable to plan at least six months ahead and to have substitutes or understudies for helpers who may not arrive on time.

H. D. CLUSE.

FEEDING SNAKES

As a confirmed snake-lover, I cannot allow Clifford Barnett's statement “ EVERYTHING has to be fed to the reptile ALIVE,” in his otherwise excellent article in your October issue, to pass unchallenged.

For some years now, all the principal zoological gardens in this country have fed their larger snakes, pythons, etc. exclusively on freshly-killed food, and no appreciable drop in the reptiles' health has resulted, once they have become used to this form of feeding.

Many of the smaller snakes, too, can be induced to take freshly-killed mice, etc. Although I must admit that my efforts to persuade the grass snake to do so have failed completely.

It would appear that the reptiles' objection to less-recently killed food is due to the fact that, after rigor mortis has set in, such food is far less easily swallowed; for, of course, all snakes can feed only by swallowing their prey whole.

Thus, when the reptiles have become accustomed to this new form of feeding, there should be, and is, little objection on their part to freshly-killed food.

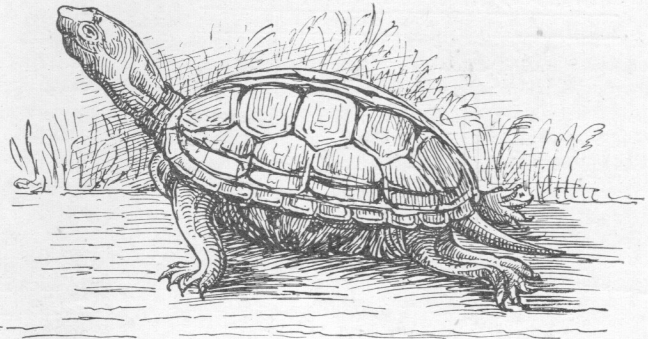
DENNIS LEVY.

WATER TORTOISES

How many are there in Britain now?

Written and illustrated by

**WINIFRED
BAKER**



Reeves' Terrapin

THIS is a question which intrigues me very much and it would be interesting if any owners of these delightful little creatures would write to our Editor about them.

Only one of mine has died and I acquired him through the "passing on" of an old lady friend, about four years ago. Of my "originals" there is, primarily my very dear "Beeks," about whom I wrote a special article in the *Aquarist* (Aug., 1940). He has been with me now for about 19 years and I can hardly imagine life without him! Nearly as old—in years with me—is a little Chinese Reeves who sinks to the bottom of his pool about the end of each October and re-appears on some bright spring morning, always to my delight, for indeed "the winter is over and gone" when these little creatures awaken once more to life.

Then there is "Chequers," christened because she came from an Inn by that name about a mile from here. The young daughter had a couple (bought from a travelling hawk) but the garden, which contained a pond, was not walled in. One terrapin escaped, never to be found again, so the other was brought to me. This one is a beauty, very prettily marked in yellow—a European pond tortoise, by the way, as is "Beeks"—Chequers is a female and has laid one or two eggs since I acquired her, about nine years ago.

Then, from the same lady who died, leaving her pets alone in the world (she lived alone) I also obtained two more Reeves' terrapins, one about the same size as mine—about full-grown, I should say—

and one half-grown, still delightfully "babyish" in ways and appearance.

At the moment of writing all five are getting ready for winter hibernation. They appear on sunny mornings basking at the side of their pool or sitting amongst the fading water plants. I never like saying "good-bye" to these delightful pets, as one does not know what may befall them during the bitter months of winter.

"Beeks" is so tame he now knows his own name like any dog or cat and will pop his little black head out of the water if called—or at least, if he *wants* to be recognised! At times, I have called in vain when, perhaps, I have wanted to show him to a friend. He has been in the water all the time, as I have discovered by putting my hands in the water and "fishing" for him! But Beeks was ever independent "a law unto himself." He has endeavoured to escape from every enclosure into which he has been put and, years ago, I "met" him, one evening, wriggling along down our drive, scurrying for dear life. Another ten or twenty seconds and he might have been lost to me for ever! The little garden in which he and his companions live is wire-enclosed, with the wire turned over at the top, but all water tortoises seem adepts at finding ways out and I lost both my lovely little Spanish terrapins this way (*C. leprosa*). I always regret them, they are charming little creatures, both in their colouring and habits. The little garden is really quite big for such small creatures; it contains a nice "Summer house" and a pool and lots of room to

roam about in. Part is grass planted, there is a rockery containing plants under which any small tortoise can hide. So one would think they might be happy there!

Chequers is quieter, as becomes "the gentler sex" (!); she sits near the pool mostly, and roams about only when she is seeking for a nice spot in which to deposit an egg! These eggs are extraordinarily large for the size of the tortoise—quite oval, not bigger one end, like a hen's. I once caught Chequers in the act of laying one. She was scooping away the soil with her hind legs; slowly but surely she had made quite a deep hole. I wished I could have tried to incubate that egg, but it is extraordinarily difficult, as water tortoise eggs take weeks to hatch. They must not be allowed to get too dry, too hot or too cold. It would be almost a full-time job to look after them and could only be undertaken by some such organisation as the London Zoo (with laboratories at their disposal) or by someone with ample leisure. This last I have certainly never had!

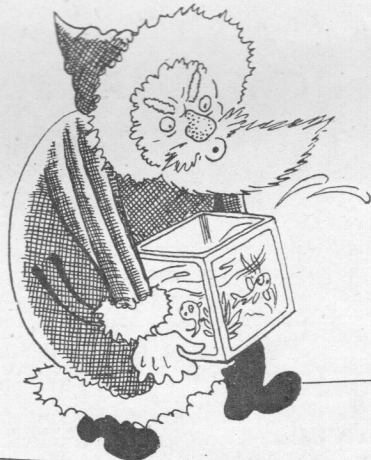
All my terrapins will feed from my fingers. After a hot, sunny day it is delightful to approach the pond and see them all scrambling up the shallow end, waiting to be fed! How they eat, too! One can hardly cut up the raw meat or fish fast enough. Yet, in midsummer, I feed them every evening, for I realise they must accumulate sufficient fat in a few weeks to last them through the months of hibernation. Many people say it is sufficient to feed them about twice a week only, but I do not agree. The terrapins are only in full feeding condition for a short time. In the spring, they eat rather sparingly; towards Autumn they begin slowly to go off feed. But in high summer they will eat voraciously. My Reeves, especially, are big eaters—and how fat and heavy they grow! When obtainable they all love mealworms. But these are so difficult to get, now. By the way, I wonder if any of our Dutch friends—or even the Germans—could be induced to start again, this very important and lucrative trade, of which they alone seem to possess the secret? Many people can breed in small quantities; I kept mine going all through the war, but the Germans and I believe the Dutch were the only nations who seemed able to produce in bulk, for extensive export. When we can all start keeping our birds and reptiles again, these mealworms will be quite indispensable to us.

To return to the heading of my article. I wonder how many tortoises and terrapins there are in England now? Have they died! Have they escaped from homes that have been hopelessly bombed? Are there any happy possessors of these delightful pets, left? I would much like to know. It is always interesting to get in touch with people

who share one's particular flair in pets!

With the exception of my article on "The Bing Boys," little has been written about reptilian pets in recent issues of the *Aquarist*. Perhaps our Editor can try and ferret out these shy folks, so that we can hear a whisper, once again, from the reptilian world.

It was on a beautiful warm early November day when I first went to see the lady mentioned in this article. Her cottage garden, quite a large one, was ablaze with Michaelmas daisies, with the soft November sun pouring upon them. As I walked up the path I saw two pretty little pools, wire netted round, containing stones and water weeds. I still remember my delight, though it is now fourteen years ago, as I exclaimed to myself: "Oh! she keeps water tortoises!!" She has now passed on, but this lovely impression still remains with me. Fresh people have come; the dear little pools have gone and one is sadly reminded of the fact that "nothing lasts"—"here we have no abiding city." But, at least, I can always remember that lovely afternoon and the momentary thrill of joy, which will live on in memory through what days of life may still be left to me.



dum

"What the heck made the little brat wish for this?"

NEWT-KEEPING

By _____ ELIZABETH CROSS, N.F.U.

I am surprised that more teachers don't keep newts in the classroom aquarium. Perhaps it is because they are under the impression that newts must be fed regularly and have read some of those alarming descriptions of what happens if you allow old bits of food to remain and foul the water, or don't have the water sufficiently aerated and so on! I know accidents do happen in the best regulated aquariums and that a really comprehensive textbook is bound to contain many horrors that rarely happen to us, but I imagine that many people are

put off making interesting experiments merely because they have read too much and attempted too little.

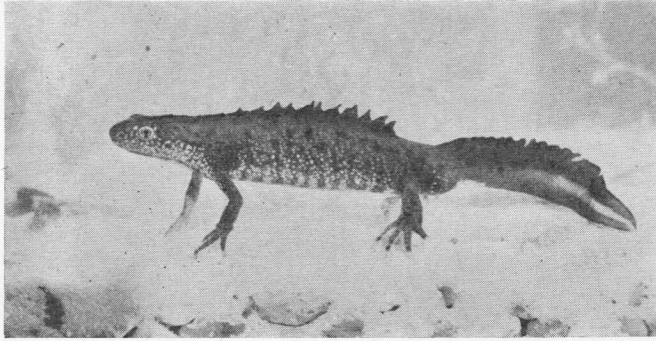
I am certainly no expert and don't pretend to be, but I have kept all sorts of creatures very happily, with little equipment, and various newts have been among the family.

Newts are particularly suitable for children to watch for the simple reasons that they are large enough to be seen easily, they are lively, and what is most important, they breed happily in the class-



Alpine Newts (male, upper right)

[Photo: Walter Murray]



Great Crested Newt

(Photo : Walter Murray)

room aquarium. You can, if you are lucky, go and catch your newts yourself, or, ideally, take an expedition to catch them. In any case, you get your newts and the problem is to make them happy and comfortable.

We kept our newts in a large disused glass battery (the sort used in old-fashioned country houses) and had three newts to a great deal of pond weed and some mixed inhabitants (including pond snails). No doubt some of the other inhabitants were somewhat unorthodox, and one tragedy occurred when an enthusiastic ponder came in one day and decanted a large water beetle into the tank. The beetle promptly bit one of the newt's front paws and left it minus any fingers. This was indeed a lesson to us, and we were overwhelmed with shame and grief. Luckily the newt was made of sterner stuff, made a splendid recovery and grew new stumpy fingers. This was a startling and remarkable happening, and, although the new fingers were never quite as good as the old ones, we were inordinately proud of them and never ceased writing the matter up and boasting about our newt.

We did feed our newts, but by no means every day, and then more for the pleasure of the job than of necessity. The newts seem able to make a very good living for themselves, particularly if you have a set of children who love fishing in the garden pool and dumping in fresh oddments every week. As I say, this may not be the correct method of keeping newts but it works. One thing we learnt to try and keep out of the tank and that was the hydra. Our hydra family just turned up, as most of the other inhabitants did, and multiplied exceedingly. Then one day we found them clinging to the newts' legs and it was obvious that they made them uncomfortable. It is an almost impossible job to de-hydra a newt, but we managed, cleaned out the tank and started afresh, and did our best to keep hydrae in a separate aquarium.

It is certainly best to arrange for a tank full of newts to be taken home in the school holidays, because it is never certain that enough natural food is available in the aquarium. But it is perfectly safe to leave them for a week, provided the tank is well stocked with pond weed and that the water flea population is really dense.

The courting and egg laying of the newts makes a most fascinating study for children of all ages, and for those who have reached the stage of being able to handle a microscope there is nothing better than the thorough watching of the developing egg and young newt. The newts go through their courtship dances in the tank and the female may be seen laying her eggs and folding the pond weed carefully round them. A few eggs may be carefully extracted and can be viewed day by day (keeping them in separate small containers). As they are transparent the children are able to see the developing embryo, and for those who are at a suitable stage, this study makes a most helpful illustration to their work on the evolution of species. As the baby newt grows, the children can see the gills, gill slits, the eye, the heart and so on, and can watch, finally, the hatching and emerging of the newt tadpole.

It is not advisable to tackle this particular piece of work with children who have not had a certain amount of microscope practice, and care must be taken not to harm the eggs. However even the younger ones may be allowed a peep at the developing creatures, if the teacher prepares the specimens before class time, and all can see a great deal with the naked eye. It is fascinating to watch the little, semi-transparent newts swimming about the tank, and altogether the mortality is not very high, so that there is little danger of fouling the water.

Some people have told me that their newts occasionally get the wanderlust and climb out of the tanks and disappear. I have never had this happen, although it seems perfectly reasonable that

it should on occasions, for newts live very happily in the garden and we often found them in damp places, under bricks and so on. It may be that they tend to wander in the breeding season(as do frogs and toads) particularly if their tank or pond is not plentifully supplied with the sort of food or pond weed they happen to fancy. Naturally, as your baby newts grow up you must either take them back to a field pond or find them good homes. Never keep newts in the least degree of overcrowding or they may take to cannibalism. Some people have the mistaken idea that because newts are air-breathers (this in itself is a fascinating study for the children) it does not matter having them in large numbers in the tank. Certainly they will not suffer from lack of air, but they will suffer from lack of live food and from sheer lack of exercising space. Our tank was by no means the ideal, being really too deep for its surface space, but it did provide plenty of swimming room and our newts were always healthy and bred well, showing that we were providing them with the kind of environment that suited them.

Now do you feel attracted to newts? I haven't told you how beautiful and graceful they are, and what delightful subjects for the children to draw (incidentally they make splendid models for all kinds of design lessons) but I have said enough, I

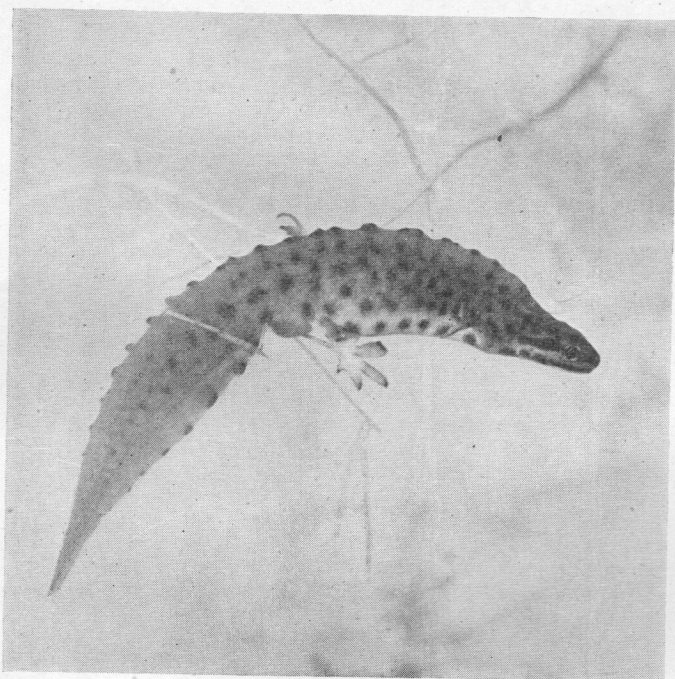
feel sure, for you to say to yourself, quite truly, " Well, if *she* can keep newts without them dying, and she's obviously no expert, then so can I." So now you can go ahead.

" TAIL-UP FISH "

A lady named Mrs. Trimming says she has a Goldfish which has swallowed a large stone which became fixed in its mouth and has now caused the fish to lose its balance and stand on its head in the water. It seems dead, but when touched, it lurches up and seems to be able to eat well.—Press Item.

There's something queer about this fish,
I feel it in my bones ;
Most are content to swallow worms,
But this one guzzles stones
Which, passing on towards his vent,
Upon his head erect him.
The vent's too small, the stone won't pass,
It seems we should dissect him ;
But then alas he would be dead,
No longer going swimming.
Lift up by tail and shake him well,
Our tip to Mrs. Trimming.

" TORCH "



The Smooth Newt.

(Photo : Walter Murray)

Hunting Vivarium Animals in Surinam

By H. A. L. MENNE, Paramaribo (Courtesy of Lacerta, Holland).

THERE has always been a particular charm for me in getting acquainted in a foreign country with the reptiles and amphibians occurring there. Here in Surinam that charm was very pronounced indeed, for this continent is entirely new to me and, as far as the fauna is concerned, there is a very great deal to be enjoyed, not the least in Netherland Guiana.

Although I have not been here for three months yet, I have already had interesting experiences in the field of herpetology. Some of these I now wish to relate. I am still without a vivarium, because such a thing is unknown to the artisans of this country. I must admit that nature study is far behind here. There are very few aquarists and they have no society. Vivariums are not kept here at all. People do keep pets (parrots, monkeys, deer, song birds, etc.), but often they are not well cared for. In a British Indian shop I found a squirrel monkey tied to a chain so short that it could not move. Its suffering was apparent.

Now coming to my subject I think I can do no better than describe an excursion I made in the company of an Indian to find vivarium stock for "Lacerta," the Netherland society of amateur herpetologists and vivarium keepers, of which I am a member.

On my bicycle I went about $4\frac{3}{4}$ miles from Paramaribo. Marius, the Indian, lived there in a wooden hut built on piles on the bank of a creek in which caymans were frequently observed. We first went along the creek until we reached the forest where the narrow trail soon ended so that we could advance only by cutting our way through the vegetation.

Near the hut I saw countless lizards, *Ameiva ameiva*, small and large, some bright green, others a greenish grey. Cute small striped lizards *Cnemidophorus lemniscatus*, darted about everywhere. When they sat still, they waved their front paws.

Now Marius halted at the water's edge, held his nose and produced a muffled sound, imitating exactly the noise of baby caymans. On hearing this sound other caymans are supposed to raise their

heads immediately out of the water. We did however not see anything. So Marius said "They are not here today."

Suddenly we heard a rustling in the bushes near us. "A large leguan," said the Indian, "watch him and I'll make a noose." I kept as still as a mouse and the reptile remained motionless. When Marius returned with a long thin stick to which a noose was attached, he pushed it carefully through the foliage in the direction of the leguan and whistled softly. "Then he will look up." The noose was now very close to the raised head. But suddenly the animal threw itself into the creek. We saw nothing anymore until a moment later it scrambled up the opposite bank and disappeared into the dense forest.

We then reached a shady tree of which the trunk and branch were covered with large thorns. "A poison tree," said Marius, "when a leguan is so unfortunate as to swallow one leaf, it drops dead into the water. Look out (and he cut with his knife into the trunk from which a white fluid came squirting vigorously), if you get this into your eyes, you are blind, but Marius has a secret remedy to cure you." This tree is called *Hura crepitans*.

Thereupon we came to a pool where young caymans could be seen every day, but they seemed to be in hiding, for we could not notice any, though we did see a sapacara, a lizard (*Tupinambis teguixin* L.) which is prone to steal chickens (and is caught for its skin. Ed.).

I tried to secure some Ameivas, but they slipped through the noose. Marius did better and we came home with three. He led me to some boulders and on turning them over found some gigantic toads, *Bufo marinus* L.

"These toads eat fire," said Marius. So we took them to an abandoned shack and Marius made a fire. In front of the toads he beat a burning piece of wood against the floor so that the sparks flew about their heads. They hopped away. One put its foot upon a burning ember and quickly raised its leg. The Indian then carefully placed bits of fire in

front of the toads and made them move. But the Bufos did not budge. "They are shy" commented Marius, "They have to be alone."

I told Marius I was becoming hungry and thirsty. So we followed a long sandy path at the end of which he knew a British Indian shop. All along the path we saw coffee mothers. These bear that name

because they are used as shade trees in coffee plantations. I saw gaily coloured birds, including a large kind of oriole, black with a yellow tail, and also enormous caterpillars. The shop had a refrigerator and ice cold beer. I ordered a tin of salmon to be open and bought bananas and oranges

So long!

DOES YOUR THERMOMETER TELL THE TRUTH?

Quite recently it was necessary for me to obtain a couple of spare thermometers; one I gave to a friend and the other I kept for myself. These thermometers were of the pre-war German type, spirit filled and quite a neat job.

A few day's ago my friend mentioned to me that his instrument was reading 6 degrees high at 75 degrees Fah.

As I had experienced quite a bit of misfortune through other breakdowns I decided to pop home during the lunch break and check mine up. To my

intense surprise it was reading 63 degrees F.

I grabbed it out of the tank, placed it in my pocket and took it along to the works to have it checked. I was fortunate in the fact that it read low to the extent of 4 degrees at 60 degrees F.

What with the coal shortage, electricity cuts, and a sudden fall in the temperature, your thermometer is a very important part of your equipment.

Have a check up on your instruments.

TOM WYBER

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CORYDORAS PALEATUS
BARBUS STOLICZKANUS
HEMIGRAMMUS UNILINEATUS
MOENKHAUSIA PITTIERI
PANCHAX CHAPERI
RIVULUS HARTII
NANNOSTOMUS ANOMALUS

Each month we hope to offer fresh
varieties.

EDITORIAL—Continued

interest like the Guppy, though all will, we hope, be readable by everyone.

May we draw special attention to the hints given on page 343, by Mr. Cluse for the conservation of heat. In the present serious fuel situation it is the duty of every aquarist to see that not a unit of electricity, not a gill of oil, produces heat that will be uselessly dissipated.

OBITUARY

AS we go to press we learn with the most profound regret of the death of one of our oldest friends and most valued contributors—Miss Winifred Baker.

Accomplished both as writer and artist, this gentle lady wrote articles for this journal from its early days, and her richly human style, often deeply touching, won her many admirers. Although we never met her, we could always picture her vividly through her writings—a kindly, old-world person in her quiet garden, lavishing her care upon her aged mother and invalid sister, and upon her beloved pets—surprising pets they always seemed, too. For she studied reptiles, in particular, tortoises of all kinds, and loved them deeply. This love she infused into her style, so that we came to love them too. How well we knew the capricious Beeks, the matronly Chequers, and the rest! But there was never an excess of sentimentality, no undue anthropomorphism. She had an unrivalled knowledge of these creatures, could live *with* them, and see as they saw, and she had the ability to make us see too, just a glimpse, like the raising of a curtain.

In her last article, which appeared in our December issue, she asked for information about other tortoises that had survived the cataclysm. The small response must have saddened her, for she was always delighted to find someone who shared her interest.

Winifred Baker suffered many difficulties in recent years, like so many others, and not long ago she lost the sister for whom she had cared so long. Now she, too, is gone. We do not yet know details of her passing, but from her letters we can guess that recent events hastened the end. It is typical that, at the last, she made provision for the future well-being of Beeks & Co. They will miss her. So will we.

THE AQUARIST

will be sent post free for one year to any address for 13/6d. Half-yearly 6/9d.

All communications for the Editor should be addressed: "The Editor, *The Aquarist*, The Buckley Press Ltd., The Butts, Half Acre, Brentford, Middx." In every case the name and address of the writer must be given.

The Editor welcomes the opportunity of considering original contributions on all branches of the hobby and its allied interests; authentic breeding records, personal experiences and photographs. Contributions should be typed or clearly written on one side of the paper only. MSS. or prints unaccompanied by a stamped, addressed envelope cannot be returned, and no responsibility is accepted by contributions submitted. Correspondence with intending contributors is welcomed.

QUERIES

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Specimens should be sent direct to Mr. Cotton, with full particulars of circumstances, and a fee of 2s. 6d.

It is important that the following method of packing fish be adopted:—wrap fish in clean wet cloth; then wrap in greaseproof or wax paper, and pack around with cotton wool in tin box. Dispatch as soon as possible after death.

The Practical Value of **FROGS and TOADS**

By _____ CLIFFORD BARNET

BOTH frogs and toads are considered to be of great use in the aquatic region of the garden, and so they are ; but they both have points in their habits which cannot be said to be useful, but rather detrimental. Let us examine the good and evil in the characters of each of them.

THE FROG

First, the frog is born in a mass of jelly, hatched from eggs laid therein, which jelly forms the first food of the young frog—then in the immature form of the tadpole—the scavenger of rivers, ditches, and drains (for it eats any decaying matter, even feasting on dead bodies of animals and birds). Then the tadpoles, changing to young frogs, become capable of living both in water and on land, and these youngsters consume a variety of noxious gnats, flies, worms, etc. The adult frog enlarges this diet and includes in it many a garden and water

pest that would have plagued the garden, pond, and fish keeper.

So far, then, the frog is a good guest ; and if you plant star-wort (in particular) in your pond the frogs will spawn upon the plants, and the eggs—and the subsequent tadpoles—will form good food for your fish ! There is no doubt that the young frog is very welcome in the garden, and wherever fish are kept. Unfortunately, the young frogs are eaten in large quantities by snakes, herons, ducks, otters, and large pike.

As winter approaches, the frogs migrate to the nearest expanse of water—stream or pond—in search of a suitable place in which to hibernate. This may be in the mud of a partially dried-up pond, or in a hole that can be turned into a warm, moist sleeping-place. Here they spend the winter ; and here their usefulness may be deemed to end.



A Frog with her tadpoles

Early in February, the frogs awake and come out of their retreats ; and now they become a menace and a danger to the fish-keeper especially. They migrate back to the place of their births—or a similar locality—for the purposes of mating and spawning. At this season there is little or no food for them, and they are hungry after their long fast, and they commence to appropriate the food given to the gold fish, to the great detriment of the latter and to the wrathful chagrin of the aquarist ! So hungry do the frogs become that they attack the fish, and bite their tails and fins in the hope that the moving objects in the water may prove good to eat !

Another danger to be guarded against is that the male frogs at mating time will clasp fish as they do the female frogs, and cling on long enough to cause the exhaustion and death of the fish. It behoves the fish-keeper to keep strict watch and ward over his treasures throughout February and March. After that period, the danger will disappear by the natural death of the frogs !

THE TOAD

This ugly creature may be regarded as being different from the frog in many respects. It eats more and has a wider selection of food items, and it disposes of an enormous number of beetles, large flies, worms, maggots, wireworms, grubs of many kinds, greenfly, wasps, bees, earwigs, caterpillars, weevils, slugs—in fact, its tongue snaps at anything that is moving on land or in water ; and it is *always* hungry ! This sounds in favour of the toad being a very useful friend in keeping both the land and water free of unwanted living creatures ! One good point about the toad is that when it has selected a site for what may be considered its "home," it remains there, unless compelled to go away ; and toads live for many years. Therefore you may rely upon the toad, having chosen your garden for his residence, to keep your garden and the pools or stream therein, free from disaster in the shape of hordes of destructive pests. Should toads select a pool in your garden as a favourite breeding resort, you will be fortunate in having plenty of food for your fish—in the way of eggs and tadpoles and very young toads—during the late spring and early summer months. And once your "piece of water" becomes the recognised mating-tryst for the toads of your immediate neighbourhood, the above will be an annual occurrence. But the toad is more



Toad in the Hole

(Photo: Walter Murray)

particular in this respect than the frog. The *individual* frogs will mate and spawn in the first or nearest water they arrive at, whatever it may be ; but the toads congregate in large numbers at one particular waterside each year, apparently selecting this stretch of water as the only one suited to the intended purpose !

The foregoing establishes the toad as a desirable creature, despite its ugliness, which ugliness can be put into the balance on the other side, for few people are enamoured of toads at close quarters ! The toad, too, is *poisonous*, not as regards humans, but affecting the welfare of domestic animals and birds that may be tempted to interfere with the toad, as a kitten or puppy might do in playful mood. An animal or bird that bites or pecks a toad will receive a shock from the poison that comes from its body, and will take great care not to repeat the bite or peck. The blood of a toad, too, is considered to be poisonous. Should the attacking animal or bird irritate the toad too much, it will emit a deadly poison from glands around its head that would cause serious illness or death to the attacker. Thus toads can be a danger to domestic pets—(except snakes, which will eat them, without suffering harm !)—and might not be considered desirable in a garden, however otherwise useful !

But there is a sad affliction that is very liable to overtake the toad, and which may excite our pity and tolerance ; and that consists of a parasite in the form of a fly which lays eggs in the carcase of the toad. These eggs duly hatch out maggots which

(Continued on page 360)

CAROLINE

A CHARACTERISTIC ARTICLE
by the late

WINIFRED BAKER

CAROLINE came to live with me about five years ago. She travelled with several cousins and relations all the way from Carolina, U.S.A. There was no announcement of her arrival in any "Court circular" and her coming did not make any appreciable stir.

She is beautiful, with large brown eyes and her expression is alert and intelligent. At first she was shy and unresponsive, but now we are the best of friends.

She did not like our climate at all and almost the first thing she did on arrival was to sneeze. All the first winter she sat about the hearth and sneezed and sneezed, until I feared she would die of consumption.

Caroline, however, has great recuperative powers. She recovered from her sneezing and adjusted herself to the vagaries of our climate.

When the warm weather came she sat out on some "leads" at the back of my London flat and basked in the sunshine, cool though it seemed to her after the semi-tropical summers of her native land.

One day calamity overtook her—too venturesome she went close to the edge of the "leads" and fell—two storeys to the yard below! I rushed to her rescue, expecting to find her crushed and probably dead. Not a bit of it! She had torn her leg and it bled profusely, but I picked her up and she merely—*swore*. Alas! the sad truth must be told—Caroline swears with unbecoming frequency.

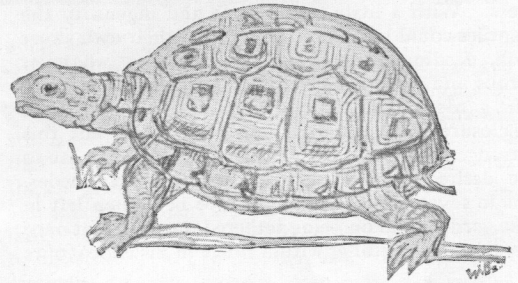
She was soon under medical supervision and had "her leg in a sling" for rather a long time. But in

due course she recovered completely and now there is no trace of her one-time serious accident.

Caroline loves bathing and will sit for hours in her bath. She is addicted to eating her meat *raw*—rather reprehensible conduct in a charming young lady. She is very partial to bananas, but her favourite food of all is—SLUGS.

You won't believe that? Well, the truth must be told—Caroline is a pretty "Box" tortoise and Box tortoises *do* love slugs and they "swear" too. If approached suddenly they emit a sharp hissing noise which I am sure is their way of saying: "d—n you, go away and leave me alone."

All the same, I love dear Caroline and no money would induce me ever to part with her.



A Sketch by Miss Baker of the Carolina Box Tortoise

WINIFRED BAKER AS I KNEW HER

By OWEN SHIVERS

THE saddest of tasks that can befall one is to write of episodes in the life of a friend now lost. So many memories come to mind, that one is hard put to condense into a few words a friendship of long standing.

First, let me say that the chief thing in Miss Baker's life was pets, and the cheer that they gave to her during dark days was beyond estimation. I want you to picture a tall, white-haired, stately lady, about 60 years of age, with the heart of a schoolgirl where her pets were concerned.

When I first knew her, Miss Baker lived with her mother (now over 90 years of age) and her sister now, alas, passed on. Miss Baker's mother would not allow the pet tortoises in the house; but like most elderly people was in the habit of retiring to her room during the afternoon. This was the time when the tortoises were carried into the sitting-room to bask in the heat of the fire. One afternoon, lunch finished, Mrs. Baker duly ascended the stairs for her rest, and the tortoises were brought in. After a short time Mrs. Baker's step was heard on the stairs. It needed quick thinking on the part of Miss Baker and her sister to stave off catastrophe! The tortoises must not be found in the house. Quick as a flash a towel was procured, the pets

wrapped up, and while Miss Baker's sister talked to their mother on the stairs, Winifred Baker safely got the tortoises outside.

I well remember a visit to them when the tortoises were polished up, their places spick and span, and, to use Miss Baker's own words, everything done except to put ribbons on their necks. We fed them on plums and dandelion leaves until one would have thought they might burst; but no, Granpop, the big old fellow, just cocked his head to one side, winked his eye, as if to say, "Well, what are we waiting for?"

The pleasure of this lady to have someone who understood the type of pets that she liked, and who could follow her talk on various topics concerning them, was unbounded, and, I fear, after such visits, she would dwell more on her semi-loneliness, when her friends had gone. Only the most hardened, or perhaps pet-ignorant people, could fail to be interested in her discourse on tortoises, chameleons or lizards, and I have many times been led into realms of jungle fantasy by listening to her learned words on the creatures she loved so much.

The passing of Miss Baker has left a large gap in the association of people interested in her type of pets.

A GARDEN REPTILIARY

By _____ T. BROWN

ALTHOUGH a fish enthusiast, I have always taken a keen interest in reptiles and batrachians and have kept them with varying degrees of success in vivaria and converted aquaria, improvised to give some kind of natural surroundings. The one drawback to all these cages, etc., is that one has to feed the inmates artificially, and hunt food to maintain them in health and vigour, as most of these creatures will only take life food.

As this is a serious handicap in keeping many of these interesting subjects when one has only limited time to devote to them, I have always thought that anyone with a completely walled or closed-in garden was missing a great treat by not keeping a few of these pets. With a little contrivance and ingenuity the reptiles could be allowed to roam at their own sweet will, feeding themselves by capturing whatever grubs and insects they require, with great benefit to the garden. Our Edible Frogs did well in a small enclosure with a sunken tub for a pool, but this arrangement was rather unsightly and left a lot to be desired; while our pet tortoise, Archimedes, made several raids on the lettuce bed when left in the garden, and on being tethered proceeded at once to dig up everything within range in his endeavours

to break loose.

This set me pondering on ways and means of keeping our pets in some place where they might have a certain amount of freedom. There was in a corner of the garden, facing south, a spot about 12 ft. long by 6 ft. wide, where the fences met at right angles. As I already had a small pond nearby, there was not very much room for anything else but a Mock Orange bush which hung in cascades over the remainder of the space, and it always had a somewhat bare appearance in comparison with the rest of the garden. Gazing at it one day I suddenly conceived the idea of turning it into an open-air enclosure for tortoises, terrapins and edible frogs. I accordingly unearthed some $\frac{1}{2}$ in. mesh wire netting I had in the tool shed and found there was just enough for my purpose. I ran four yards along the side fence, burying a foot into the ground, leaving a wire netting height of 3 ft. This was tacked on to the fence. I next purchased eight metal rods about 5 ft. long, and a hole was drilled through each of these about 1 inch from the top, to allow a length of binding wire to run through the rods and be drawn taut. This, of course, afforded support for the remainder of the wire netting. The



The Edible Frog
(*Rana esculenta L.*)

(Photo : W. S. Pitt)

The Grass Snake
(*Natrix n. natrix* L.)



(Photo : Walter Murray)

rods were then driven into the earth at regular intervals across the border and the front side, the last one being close up to the rear fence. Two of the rods on the front side were placed about two feet apart to mark the doorway to the enclosure, and I left this problem to solve itself later. My main consideration was to finish running the netting round.

I should have mentioned that the rods were $\frac{1}{2}$ in. round—quite heavy enough to give a good support without being unsightly—and these were driven two feet into the ground, leaving 3 feet above. They were coated with black bitumastic to prevent corrosion. Binding wire was then run round taut and secured to the rear fence with staples.

The next job was to dig a narrow trench, along the side and front of the measured enclosure, to a depth of 1 ft. to take the wire netting, in direct line with the metal rods. Two lengths of netting were then cut off the roll—a piece 6 ft. long for the side and another piece 12 ft. long for the front and doorway. This netting was given a coat of black bitumastic, allowed to dry and then placed in position, being sunk to the depth of the trench. Next, I fastened the netting to the metal rods with thin binding wire, then filled in the trench, firming the soil down as I went along. All that now remained to be done was to bind the top edge of the netting to the wire running through the rods, thus making a neat rigid job.

The final problem was the door to the enclosure, and this was overcome in the following manner. I considered that a door with the bottom practically flush with ground level would be an inducement for the inmates to escape, and believe me they are

adept at finding any loopholes.

I must here stress that you should always take extreme precautions against any reptiles escaping, as this may have serious consequences. There are still a surprising number of people who are unaware that all the British reptiles and batrachians (with the exception of the Adder) are perfectly harmless, and should any nervous person come in close proximity with some of your escaped pets, results might be disastrous; so I cannot emphasise this point too strongly—prevent escapes and have no trouble with neighbours.

Two posts 3 in. \times 2 in. thick and about 4 ft. 6 in. long were creosoted and driven into the ground against the two rods I have already mentioned as being 2 ft. apart. The posts were driven in flush with the tops of the rods, then each rod was secured to the wooden posts with large staples, taking care to see that the posts were equal distance apart top and bottom. A cross piece was then fixed between the upright posts, 6 ins. from ground level, to strengthen the gate posts, and form the threshold for the doorway. The soil was dug out as before below this cross-bar, and a strip of wire netting fixed on so as to close in the lower portion. The enclosure was now complete with the exception of the door itself, which would be a wooden frame $2\frac{1}{2}$ ft. \times 2 ft., wire netting tacked on with small fixing staples, then a thin slat nailed over the edges of the netting giving a neat finish, and preventing raw edges of wire from doing any damage to the inmates.

I considered that an ordinary hinged door would be somewhat cumbersome, also interfering with free passage on the garden path. Therefore, slats were

tacked on to the insides of the posts and bottom edge, allowing about $\frac{1}{2}$ in. play for the door to slide up and down. A hand-grip was screwed to the top edge of the door. We could then simply lift up the door, stepping over the threshold into the reptiliary.

Next came the furnishing of the interior. A small pool was the first consideration, and although we might have enhanced the effect by constructing an informal rock pool, I decided on the simpler method of a shallow, rectangular pool, 3 ft. \times 4 ft. with 9 in. to 1 ft. depth of water, at one side of the doorway. The soil was excavated to a depth of 18 inches, the earth bottom well rammed down, then about 3 inches of brick rubble pounded in with a heavy mallet. A 3 inch concrete base was then laid, mixing 1 part cement to 3 parts sand and gravel. This left roughly a depth of 12 inches from soil surface.

The concrete having been left a few days to harden, I then proceeded to build the pond walls, which consisted of three courses of bricks, using one part cement to three parts sieved builders sand as the mortar, and soaking the bricks before use.

After the brick walls were complete and left to harden (which brought us up to soil level) I ran a capping of cement mortar on the brick heads to give a neat finish to the pool.

I now thought of an idea for easy access to the pool for the batrachians and water-loving amphibians. A row of bricks was cemented into one end of the pond, then a layer of cement sloped off, making a shelving edge. This suited the frogs admirably, who could leave or enter easily at this end.

While the pool was soaking, I gave attention to the surrounding land. As there was a heap of soil

from the excavation, this came in very handy to level up round the pond. A slight slope was made to the rear fence to form a bank where the inmates could bask in the sun within easy reach of the water, and a line of crazy-paving was laid along one side of the pond, forming a small path to the doorway, thus preventing anyone stepping on to plants, or uneven rocks, etc.

Where the soil was banked up to the rear fence, I embedded large stones, forming a natural-looking bank which was planted with saxifrage, and other alpine plants, while at the back, towards the Mock Orange bush, a clump of Hart's-tongue fern together with foxgloves added further to the natural effect and afforded cover for the inmates. Two old drain pipes were half buried in the bank side wherein the frogs could hibernate, and along the remaining edge of the pond was planted some *Iris siberica* and other water plants to help break up the hard outline of the pool. As this small pond will occasionally flood and the surplus water drain to the surrounding soil, the Irises and moisture loving plants should do well.

Later, when imports of livestock are allowed, we shall add some European pond terrapins and several other of the larger batrachians and reptiles. Archimedes, the tortoise, seems quite happy in his new surroundings, while the frogs seem to favour the base of the bush, where they capture grubs falling from the branches.

Now this, of course, is very nice for our larger pets which are unable to escape through small mesh wire netting, but something had to be improvised for lizards and tree-frogs who can escape through the smallest aperture. Therefore, in a future article I will describe how an ideal vivarium was constructed for these smaller pets from a disused cucumber frame.

PROPOSED REPTILE SOCIETY FOR BRITAIN

AT an informal meeting held at the British Museum (Natural History) on the 10th April, 1947 it was decided to attempt the formation of a "British Herpetological Society." The society would be formed with a view to increasing our present knowledge and promoting interest in various aspects of herpetology which, it is felt, have been somewhat neglected, its main objects being:—

- (1) To encourage the study of the ecology, life-histories, habits and distribution of the Amphibia and Reptiles, and of the British species in particular.
- (2) To publish annually a report on the work of the society, and to review briefly advances in knowledge, particularly in the field of ecology.
- (3) To hold meetings, when possible, for the

reading of papers and the discussion of problems relating to herpetology.

(4) To record and compile information on the various aspects of the subject covered by the society.

Although such a society would, of necessity, be concerned mainly with the study of British species, foreign membership would be most welcome. It is suggested that the annual subscription to the society, including a free copy of the report, should be ten shillings.

Those interested in the formation of this society are requested to send in their names to Capt. J. D. Romer, 96, Mortlake Road, KEW, Surrey. If the response is sufficiently large, further steps will be taken to inaugurate the society and individuals will be informed accordingly.

Notes on

THE MONITORS

by _____ J. D. ROMER, F.Z.S.

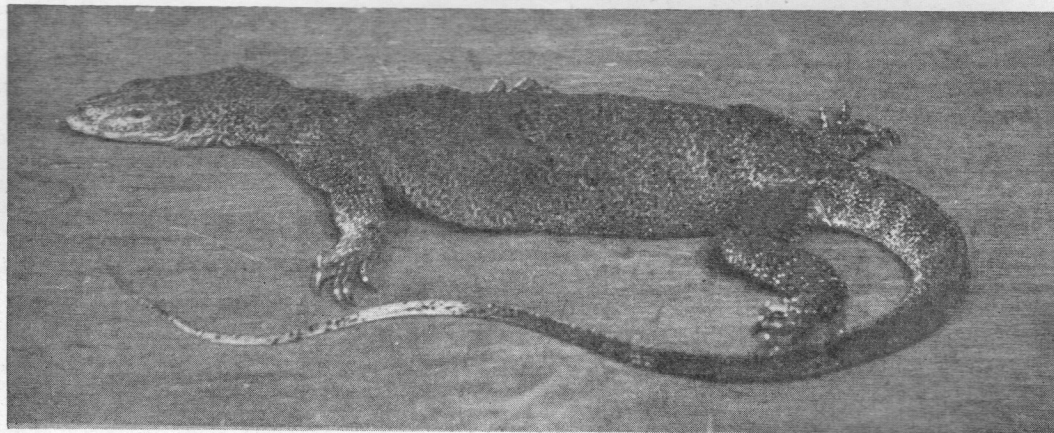
THERE is no doubt that in many respects the war has had its compensations, and for the writer, not least of these was the opportunity to spend several years in India. Many a naturalist will now be familiar with animals which previously he encountered only in the world of literature, or in a museum or zoological gardens; for this reason, therefore, many readers of the *Aquarist* may not now be unfamiliar with this interesting family of lizards, namely, the *Varanidae*.

These large reptiles, commonly known as monitors include the world's largest living lizards. There is but a single genus (*Varanus*) comprised of some thirty species. In general appearance they are typically lizard-like, with comparatively long necks and long, gradually tapering tails, the latter frequently laterally depressed, though not fragile as with most lizards. The limbs are powerful and the fingers and toes provided with strong claws. There is a long, forked, retractile tongue, similar to that of a serpent, instead of the more typical flat, notched lizard's tongue. Coloration varies a good deal according to the species and age of the individual, but is often of a brown, yellow, grey or blackish shade, or a combination of two of these, sometimes

with the addition of yellow spots or ocelli.

Varanus is confined to the old-world where the species are widely distributed in Africa, Southern Asia and Australia, but not in Madagascar. The common species in Africa is *V. niloticus* which reaches a length of over five feet, whilst its counterpart in India, Ceylon, Assam and the greater part of Burma is *V. monitor*, the latter usually attaining a length of from three to five feet. In the year 1912 an outstanding zoological discovery was made when a species of giant monitor, now known as the Komodo Dragon, *V. komodoensis*, was found to be inhabiting certain islands, notably Komodo, in the Dutch East Indies. These huge, dragon-like reptiles grow to the enormous size of twelve feet in length and one cannot help being amazed that such an animal remained so long unknown to science. An extremely interesting and well illustrated account by Lady Broughton of Lord Moxme's expedition to Komodo to collect specimens for the London Zoo, appeared in the National Geographic Magazine for September, 1936.

When alarmed, monitors are able to move exceedingly fast over land, and many species are also very much at home in the water; furthermore, most of



Female Indian Monitor (*Varanus monitor*)

them are expert climbers and will readily take to the trees when pursued or in search of food. In their native haunts these lizards are extremely difficult to catch by hand and on more than one occasion I have given chase to one of them, to finish up out of breath—but with no monitor! Their food is very varied and is said to include mammals, birds, reptiles, amphibians, fishes and insects, as well as the eggs of birds and reptiles. It is likely, however, that the choice of food varies somewhat according to the species, as well as depending upon the type of habitat in which it is found. They are also known to eat carrion.

Monitors usually live well in captivity and become quite tame, though at present live specimens are not being imported into this country, other than for exhibition in zoological gardens. Feeding does not usually present much difficulty, but it is important that cages in which monitors are kept are as roomy as possible, and provided with branches, rocks, etc in order to facilitate exercise, as confinement in a small cage, and the consequent inactivity, may cause the creatures to become extremely fat and

result in fusion of the vertebrae.

The accompanying photograph shows a gravid female of the Common Indian Monitor, *V. monitor* which measured a total length of 3 ft. 5¼ ins., of which 2 ft. ½ in. was accounted for by the tail. This specimen was kept by the writer in Bombay for a few days, during which time five eggs were laid. These were deposited separately, being oval, pure white in colour, and soft-shelled. The measurements of one of these eggs was 4.2 cms. long × 2.7 cms. wide, with little variation in size between them. A further seven eggs could be distinctly felt in a row on each side of the belly, thus making at least twelve in all. The specimen which laid these eggs was particularly docile in disposition and never attempted to bite, or even struggle very much, when handled. Having nowhere else to accommodate the animal for a few days, it was given the freedom of my bedroom—however unorthodox this may have been. The amusing side of the story however, is that the animal crawled inside one of the drawers of the dressing-table in order to deposit two of its eggs amongst my underwear!

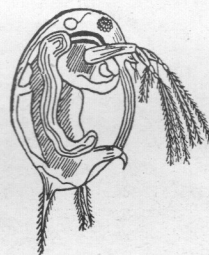
THE DAPHNIA HUNT (Continued from page 69)

through their agency the females lay a limited number of specially fertilised eggs. It was formerly thought that these were to resist the cold of winter when, it was stated, the species would otherwise have died out.

Recent investigations conducted by myself, however, have inclined me to the opposite opinion, that these eggs are drought resisting, and are usually laid to carry the species over the heat of summer, when ponds tend to dry up completely. For many winters there was no appreciable decline in the *Daphnia* population of many ponds in my native Berkshire, even when I had to break the ice to obtain the creatures, yet, though the same ponds did occasionally dry up completely in summer, the species always reasserted itself in the autumn.

The recent winter, however, was different. Some of the ponds were frozen absolutely solid for months, and, of course, the *Daphnia* population did suffer. At the time of writing, *Daphnia* supplies in most parts of the country are not up to par. It will be interesting to see if the species recoups as quickly from a dry summer. My guess is that it won't!

So, in case you have to search well and truly for your *Daphnia* this summer, don't forget to choose water that is not fast-flowing, has no superabundance of *Daphnia*'s enemies, and contains plenty of infusoria.



Daphnia

And do select a fine day for your fishes' sakes as well as for your own. *Daphnia* are attracted to the surface in their thousands by bright sunlight.

Should you find the supply so short that you are tempted to try to breed *Daphnia* at home, there is no need to reproduce faithfully the creatures' natural habitat. Indeed, running water is by far the best for them under these conditions, as each individual consumes a surprisingly large quantity of oxygen for its size. Otherwise there is no reason why you should not succeed in maintaining a flourishing culture if you provide infusoria, infusoria, and more infusoria.

A GARDEN REPTILIARY

By _____ T. BROWN

(Continued from the previous issue).

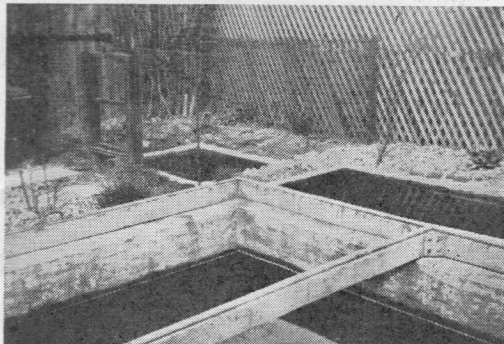
At one time we almost gave up the idea of keeping lizards, tree-frogs, salamanders and small toads outside, as without a brick enclosure the case seemed hopeless, and as most of our garden was taken up by various ponds, I did not wish to take the remaining useful rose border for this purpose, but we did wish to have our collection of small pets outside for the summer at least, if possible.

Previously, I had constructed a spare garden frame out of some second-hand $1\frac{1}{4}$ in. flooring deals, with a spare window-frame to fit; this measured 3 ft. 6 ins. \times 2 ft. 9 ins., 24 ins. deep at the back and 18 ins. deep at the front, and was intended for a cucumber frame. However, my wife suggested that we might forego some cucumbers and give our pets the benefit of the frame instead. I was only too glad to fall in with the idea, as one becomes weary of looking for grubs and prowling around at night with a torch, thus incurring suspicious looks from neighbours, who think you either (a) mad, (b) a cat burglar, or (c) a foreign spy!

Of course, the glass lights of the frame would keep our pets cosy in winter when hibernating, but would suffocate them in summer; we could not allow the frame top to be open otherwise they would escape. Accordingly, I measured the top of the frame, and as I had one or two deals left over from the frame job, $1\frac{1}{4}$ in. thick, I had these ripped down on a circular saw to give me sufficient battens $1\frac{1}{4}$ in. square; these were cut with $\frac{1}{2}$ lap joints and screwed together to form a wooden frame to fit the top of the cucumber frame.

We next purchased a piece of $\frac{1}{4}$ in. square mesh wire, fixed this to the frame, tacking some slats over the wire on the battens to give a neat finish. This frame slid on the runners in the same way as the window light, so that the glass could be removed when desired and the wire frame substituted.

We thus solved the problem of escape of the inmates from the top of the frame; our next job was to make sure there were no outlets at the bottom. As the frame was made of deal boards, it was useless to allow the base to sink into the soil encouraging rot and a certain get-away at some



Behind the ponds in the foreground is seen here the enclosure for large reptiles, described last month.

future date; so we made a false base with a single row of bricks placed end to end, directly under the base of the deal boards, but flush with the outside measurement of the frame. There were now small spaces between some of the brick spaces and the wooden base; these were rendered harmless, by cutting some strips of sheet zinc about 6 ins. wide, punching a few screw holes along one edge, and then inserting these into the earth, thus overlapping the brick and wooden base entirely. These were fixed to the frame with small screws, and thus prevented the frame being shifted from the brick base.

We now gave the bottom board of the frame a good coat of creosote inside and out, finished the inside with two coats of flat white lead paint, while the outside received a slate coloured priming and was finished with a coat of chocolate brown paint when the first coat was dry. It really looked a very neat job when finished, and all that remained was to leave it open to the weather for a week or two, allowing fumes from the creosote to escape; a wash or two of rain removed any remaining oily film. This is important as new creosote is deadly to small creatures.



The converted cucumber-frame. Wire top in position and glass cover thrown back.

When the frame was weathered we filled the base with good leaf-mould and levelled off. At the back and deepest portion of the frame some flat sand stones were erected to about 1 ft. high, while a large flower-pot (9 or 10 ins.) was half submerged in the centre, to grow a large fern or other plant for shade. An old pipe, about $4\frac{1}{2}$ in. diameter and 18 inches long was then half-buried in the soil to give shelter to the inmates when hibernating.

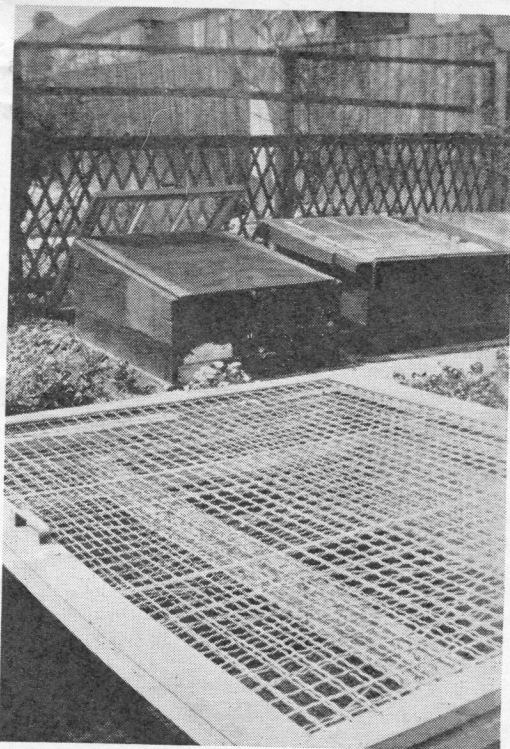
Next, a small zinc trough 1 in. deep, 18 in. long and 6 in. broad was purchased and given a good coat of bitumastic black, as zinc has a harmful action on water unless coated before use with some preparation such as the above. This trough was placed at the front of the frame, sinking it slightly into the soil to allow the water-loving creatures easy access for drinking and bathing. When the glass cover is just slightly eased back, leaving about $\frac{1}{8}$ in. open, the rain runs over the glass edge, splashes into the trough, thus keeping it always sweet and clean.

Later on we planted saxifrage together with other small rock plants and mosses, placing an old tree branch across to give further natural effect. Of course, this furnishing is purely a matter of individual taste, and can be altered to suit various occupants; for instance, when keeping lizards, a small bush of heather might be planted in the flower-pot, leaf-mould being replaced with sand to give a dry effect. For tree-frogs, toads and salamanders a leaf-mould floor is best, with a fern planted to give shade and the more humid atmosphere which these creatures desire.

Should any reader care to copy this idea, I am

sure they would not regret the small trouble and outlay involved, as all these creatures thrive better when living in more natural conditions.

In conclusion—a word of warning. Should your collection include the little African green tree-frog, I should advise you to place the glass cover or some sacking over the frame at night whenever heavy showers of rain are likely; otherwise your nearby friends will not appreciate the chorus set up by your little band of musicians during the night, not to mention the trouble of getting out of bed to stop the noise, for sleep is impossible when tree-frogs commence to sing in the vicinity; however, this is easily prevented by the precaution I mention. They are well worth this little extra care, being the most delightful of all small batrachians. Once you have had a few of these little acrobats you will never be long without them.

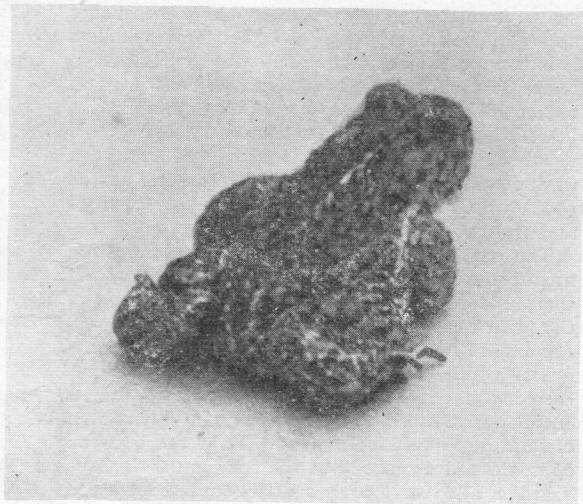


Another view of the small reptiliary. Note the cover on the fish breeding ponds in the foreground—for protection against predators.

(Photos: T. Brown)

Among the Natterjack Toads

by ERIC HARDY
F.Z.S.



WHEN my wife and I visited the sand dunes at Ainsdale, near Southport, in the first week of November, the yearling natterjack toads, measuring about an inch in length, but with the yellow line distinctive down the centre of the back, were already crawling over the dry dunes far from their breeding haunts, on their way to winter hibernation quarters amongst the vegetation, and particularly in the loose sand in the pinewoods. The winter, so severe in other parts of Lancashire, was sometimes a little milder here on the dunes, but the famous colony of these uncommon toads was subject to such severe spells of frost that even in the following summer we were still picking up the dead bodies of fieldfares, redwings and other birds amongst the marram grasses and the bushes of sea-buckthorn. By the beginning of April, however, the adult toads were all out of hibernation and back at the shallow breeding pools, and although a little less numerous, at night the volume of their croaking rose to the usual strength, audible a mile away. In the last week of April the first thin strings of spawn had hatched into pin-head black spots of wriggly young tadpoles, and when I was there again early in June the tadpoles were big, but not yet showing their limbs, and the adult toads were still around the borders of the pools. This colony of breeding natterjack toads at Ainsdale is, of course, the largest in the country, and numbers several hundred individuals, but it is only a relic of its former strength when, last century, the toads bred in vast numbers

over the West Lancashire dunes from Southport to Bootle. There are smaller colonies on the north-west coast from the Solway to the Conway. In the Dee mouth a few live on the West Kirby and the Hoylake lifeboat slip, others on the marsh behind Leasowe lighthouse, and near Pilling in Morecambe Bay, but these are very few and they have grown smaller in modern times.

Not every toad has the Shakespearean jewel for its eye, but there is such a semblance in the natterjack, whose evening chorus in the breeding season is as distinctive as its colour and its habits. If ever a toad may be called beautiful, this is the most worthy of them all. Its olive-yellow skin is enhanced by the golden-yellow line down the middle of the back. Smaller than the common toad, it is not nearly so repulsively bloated. It neither hops nor crawls, but walks nimbly, with its belly raised off the ground, and when pursued it runs with speed. Swimming in the water it is a performer of merit, clasping its small forelimbs to its chest and kicking methodically with its back legs only. As a burrowing animal its speed equals some of the desert snakes and lizards, for it will excavate a way into the loose sand before one's eyes, and in winter descends as much as twelve feet down to its hibernation.

Its thin strings of spawn are laid in the more barren pools where little vegetation grows, and often where the water accumulates in winter and spring and dries out in summer. It does not seem to

require the vegetation of pond weeds to hold its spawn from the wind, which easily blows the thicker spawn of the common toad on to the margins unless it is wrapped amongst the pond weed. Strange to relate, the mortality of the natterjacks here is rather high and I have frequently found disembowelled toads about the slacks every year. The usual suggestion of visitors is that birds have been at them, but herons are very rarely seen at the pools, which have no fish although plenty of frogs and newts.

This part of West Lancashire is a very interesting area to the student of reptiles and amphibians, and there is a total of ten species of these animals in the district. The most interesting of the West Lancashire reptiles is the sand-lizard (*Lacerta agilis agilis*) which, like the natterjack, has its largest breeding haunt in Britain on these sand dunes. Incidentally, these are the largest continuous area of sand dunes left in England. It breeds between Ainsdale and Formby, but the common viviparous lizard is also there and is often confused by the visitor who has not got his identifications correct. The common lizard inhabits many of the old quarries, dry heathlands and banks elsewhere in Lancashire, but never so commonly as on the dunes. Then there is the blindworm or slow worm (*Anguis fragilis*), a widely distributed but nowhere abundant reptile, occupying mostly the dry railway embankment of the Cheshire Lines Railway around West-head, Ormskirk and Maghull, as well as the dunes.

Snakes are very rare in the area and most of the reports are of escaped pets. The grass snake (*Natrix natrix natrix*) is that most frequently found. The white ridge down the back of some of the captures have distinguished the Continental or Spanish form and indicated an escaped pet. When grass snakes were commoner in Lancashire their haunts were on the damp mosslands whose drainage in modern times no doubt explains the demise of this aquatic serpent. The adder (*Pelias berus*) was also common on the mossland heaths last century, especially at Chat Moss where Stevenson built his famous railway between Liverpool and Manchester, and some of the older farmers at Simonswood Moss, near Liverpool, have told me that they remembered seeing adders on the moss when they were boys, but not nowadays.

In addition to *Bufo calamita*, the natterjack, the damp hollows amongst the dunes from Ainsdale to Formby are the breeding haunts of common toads (*Bufo vulgaris*) and the common frog (*Rana temporaria*).

All three British newts inhabit Lancashire, but we are still working out the distribution of the little palmated newt (*Molge palmata*), the rarest of the three. The smooth newt (*Molge vulgare*) breeds

annually in the rather brackish pools between the sandhills, and the crested newt (*Triturus palustris palustris*) inhabits the larger ponds inland.

The natterjack is common in suitable parts of France, Germany and elsewhere on the Continent. It is strange that Gilbert White had no comments to make upon the natterjack toad, and possibly he may not have been aware of its existence in his neighbourhood. But when the famous Professor Bell lived at Selborne he found it was very often in his garden there, and in recent years it has been found in one of the haunts White mentions most frequently of all.

As a pet the natterjack takes well to a good vivarium, for it tolerates much drier conditions than does the common toad. I have kept it for upwards of four years, which appears to be the limit of its natural span of life; but it is extremely difficult to get it to breed in captivity. For food small earthworms, crane-flies and other moving prey are most suited, although it appears to feed to a large extent upon small beetles. It should always have some sort of retreat or it will burrow one for itself, and it should not be forgotten that it is a very good climber and, afforded suitable foothold will find a way out. Its feet are much less heavily webbed than those of the common toad and its skin is much drier.

THE BRITISH HERPETOLOGISTS' SOCIETY

A well-attended meeting at the Linnaean Society's rooms at Burlington House on Friday, July 11th, inaugurated this new Society for the study of reptiles and batrachians. After much discussion it was agreed that while the primary object should be the increase of our knowledge of the limited British fauna, the ranks should be open to foreign members and those maintaining foreign species in vivaria, and that publications should be available for all observations of special interest to herpetologists.

It was decided to publish a regular duplicated bulletin dealing with the Society's activities at quarterly intervals, and a printed journal annually in which papers of special interest, with illustrations, can be published. Many suggestions as to the time and place of meetings were put forward, and the committee was empowered to decide which would be the most practicable.

The membership is already in the region of 50, including many distinguished scientists; the annual subscription is 10/-. Those interested should communicate with the secretary, Alfred Leutscher of 5, St. Margaret's Court, London, E.12.

The Breeding of the WESTERN BOA

By J. W. LESTER F.Z.S. (Curator of Reptiles
Zoological Society of London)

IN one of the earlier editions of the *Aquarist*, mention was made by the editor of a family of forty-two young Western Boas born this year in the London Zoo.

The story begins in June, 1946: on the 11th of that month an eight foot male and an eight foot six inch female Western Boa (*Constrictor occidentalis*) arrived amongst a consignment of reptiles from the Argentine.

They settled down quickly and on the 15th of July the male started to show an interest in the female. For three weeks the courtship continued, and although it was hoped mating would take place, it was not observed.

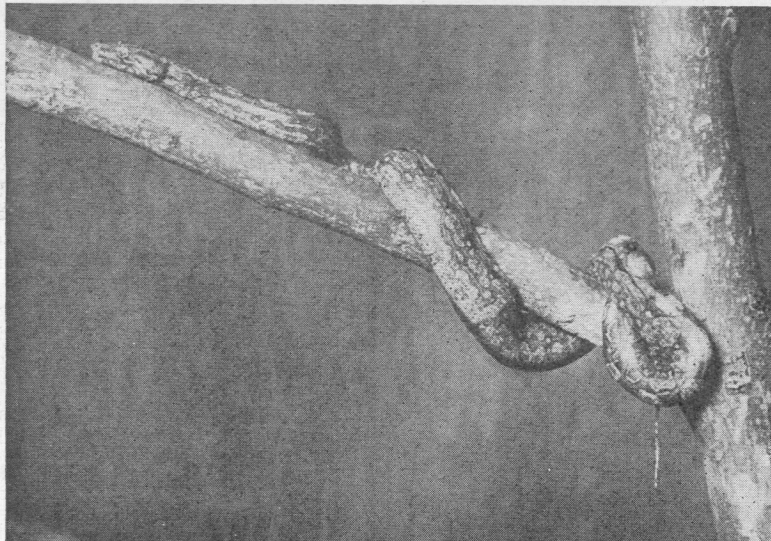
This is unfortunate as it makes it impossible to tell the gestation period accurately, but after a few weeks it was obvious, by her increasing size,

that the female was pregnant, and on January 3rd, 1947—about five months later—parturition occurred.

The young snakes were first seen at eight o'clock in the morning, each contained in a separate embryonic sac and being clearly visible through the transparent membrane. In some cases unabsorbed vitellus could also be seen.

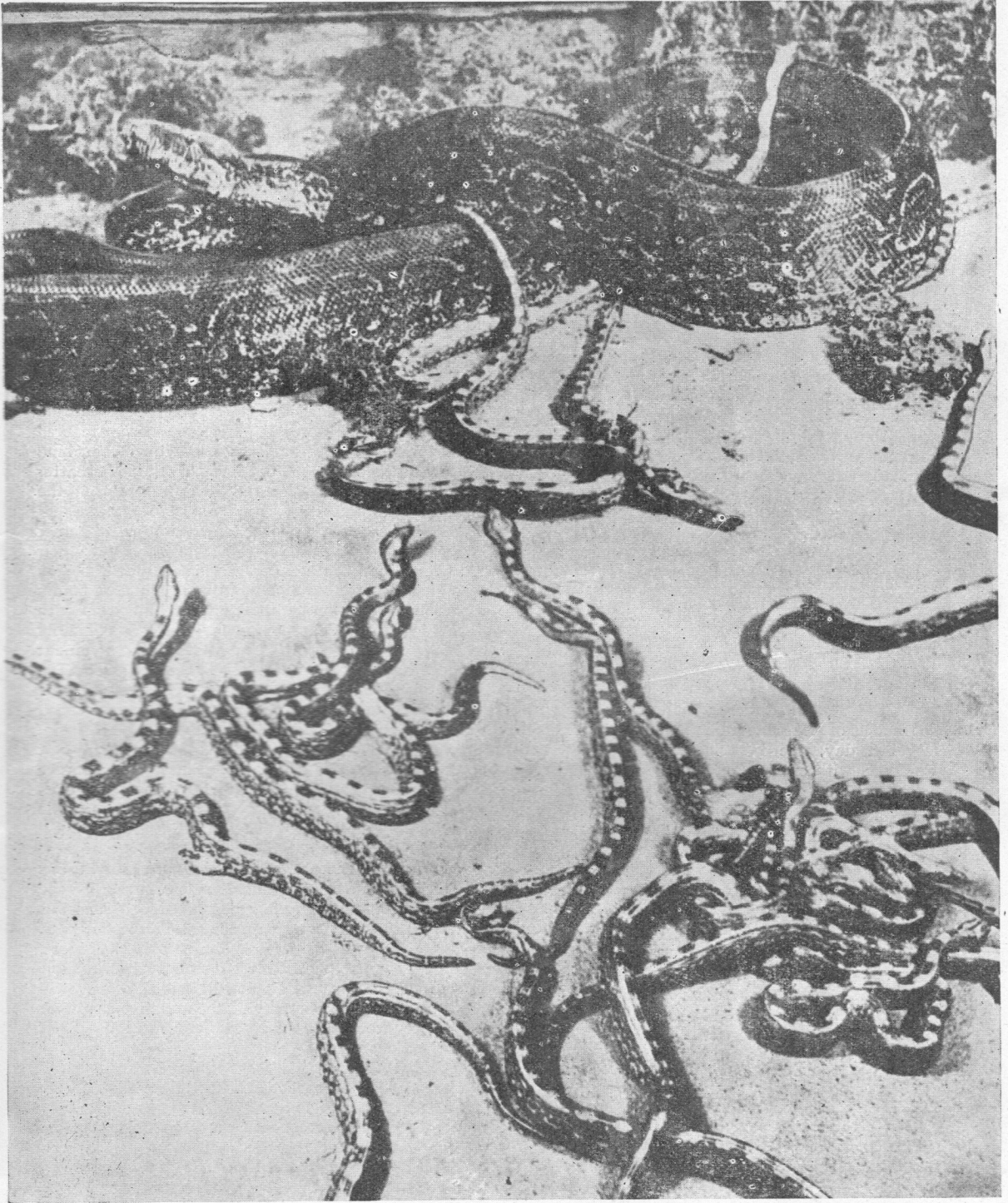
At five minutes past nine the first one broke through its egg sac; the actual break through was accomplished by a steady thrust extending the membrane until it burst. By twelve o'clock all the membranes had been penetrated and the young snakes were lying with heads extended outside their sacs. A count revealed there to be forty-two in number.

The female remained close by the egg mass and



[Photo: John Markham, F.R.P.S.]

Young Western Boa, 24 hours old, showing umbilical cord partly dried up but still attached.



Some of the 42 young Boas with their mother.

[Photo : Daily Mirror

PUBLICATIONS

"**The Dominion Aquarist and Pond-keeper.**" The April issue contained some generous sentiments. Our New Zealand friends are collecting funds to send food parcels to aquarists in England, and there is a discussion of the trials and tribulations of British enthusiasts, based upon notes contained in this journal. We find it gratifying that our friends "down under" read our journal so thoroughly, and also appreciate the Editor's advice to his readers to subscribe to *The Aquarist*, not only as a good investment, but as a means of helping us through our difficulties. Such kind thoughts are deeply appreciated.

"**Lacerta**" (Holland). The June issue contained valuable technical notes and suggestions for heating the vivarium, stressing the desirability where possible of keeping vivaria in a heated room; a most comprehensive study of the Tree Frog (*Hyla arborea*); a discussion of the cannibalistic propensities of snakes; a useful and interesting study of the effect of light on vivarium animals, and notes on nomenclature. There are some good photographs and other illustrations.

The July issue included a description and photograph of a fine outdoor vivarium, a continuation of the article on succulent plants, and an account of the South American toad *Bufo marinus*.

"**Het Aquarium**" for July opens with an article on the Spotted Salamander, var. *taeniatus*, illustrated with a coloured picture, followed by illustrated accounts of two tropical fishes (*Haemania marginalis* and *Nannostomus anomalus*), a description of the beautiful plant *Aponogon ul Vaceus*, with drawings of plant and flowers, and articles covering a variety of topics of interest to aquarists.

The August issue contains a coloured illustration of *Danio malabaricus*, an article on the Angel-fish and one on Cichlids accompanied by a splendid photograph of Brown Acaras, several on broader subjects and a plant section (*Cardamine lyrata* and *Cryptocoryne cordata*).

"**The Aquarium**" (Philadelphia) for June contains an account of *Aequidens cursiiceps*, a report of the second breeding of *Symphysodon discus*, an outstanding article on the breeding of black Mollies, short notes on a variety of subjects, and a discussion of the Guppy by the Editor.

Guppy Breeders' Society's Year Book, 1947. Sixteen pages and cover, and a monochrome photographic plate showing some nice specimens. Price 10d., post free, from the Hon. Secretary, 30, Alverton Street, Deptford, London, S.E.8.

The G.B.S. will have to do better than this if it is to be taken seriously.

"**Pollution—No. 1—Trent, Tyne, Eden, Ribble, Lune and Wyre, Severn, Welsh Dee.**" This is the first of a series of reports prepared by the British Field Sports Society, in an effort to spotlight and arrest the increasing menace of river-pollution. Although the Society is mainly concerned with the interest of anglers, they should receive the backing of serious aquarists, for the preservation of the life in our freshwaters is very much in their interest. This booklet contains much interesting, instructive, and very shocking data; it tells a story of criminal carelessness and often downright callousness on the part of numerous industrialists, that should convert many a conservative naturalist to a rabid socialist desire to clamp controls on these vandals! Copies of this report may be had, free of charge, from the Secretary, British Field Sports Society, 3, St. James's Square, London, S.W.1.

"**Wild Birds Magazine.**" This is a beautifully produced bi-monthly journal catering mainly for the field ornithologist. 48 pages of interesting reading and fine photographs, price 1/-. The Editor is our old friend Eric Hardy. Obtainable from *Wild Birds*, Friars Lodge, Friars Lane, Richmond, Surrey.

LONGEVITY OF NATTERJACK TOADS.

With regard to Mr. Hardy's remarks that upwards of four years appears to be the limit of its natural span of life, it may be of interest to readers to mention that I have kept a male Natterjack toad in captivity for approximately ten years. When received, this toad was adult and may have been a number of years old; furthermore, it died an unnatural death and may have lived for many more years. The age limit of toads of the genus *Bufo* is a subject upon which more detailed information would be most desirable. Bonnaterre and Pennant both quote the case of a toad (presumably *Bufo bufo bufo*) kept in England for thirty-six years.

J. D. ROMER.

THE ZOO AQUARIUM

After months of setbacks and patient effort on the part of its Curator, Mr. H. Vinall, the whole of the Aquarium at Regent's Park is now open to the public. Considering the difficult times the show is a creditable one, enabling us to renew our acquaintance with many old friends. In particular, the return of the sea-horses is bound to be popular, though they were not looking very well when we saw them. Most of the marine exhibits are, of course, British, and a certain amount of repetition has been necessary this stage, but every tank is interesting and well-arranged (except the one with two aerographed cabbages in the background—an experiment which in our view is unsuccessful). There is a display of sea-anemones and marine worms that is exceedingly beautiful, and the tank showing "dead-men's fingers" is also colourful. A spectacle of bizarre, primeval drama is presented by a group of Crawfish, while elsewhere is a very handsome lobster in blue and gold and a number of different kinds of crabs. The ever-intriguing flatfishes are there in plenty—plaice, turbot, dab, merrysole, flounder, sole and so on, many cunningly concealed, and the brightly coloured sapphire gurnards which use part of the pectoral fins as legs are amusing to watch. Dogfish, skate, conger, bass, whiting, wrasse and so on are old acquaintances, but an interesting fish which we do not recollect seeing there before is the eel-pout, a viviparous blenny.

In the Tropical Hall are a number of many fine Cichlids, which, together with the handsome *Leporinus fasciatus*, are veterans from pre-war days; there is also a number of climbing perch, but they are not encouraged to climb. A fair selection of the usual small tropicals is on show, and in one tank will be found three specimens of the neon-fish.

We hope that it will soon be possible to improve the system of labelling in the aquarium. At present many of the exhibits are not labelled at all; in other cases the public has no means of knowing which label applies to which exhibit; and in some instances the label is incorrect.



"Not just now—they're spawning."

THE CLAWED TOAD

(*Xenopus laevis*)



By _____ EDWARD ELKAN, M.D.
(With photographs by the author)

THE old readers of this journal will, I hope, forgive me if I re-state hereunder the case of one of the most useful and, at the same time, most unknown of the batrachians. The editor informs me that the illustration blocks belonging to my previous notes on *Xenopus* were destroyed through enemy action; this re-statement, then, is mainly an excuse to reprint the old and some new photographs of the claw-footed toad.

Xenopus owes both its Latin and its English name to its feet and these—anterior and posterior pair—are indeed strange enough (*xenos*, Greek = strange; *pus*, Greek = foot). The fore feet are short, clumsy, and have four toes, not connected by a web. They are used mainly to shovel food into the mouth. The male also uses them as an organ of fixation when hanging on to the female during the egg laying process (amplexus). These fore legs are quite useless to hold or grasp anything. The toes have no claws. Totally different the hind legs. They are long, strong and muscular. The foot has five toes, the three anterior of which are armed with a horny tip, all toes being connected with webbed skin. These legs give *Xenopus* a most amazing power of propulsion. Owners will have to get used to the fact that these "pets" can both jump and swim with lightning speed and that deep nets are required to handle them. Once on the floor they are not easy to recapture. Since we must always find some "use" for any characteristic feature an animal shows, it might be mentioned that the claws—too soft to hurt anyone—help the toad to get rid

of its old skin at skin-shedding time. If someone would make a film showing *Xenopus* getting out of its old skin with violent backward jerks, finally pulling it over its head with the aid of the "claws" until it comes within reach of the mouth into which it then disappears, this process would make a most entertaining item.

The second part of its name, *laevis* (Lat., smooth) the toad—first described by the French naturalist Daudin in 1803—owes to its ability to pour out a good quantity of slimy mucus from skin glands, distributed in lines along the sides of its back. These glands go into action as soon as you try to catch one of these toads; any attempt to hold them in your hand unarmed is doomed to failure. A dry towel at least is required; a net is better.

Xenopus stands low on the phylogenetic scale. Here is a batrachian which has never learnt to leave the water and whose tadpole still looks like a Siluroid fish. It seems to be a case where a species specialised early in its developmental history and where, as in so many other cases, no further change is now possible. Only one nearer relative is known: the Pipa toad (*Pipa americana*); *Xenopus*, however, is not found anywhere in the New World but only in Africa where the following eight species have been found:

<i>X. laevis</i>	<i>X. calcaratus</i>
<i>X. muelleri</i>	<i>X. clivii</i> ;
<i>X. fraseri</i>	<i>X. poweri</i>
<i>X. tropicalis</i>	<i>X. gilli</i>

Of these *X. laevis* has the widest distribution and is

found in swamps and rivers as well as in farm ditches and water holes everywhere in the Cape peninsula up to the Equator and the Sahara.

The only source from which quantities of *Xenopus* can, at present, be obtained is the Department for Inland Fisheries of the South African Government, after the amazing *volte face* which occurred between 1930 and 1935 when *Xenopus*, so far regarded as a perfect nuisance for living on small trout and other fish fry, jumped into prominence and became the pet of biological laboratories because it was found to be a most reliable fortune-teller. The fact that *Xenopus* can be used to foretell the arrival of a baby from about the second month of a pregnancy onwards was discovered by Prof. L. Hogben during his tenure of the Chair for Zoology at Cape Town University. The "Xenopus Bibliography," published by Zwarenstein *et al.* in 1946, lists 305 papers that have since appeared on this unique toad. Readers will forgive me, if, in the face of this deluge of scientific information, I am leaving many of their questions unanswered. But I will try to answer a few.

Small specimens are very suitable as aquarium

pets and they can be kept and fed exactly as fish. Anything in the protein line is eagerly accepted; the appetite is never-ending. Earthworms, little shreds of raw liver or meat (which need not be fresh), dead fish, slugs or mosquito larvæ are all gratefully accepted, but even if fed well *Xenopus* grows slowly and it takes a specimen two years to reach maturity and five years to reach its maximum size, which is about 4 ins. from mouth to anus. Add to this another 3-4 ins. for the hind legs and you have a giant toad. Specimens like this often arrive from South Africa. *Xenopus* becomes about as tame as a fish, i.e., it can be trained to be fed by hand. If supplied with a rocky island it will come up during heavy rain and thunderstorm, climb on the rocks, jump back into the water and generally display greater activity than at any other time. Some specimens kept in a small garden pool just under our bedroom windows, splashed about with so much noise during thunderstorms last summer that we seriously considered their transfer back to the laboratory. During the day this toad likes to stay motionless, just below the water surface, its nostrils just above the water, the body hidden by

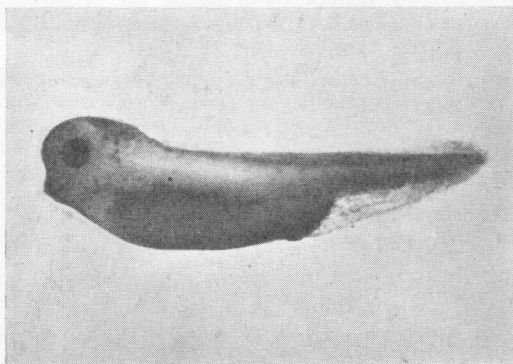
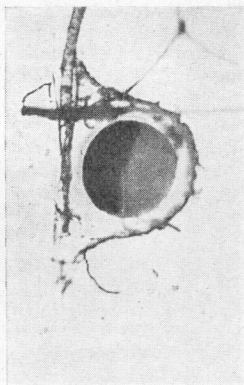


Clawed Toad, Fore—

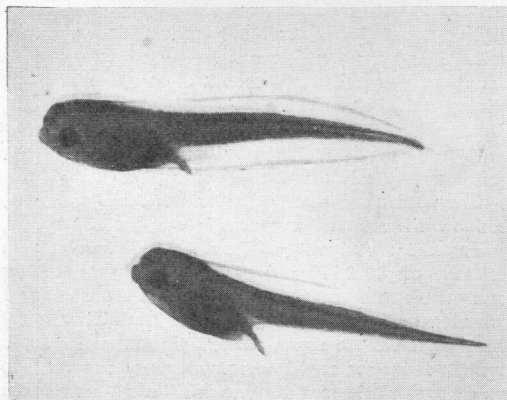


—and aft

Xenopus laevis D. Egg attached to water weed.



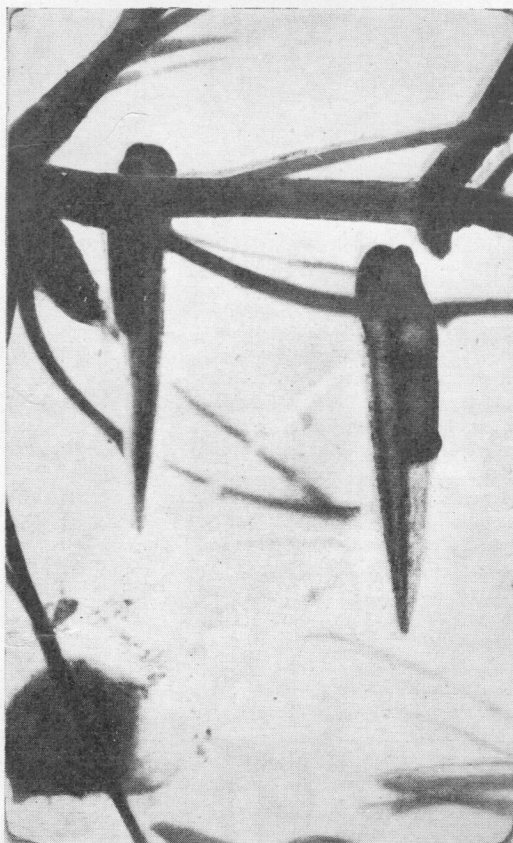
Xenopus laevis D. Tadpole after hatching. Note absence of mouth and anus. "Cement gland" in place of mouth. Lipoid material from egg yolk not used up yet.



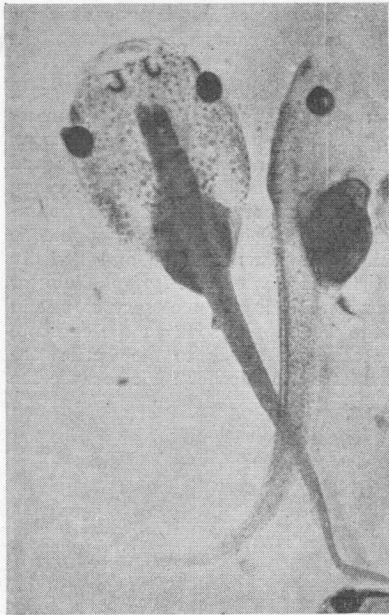
Xenopus laevis D. 1 week old. Formation of anus. Yolk material much reduced.

a floating leaf. In this position it may stay for hours; feeding normally takes place during night time.

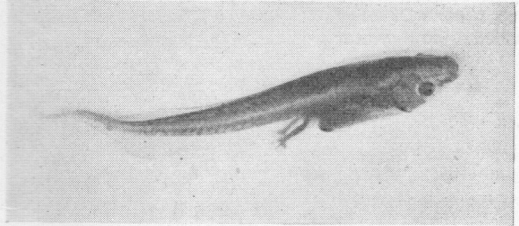
Volumes have been written about how to breed *Xenopus* in captivity. It can be done, as many reported successes prove, but it is not easy, *Xenopus* is much adapted to its normal surroundings and although it will live in an aquarium for many years, it does not easily spawn there. To achieve spontaneous spawning, a freshly imported pair should be put in a tank as large as possible and lavishly supplied with floating weeds. *Myriophyllum* or *Elodea* are suitable. It is not necessary to put in soil or plant the weeds. As soon as the eggs are laid (they are attached singly to the weeds) the plants are transferred to another tank because the



Xenopus laevis D. Tadpoles, five days old. In the left bottom corner an egg, attached to the weed. The tadpoles at this stage attach themselves to water weeds by means of a "cement gland" situated in the place of the future gills mouth. They breathe through small gills which soon atrophy.



Xenopus laevis D. Tadpoles 3 weeks old. Mouth and anus formed. Skin partly pigmented. General appearance siluroid.



Xenopus laevis D. Tadpole 8 weeks old. Note appearance of hind legs and segmentation of tail.

(Below)

Xenopus laevis D. Tadpoles three months old. Note presence of hind and fore legs. Note typical attitude, the body balanced by the quivering tail.

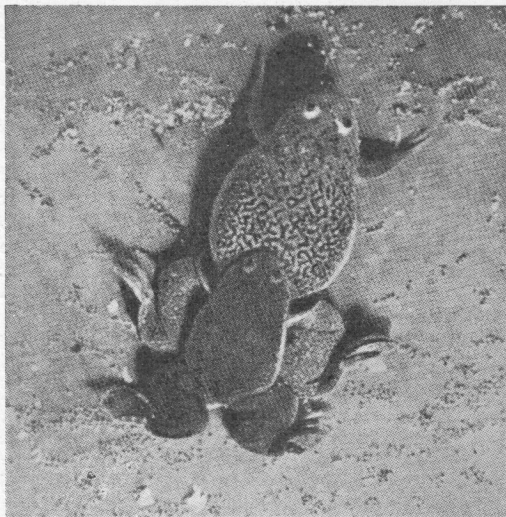


toads, particularly the males, eat their own eggs with relish and it is easier to transfer the plants than to catch the toads. Bringing up the tadpoles is no different from bringing up fish fry. I have no room here to describe the details of their growth, which is most fascinating to watch. Some of the stages can be distinguished on the accompanying photographs.

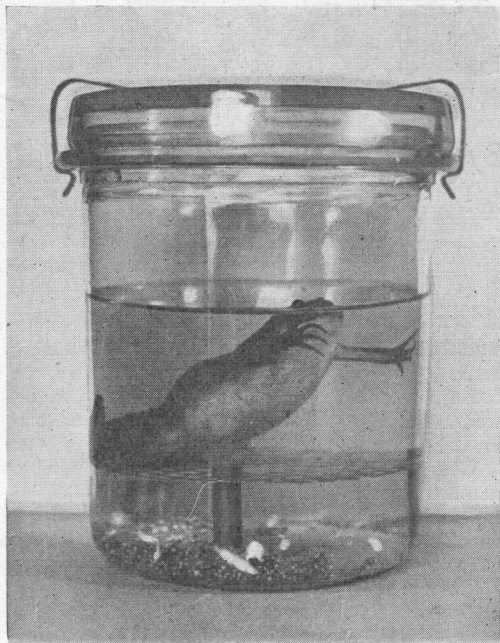
As a laboratory animal *Xenopus* is difficult to beat. The toads can be kept, like fish, in large tanks, electrically heated and thermostatically controlled at 20-25° C. They suffer, of course, from a "crowding effect" since in nature they are not at all gregarious, but if the water is frequently changed and plenty of food available, their readiness to spawn remains unimpaired. Between 1938 and now I have done about 10,000 pregnancy tests with these toads and I think they fully deserve their popularity.

For the purpose of a test 6 oz. (180 cc.) of morning urine are collected. This urine, in case of pregnancy, contains a hormone, put out by the placenta. The larger the placenta the more hormone is found in the urine. This amount increases up to about the third month and then remains more or less stationary until the time of the confinement, after which it immediately disappears.

From this urine an extract is made, 2.5 cc. of which are injected into the dorsal lymph sac of a mature female *Xenopus*. The toad is then



Xenopus laevis in courtship. The largest males do not even reach half the size of the largest females. The eggs are laid singly and normally attached to water weeds.



Positive pregnancy test with *xenopus laevis* D. The toad, after injection, is placed into the test-jar where it sits on a perforated platform and kept at 26°C. for 12 hours. Eggs laid fall to the bottom of the jar. The lid of the jar is perforated.

isolated in a 2 lb. jam jar where it sits on a perforated platform at a temperature of 26° C. If eggs are laid they fall to the bottom and cannot be eaten by the toad. Eggs have been laid within three hours after injection. Usually the test animals remain in the incubator overnight and the tests are read the next day. Readers interested in details will have to read up the extensive literature published. The toad, when the test has been read and recorded, goes into the resting tank where it remains for at least four weeks before being used again. If it does not die accidentally or through the interference of parasites (flake worms particularly) a toad can be used again and again. Needless to say the eggs laid are—in the absence of a male—not fertilised and therefore sterile. But, to combine the agreeable with the useful, they make excellent food for the larger kinds of tropical fish; in this way no product of nature's cycle is wasted and the fish thrive on the eggs involuntarily laid by the toad in the test jar.

Literature. *Xenopus laevis*. A Bibliography. Compiled by Zwarenstein, Sapeika and Shapiro. Published by The African Bookman, Cape Town, 1946.

The American "Chameleon"

(*Anolis caroliniensis*)

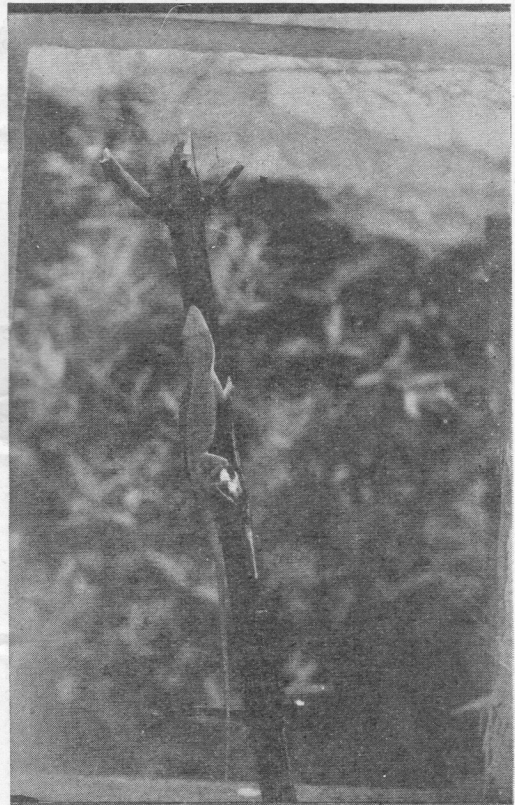
by J. K. GOODY

THOUGH not a chameleon in the true sense of the word, this little fellow possesses the fascinating ability of the true chameleon to change its colour and yet lacks the delicate nature of its African namesake and so makes an ideal pet. This Anolid is found in swampy districts in the south-eastern United States and in Cuba, but perhaps is most especially noticed in the swamps of New Orleans and the Carolinas, hence its specific name.

The lizard attains a maximum size of five or possibly six inches inclusive of its long tail. It is most active, and most of its life is spent in trees where it feeds on flies, beetles, crickets, etc. It will, in captivity, thrive on "meal worms," flies and cockroaches, but it will refuse earth worms. The lizard needs drinking water but if a dish of water be placed in the cage, it will probably ignore it. However, it will lap up water sprinkled on the footage of the plants in its cage.

The lizard is a very colourful creature and is normally of two main colours, either a vivid bright green above and yellowish beneath, or a light brown and white beneath. While changing from a bright green to a deep brown it turns first yellow and then gradually assumes a brownish tinge. Contrary to a popular belief the changes are not brought about by the change of a colour background but are due to light, temperature and mental state. When the creature is in bright sunlight it assumes a deep brown coloration, whereas when it is in darkness it assumes a yellow-brown coloration. When warm, the lizard is bright green, when cold, greyish. A dewlap of a greyish colour adds to the quaintness of this creature. This dewlap glows a bright red when the lizard is provoked or when two males meet and fight for their spouse. The chameleons are pugnacious with their fellows and males will fight bitterly—the defeated retreating, a greyish-brown colour, and often minus a tail; the victor, a brilliant green, resuming his wooing. Normally this attitude is not shown to humans but a specimen in my vivarium once bit me on an unusually hot sunny afternoon. The little creature, a female, hung on for dear life but of course could not break the skin. It was finally persuaded to let go by gentle coaxing, and she never again showed any aggressiveness to me and would take flies and grubs from my fingers. The same female laid a single egg on May 6th, 1945, in my vivarium, but left it on a stone and ignored it. The egg was oval and about $\frac{3}{4}$ inch long and $\frac{1}{2}$ inch wide at its broadest point. It was of a pale yellow colour and perfectly smooth in texture, slightly depressed in the middle. Unfortunately the contents of the egg solidified and it did not hatch. No further eggs were laid. This chameleon was later

placed in a cage containing two adult Red-headed Skinks (*Eumeces fasciatus*) and two young specimens of the same species. At first all seemed well but after two days a fight occurred between one of the adult skinks and the chameleon. Surprisingly enough, the former, a big clumsy lizard, was killed by the doughty little female chameleon—the latter inflicting severe head wounds on the skink. The same little battling lady then picked a fight with, and killed, one of the younger specimens. Before she could enact further carnage, however, she was removed, (June 3rd, 1945).



Anolis caroliniensis

OUR BRITISH SNAKES

By

G. F. COLE

THESE seem to have been more snakes than usual about last year, due perhaps to the favourable weather conditions, but more probably because I'm more observant than I used to be. At one time every rustle or movement in the undergrowth was, with the briefest glance, "a field mouse," or "a bird." But now, if I'm quick enough, I often see not fur or feather but the scaly tail of a slender form glide swiftly to shelter where its owner may see without being seen; and if I wait patiently and long enough I may spot a tiny head with amber coloured eyes motionlessly watching from its hiding place.

Recently, walking across a moist, long-grassed meadow I came across a fine specimen of grass snake sun bathing by a tuft of Willowgrass. Sensing my approach (snakes appear to have no sense of hearing in the usual way but a great sensitivity to ground vibrations) he slid from view, but it was possible to trace his progress by the swaying of the grass stems

A few feet away he paused and thrust his head and about 8 in. of his neck out from the clump of grass. One would easily have passed him by unseeing. He held this attitude for a full three minutes while I focused my camera and took snapshots of him, but presently he decided that perhaps it was unsafe to tarry longer and, withdrawing his head, glided from sight.

There can be few people who do not know of the grass snake and the adder, but how many are aware that there is a third species native in this country?

This is the *Coronella*, a member of the smooth snake family—a family quite common and numerous in various parts of Europe, but rare and local in England, being found only in Surrey, Dorset and Hampshire, and more about Ringwood in the New Forest than elsewhere. It feeds entirely on lizards, and it is interesting to observe that the Sand Lizard is also found in those counties. The Slow Worm, by the way, which looks so much like a snake, is a true but legless lizard, and cannot be included in the list of British serpents.

The *Coronella* is closely connected with the Leopard Snake (a tree lover and a hunter of birds) of South and East Europe, the North American Chicken Snake (it has a taste for poultry), the Bull Snake, and the Aesculapian Snake. The latter, by the way, is found in numbers near the sites of ancient Roman medicinal springs and baths, and is

believed to have been encouraged there by the followers of Aesculapius.

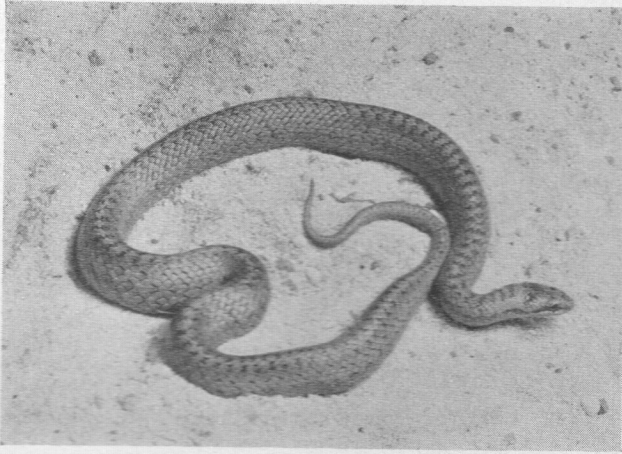
The *Coronella* is somewhat similar to the Adder, the colour of its back being greyish with a dark zig-zag marking from head to tail. There is a dark patch on its neck. The chief difference from the Adder being the smoothness of the scales. On the Adder they are rough. The Adder has vertical slits for the eye pupils whereas the *Coronella* has round pupils. The latter snake is viviparous, producing its young in August-September. It seldom grows to a greater length than two feet.

The Grass Snake—the British "Ringed Snake"—belongs to a genus of Water Snakes and is found in Europe, West and Central Asia, and in Algeria. It is very common in southern England, and is found here in large numbers; seldom seen in the north of England it is never found in Scotland or Ireland. It varies in colour a great deal, in England usually being olive, brown or grey with black spots, and has a yellow-orange marking with black spots on the neck. In other parts of Europe the marking may not appear on adults.

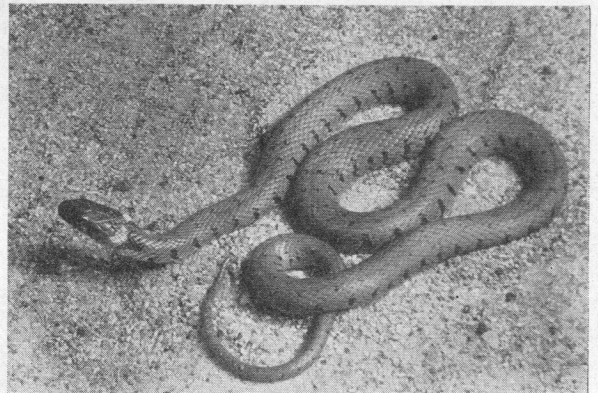
The Grass Snake is seldom found far from water, and is often seen swimming in rivers or pools, its head held well above water level. It seems to be a very capable swimmer, and when motionless floats immediately below the surface with its head a few inches above. The females are usually larger than the males, sometimes growing to five or six feet in length.

All snakes are flesh eaters, and the diet of the Grass Snake consists of frogs and fish etc., swallowed whole. It produces its young via a string of eggs (joined together) laid where rotting vegetation will give sufficient heat to incubate them. It makes no attempt to bite when caught, but hisses in an impressive way. It quickly becomes quite tame—at school I remember we kept one for several months and it spent a lot of time in jacket pockets, or, twined round an arm, within a coat sleeve. On more than one occasion it found its way into a locked desk via the ink-well hole, once nearly causing the French master's sudden demise!

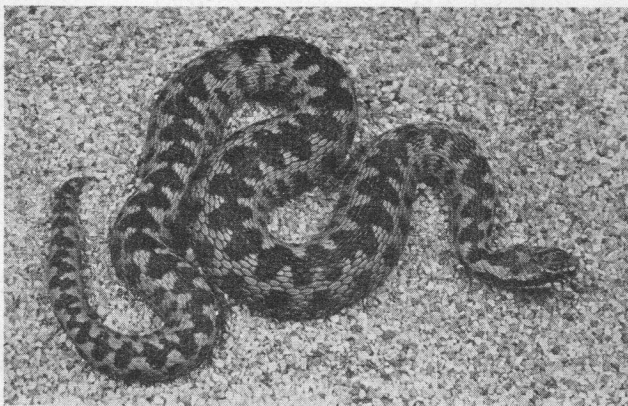
This Grass Snake was caught while swimming in a woodland pool in Kent, and became very tame. He lived in a box specially made for him in a secluded corner of the study of one of the senior pupils, but had limited freedom to roam where he



Smooth Snake
(*Coronella austriaca* Laur.)



Grass Snake
(*Natrix natrix* L.)



Viper or Adder
(*Vipera berus* L.)

(Photos : W. S. Pitt)

NEWTS

by _____ IRIS MURRAY

with photographs by LIONEL E. DAY

ALTHOUGH there are three species of newts to be found in the British Isles, the two which are most common are the Great Warty Newt (*Triturus palustris*), Figs. 1 and 2, and the Common or Smooth Newt (*Triturus vulgaris*), Figs. 3 and 4. As is the case with all amphibians, they spend most of their lives on land, and only return to the water during the breeding season.

Generally speaking, their legs are used as a means of transport while on land, and they swim by an undulatory movement of the tail. To offer less resistance to the water, they tuck their legs up against the under side of the body, and point them towards the tail.

They are to be found in almost any pond or ditch during the spring and early summer, but leave the

water to find their winter hiding places on land in the autumn. It is during their stay in the water that they become most active, and flaunt their most vivid colours. At other times of the year they are to be found hiding under stones, or in crevices of walls, seldom showing themselves during the day, but coming out at night to hunt for food.

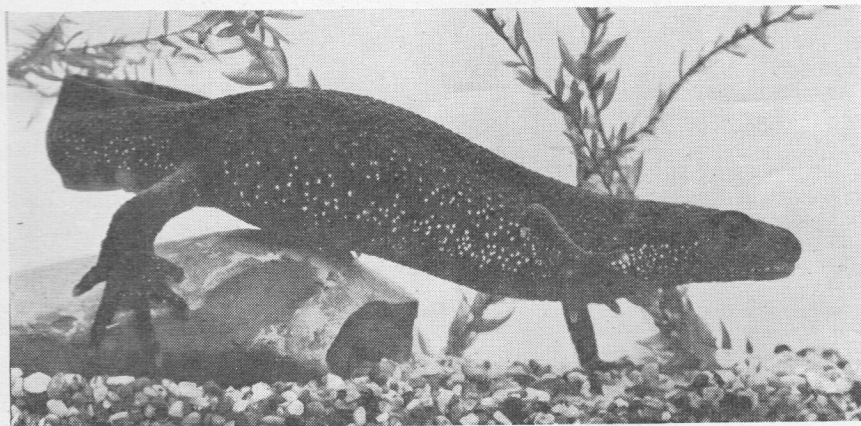
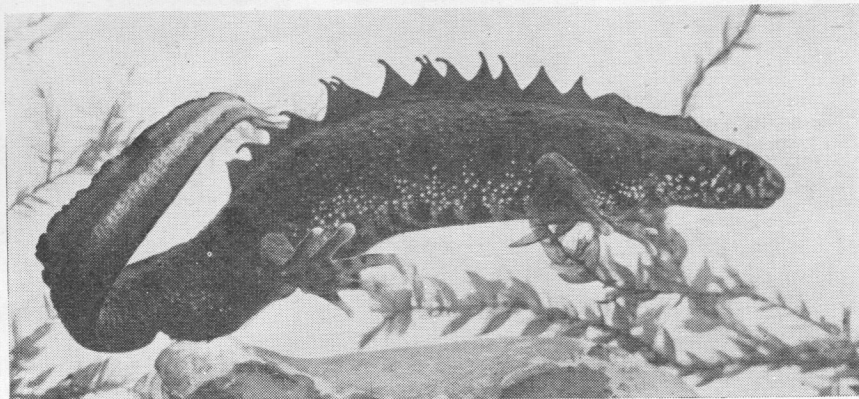
It is because of this sluggishness that they once received the generic name of Molge, derived from the Greek word meaning slow.

The metamorphosis of the tadpole is very similar to that of the toad and frog except that the tadpole takes six months before it can leave the water in the adult stage, and it does not breed until the spring of the fourth year.

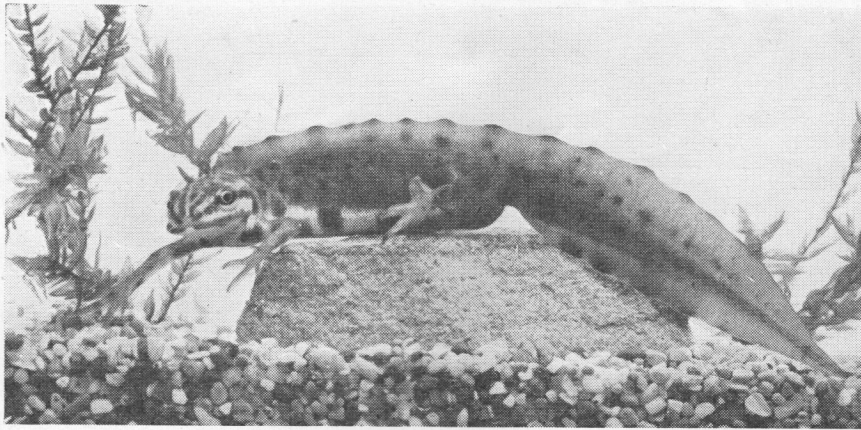
The skin is soft and moist like that of a frog, and

Great Warty Newt
(*Triturus palustris*)

Male

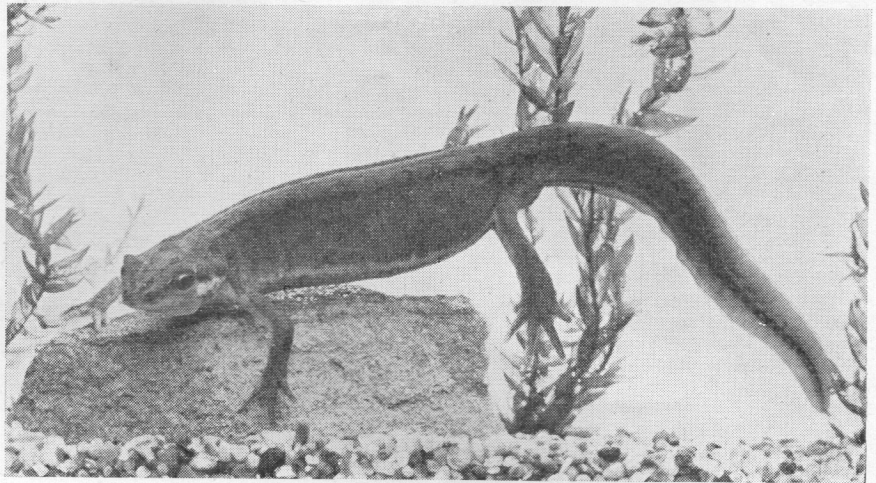


Female



Smooth Newt
(*Triturus vulgaris*)

Male



Female

the newt has prominent eye-balls, which retract into the roof of the skull. They breathe by a force-pump action of the mouth and throat, and also through the skin, while the tubercles on the skin are supposed to exude a certain fluid which keeps the outer skin of the newt moist when it is some distance from the water.

Contact with a newt has been thought to be poisonous. This is entirely erroneous, although the skin does manufacture a very unpalatable secretion as a protection against potential enemies. A similar action occurs in the toad.

The male newt of both species develops a crest down the length of its back during the breeding season, but as the autumn approaches this is absorbed, and so disappears from view.

Until they are full grown newts shed their top skin a number of times, sometimes as often as once

every ten days. This is a kind of moult, but is known as a slough. The newt starts by loosening the skin round the neck, and pushes it down its body with its forelegs. This procedure is aided by rubbing against weeds and stones, and the skin is finally pushed off the end of the tail by the back legs. The skin is perfect in every detail, even to the toes, and is so thin that quite often it remains in suspension in the water, very often to be eaten by its late occupant. As soon as it is removed from the water it becomes shapeless. Just before a slough the newt becomes particularly sluggish, and loses its appetite. Normally its main food consists of small insects, larvae and worms when it is living on land. An interesting feature of these creatures is that they have the power to replace lost limbs.

The same procedure takes place in the lobster, and if it is a leg which has been lost the new member

is perfect from the start of the growth.

The female takes three to four days to lay her eggs, usually, simply, on the leaves of various aquatic plants such as Crowfoot, Vernal Starwort or Anacharis.

The eggs are fertilised internally, and the female takes a great deal of trouble to choose a suitable leaf on which to deposit the egg. She lays it on the leaf and then folds the edges over in order to protect it, and the egg adheres by means of the glutinous substance surrounding it. If there happens to be no suitable leaves or plants in the pond the eggs will be found under stones.

Under favourable conditions the young tadpoles will be free of the egg in 12 to 15 days, but this depends largely on light and temperature, as does the growth of the tadpole. Food will also hasten or retard its development. In seven days the head and tail can be distinguished, and very shortly after the branchiae appear. The tadpole changes its position in the egg sac, and the flow of blood can be observed through a microscope. As the young tadpole leaves the sac so the latter collapses.

There are a few peculiarities to be noted about the newt tadpole in comparison with that of the frog or toad. The claspers and external gills are longer in the newt, its tail remains permanent, and the forelegs appear before the hind pair. The gills are absorbed shortly after the appearance of the hind legs, and then the young newt is obliged to come to the surface for gulps of air, making a popping noise while so doing. The eyes are a brilliant amber, and the claspers disappear as the forelegs develop. Once the adult stage has been reached the newt leaves the water, and does not return until the spring of the fourth year to breed. During this time it lives in shady corners or under stones, and feeds on worms and other insects.

Although the life-cycles of all the newts are similar, each species has some peculiarities of its own.

The Great Warty Newt (*Triturus palustris*) is so called because of its rough skin and its size. It is our largest species, and when fully grown measures from five to six inches, only growing about an inch during each year.

The back is almost black, but the underside is bright orange with irregular black markings. The sexes are difficult to distinguish, except as they reach maturity, and the breeding season approaches. Then the skin becomes rougher, the colours become brighter, and the notched crest develops down the centre back of the male, while the light stripes on the sides of the tail become a silver blue.

Although it has been established that most newts do not return to the water until the fourth year, *palustris* is an exception to this rule and will return each summer. Sometimes during the winter several will huddle together in one hole or crevice.

It is most commonly found in ponds and ditches around large towns, or even in the suburbs, and is distributed over a wide area.

The most common of the British newts is the Common or Smooth Newt (*Triturus vulgaris*). This is found everywhere in the British Isles, and is about four inches long when fully grown.

Its skin is smooth and varies in colour from yellow to green and brown, being spotted with a darker colour. These spots are darker and more numerous in the male, and the under-side is yellow; in common with the whole genus the yellow turns to bright orange as the breeding season approaches.

The toes are slightly fringed in both sexes, but it is almost imperceptible in the female, while in the male the fringe disappears when the crest is absorbed in the autumn.

These amphibians adapt themselves quite readily to an aquarium, providing it is kept covered, and an island of some sort is provided. They appear to have a certain amount of intelligence, and take quite an interest in their surroundings, both in the water and outside.

MYSTERIOUS EELS

THE majority of educated people interested in natural history to-day know that eels have a common spawning ground deep down in the Atlantic Ocean, somewhere not far south of Bermuda.

For centuries, however, the reproductive process of eels was a mystery, and many stupid notions were passed down the ages concerning spawning habits. Probably Aristotle began it all by asserting that eels had never been found with milt or roe, and that they had no reproductive organs. A little later, Pliny the Elder advanced the theory that eels reproduced their kind by rubbing themselves against rocks, the bits of flesh which flaked off becoming new eels. The Romans considered Jupiter and the goddess Anguilla were the parents of the fish! To-day, there are still a few country people who believe that if a horse-hair is left soaking in pond water for about nine days it will turn into an eel. One of the quaintest theories ever advanced was that of a German zoologist who maintained that the dews of May mornings gave birth to eels. J. H.

A COLLAPSIBLE SPAWNING POND

For those to whom, for various reasons, a permanent pond or large aquarium for outdoor breeding is impracticable, the following method can be used at a comparatively low cost. Ex-R.A.F. inflatable rubber dinghies (one-man type or otherwise) are available at various stores throughout the country, their price comparing favourably with glazed aquaria of similar dimensions. The dinghy can be inflated and set up about one week before spawning, and removed to storage immediately after hatching. It is an advantage to construct a small wooden frame upon which the dinghy can rest tilted at an angle to provide shallow water, although this is not essential. Although cats will find difficulty in catching fish, especially if the container is only partly filled, a cover of wire netting is advisable, and this can be easily attached to the metal rings on the sides of the dinghy, thus affording a sure protection.

G. J. LEWINGTON

Notes on the

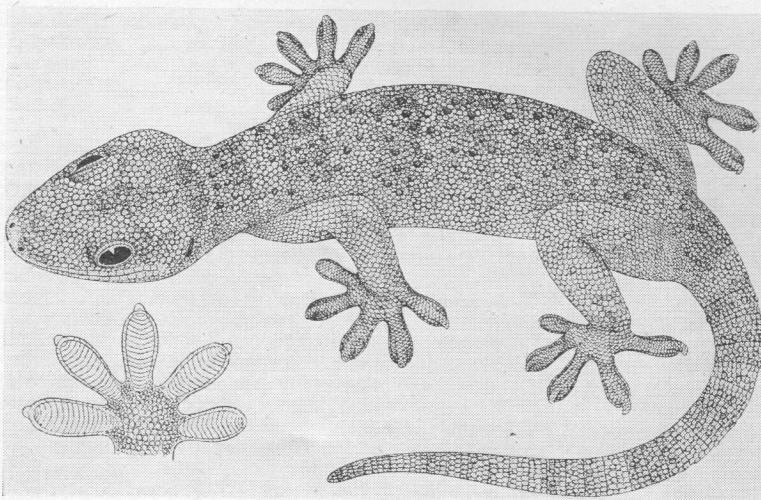
by
J. D. ROMER

GECKOS

IN the June, 1947, issue of this journal I contributed some notes on the monitors, an interesting family of lizards containing the largest species in the world. Another family which has always had a great fascination for me, however, is the Gekkonidae (geckos) and I feel that a few brief notes on these may be of interest to those who are attracted to the study of lizards. Although usually attaining a comparatively small size and of rather sombre coloration, the geckos seem to possess a particular charm of their own and a study of their habits and behaviour can be a subject of absorbing interest for those so inclined. If I am not mistaken, in pre-war days these lizards were occasionally imported into the United Kingdom and could be obtained from animal dealers; although this source of supply is not open at present, I sincerely trust that it will soon be possible to obtain specimens for study purposes. In the meantime, there is the slight consolation that it is usually possible to see one or more species on exhibition in the Reptile House at the London Zoo. As far as I am aware, geckos are generally quite easy to keep in vivaria, provided that arrangements can be made to keep them at suitable temperatures throughout the year; my own experience, however,

has hitherto been gained by observations of these animals in their natural state.

The many people who have travelled or lived in any of the hotter parts of the world will probably be familiar with the general appearance of a gecko, but a brief description of the more important characteristics may be helpful. They usually differ from the typical lizards (*Lacertidae*) in being softer to the touch and covered above by granules or tubercles in place of scales. The limbs are well developed and there is much variation in the structure of the digits. In some species the latter are not dilated but in the majority the digits are expanded and developed into specialised adhesive appendages by which these lizards are adapted to a scansorial life. On the underside of the digits there are lamellae which, when pressed against the surface upon which the animal is running, cause them to adhere in a similar manner to an ordinary rubber sucker. By this means it is easy for them to run on vertical walls or upside down on a ceiling. As might be expected, the variations in this feature have considerable taxonomic value and are thus made use of in distinguishing one species from another. The tail, in almost all the species, is very fragile, but can be reproduced as it can in the



The Tuck-too
(*Gekko gecko*)

Below is shown the under-
side of the fore foot.

(Drawn by Tang Ying-Wei)

majority of lizards. When a tail is broken or damaged it frequently happens that two, or even three, new tails are grown from the point of injury. Coloration varies but the ground-colour is frequently either grey or brown, or a combination of the two, and darker spots or cross-bars may be present.

In the hotter parts of the world where geckos occur, they are found living under many diverse conditions as, for example, in wooded localities, in the desert, in open country, and in gardens, towns and inside houses. There are, in fact, quite a number of species known as "house geckos," and in many cities, towns and villages it is unusual not to see some of these active little creatures on the interior walls and ceilings of the houses and other buildings. They are frequently seen to exhibit the habit whereby individuals, pairs or perhaps groups zealously guard their "territorial rights" in a particular part of the house or room, and any intruders over the bounds of their "reserved territories" are vigorously attacked and driven away. There can be no doubt that these house geckos serve a very useful purpose by reason of the large number of insects they devour. Their food consists of all manner of insects and other small invertebrate life. It is indeed a fascinating, and often amusing sight, to watch these lively little lizards stalking and devouring some of the many insects which have been attracted to an electric light near a wall. Although mostly of nocturnal habits, they by no means shun artificial light and are perfectly at ease within a foot or two of a bright electric light. In the warm weather in tropical and sub-tropical climates there is frequently an endless variety of insect life collected round lights situated near an open window, and I have watched fierce struggles when a small gecko has seized a butterfly or moth, and eventually been unable to cope with the large wings. In such cases the gecko appears to try to grasp the head or body of the insect, but unless the wings are torn off, I am inclined to think that the gecko usually loses its meal. I have watched this and seen the butterfly finally dropped to the ground—dead—and if geckos showed facial expression there would doubtless be

one of dire disgust at such an outcome!

Speaking of feeding habits, however, it is not always the gecko that is the predator. Here in Hong Kong, from where I write, there is a regular annual trade, particularly in the winter, when that very large gecko, known as the Tuck-too (*Gecko gecko*) is imported from Southern China to be eaten as food by the Chinese. The accompanying drawing was made from one such specimen which was purchased in Hong Kong. This exceptionally large species has a very loud call sounding something like "tuck-too," hence its popular name. All the geckos are said to possess a voice, but in many it is quite a soft ticking sound such as we can make with the tongue and the roof of the mouth.

In the colder weather geckos either disappear altogether into hibernation or are very much less active. Here in my house there are several specimens of our very common house gecko (*Hemidactylus bowringi*) and since their disappearance into hibernation last year, I noticed two of these for the first time on the 15th February. I did not see either of them again until the 29th February when one of them was seen. They seemed to disappear again until the 7th March and were then seen quite frequently, always in the same part of the house.

Regarding the breeding habits of geckos there is doubtless still a great deal to be learnt, as, for example, the incubation periods of many species. The great majority lay eggs, two being the usual number laid at a time. These are round or slightly oval, with a thin white shell. On being deposited by the female they are covered in a sticky substance which causes them to adhere together and to the surface upon which they are laid. After this the parents take no further interest in them. The courtship of the common house geckos is easily observed, when the male may be seen to chase the female, together with excited vibrations of the tail by both sexes. Before pairing actually takes place, the male may grip various parts of the female's body in his jaws, thus causing the unenlightened observer to think that they are fighting.

BREEDING THE SCALED FANTAIL—(Continued from page 85)

very bad this fish may be bred from as you may get this perfect dorsal on to a young fish which is very good otherwise.

You may breed from six fish which do not contain one perfect specimen, but which among them have fish which have at least one very outstanding point. Providing that the fish are bred right, that is, from a good strain, it is possible that from among the youngsters you may find at least one fish that combines the highest number of good points. That is why I do not believe in actually pairing my fish for breeding. I just leave the fish all in the pond together, although naturally I never allow any other fish in the pond than those which I consider good. It is possible to breed from a perfect pair of fish and get nothing but a lot of throw-outs from them. There is something strange about the fantail. These fish do not appear to conform to the usual standards

of breeding as expected with other animals. The double tail is something very exceptional which has appeared no doubt in the first by accident, and now it is practically impossible to breed even from a long-standing strain of fantails a batch of fish which are all fantails. It seems impossible that my fish can breed single tailed fish when there has not been one single-tailed fish among my breeders for at least 10 years, but yet I do breed many single-tailed fish among my hatchlings.

I hope that I have made it clear then that you must not expect the impossible when buying fish, and you will be surprised what good fish may turn up among your own fry if you breed from fish that, although they may not be perfect in themselves, have come from a good strain. In a later article I hope to be able to deal with the subject of treatment of the breeding fish in preparation for the winter.

Native Lizards

ALL the indigenous British species of Lizard are shown in the photographs on these pages. Green Lizards (*Lacerta viridis*) and Wall Lizards (*L. muralis*) have been recorded occasionally but have simply escaped from captivity, though both are native to the Channel Islands. Of the strictly native species there are just three.

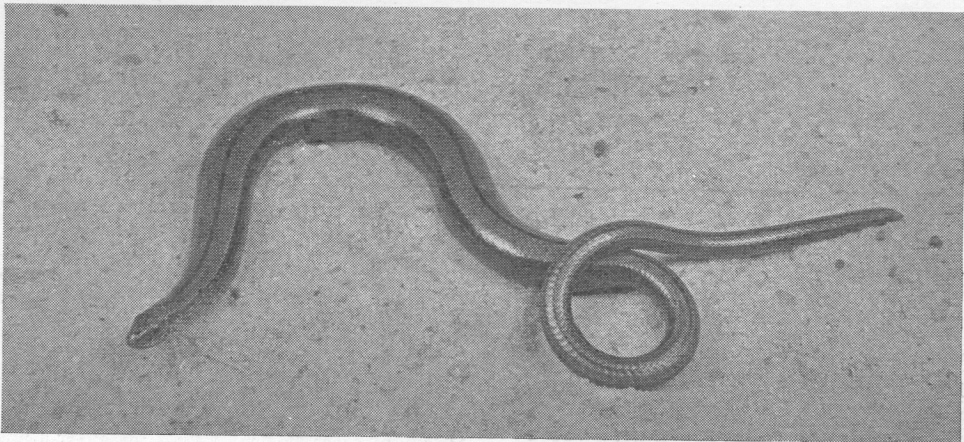
Of particular interest is the Sand Lizard (*L. agilis*), for its distribution, mainly in the southern parts of England and Wales, is almost exactly the same as that of the Smooth Snake (*Coronella austriaca*) described in an earlier issue. This is no doubt connected with the fact that the Sand Lizard is the favourite food of the Smooth Snake. Confined mainly to sandy and heathy localities, where it may nevertheless be quite common, it is an oviparous species, laying its eggs in shallow depressions where they are left to be hatched by the sun. There is considerable variation of colour locally, but the prevailing tint of the male is green; that of the female brown. She is usually a little larger than the male, reaching a length of eight inches. The food consists mainly of insects.

Rather smaller is the Common or Viviparous Lizard (*Lacerta vivipara*), which has a preference for hilly or mountainous country, but is more widespread than the former species and may also be found on sandhills and heaths. The colour is

variable, but usually brownish or reddish with pale spots, and a dark line down the middle of the back is nearly always present. Movement on land is swift, and it is a good swimmer. This species is ovoviviparous, giving birth to about 12 young at a time; no nest is made, and the babies, which are black in colour, take refuge under dead leaves or bark to absorb the remaining yolk until in a few days they commence hunting.

The well-known Slow-worm (*Anguis fragilis*) is also viviparous, the six or more young being born in the autumn. Though often mistaken for a snake, this is a true lizard, its serpent-like appearance being due to the absence of visible limbs. Though called slow- or blind-worm, it is none of these; its movements are rapid and its vision keen. The favourite food is slugs, and they are, therefore, beneficial to gardens.

All the lizards have the faculty of discarding the tail when alarmed and should, therefore, be handled with care. In captivity they become quite tame and form interesting pets; unless kept in heated vivaria they must be afforded means of hibernating during the cold weather. Immediately after hibernation and periodically during summer they cast their skins, and since they do not usually feed while doing this they require a hearty meal afterwards.

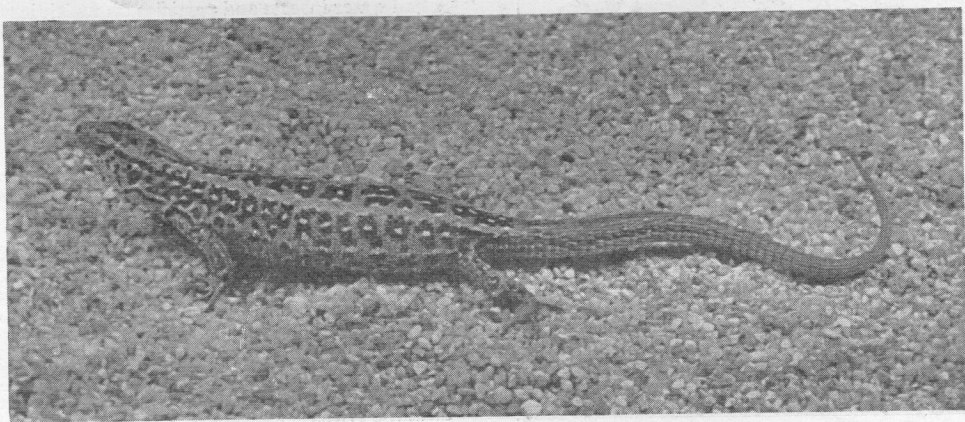


Slow-worm (*Anguis fragilis*)

Female



Viviparous Lizard (*Lacerta vivipara*)
Male on right



Sand Lizard (*Lacerta agilis*)
Female

(Photos: W. S. Pitt)

Indian Pythons Hatched at the London Zoo

Photos by R. A. LANWORN

THIS has been a good year for Indian Pythons (*Python molurus*) in the Reptile House at the London Zoo. During the spring three females laid batches of eggs and a number of healthy youngsters was reared from each. The period of incubation was 58 days, at the end of which time the embryos cracked the parchment-like shells by means of the egg-tooth, and emerged from the eggs.

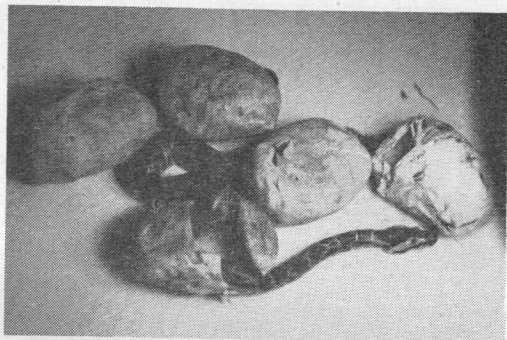
The stomachs were slightly distended with yolk, which was absorbed after three days. At five days

old they were given freshly-killed half-grown mice, which they struck and constricted before eating. Feeding frequently proved a difficult business, since when one was offered a mouse, several others would strike it at the same time. Those hatched in April are now eating four or five full-grown mice each per week.

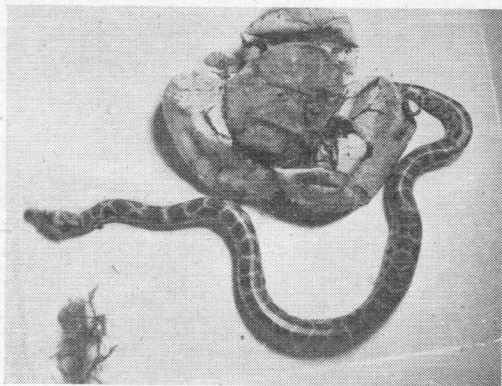
In all cases the young Pythons were aggressive at first, but very soon could be handled without biting.



An embryo Indian python uses its egg-tooth to break the egg shell, and surveys the world. When approached it popped inside again!



The danger past, young *P. molurus* disengages his coils from the egg-case and begins to explore



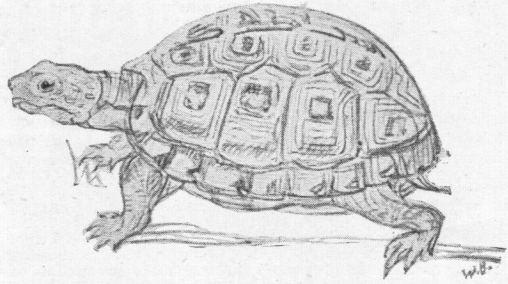
New and shiny but every inch a python!



Though aggressive at first, young pythons soon become tame

BOX TORTOISES

By ——— J. K. GOODY



THE Box Turtles, as our American friends so often call these species, belong to the largest family of the *Chelonia*, the *Testudinidae*, and the American ones with which we are most familiar, belong to the genus *Terrapene*, of which here are four species—all terrestrial—ranging over North America and Mexico.

These charming, lumbering, rather globular creatures, are characterized by the fact that their plastron, or under shell, is hinged by cartilaginous tissue and attached to the carapace by a similar material. The strength with which these Box Turtles can hold shut their plastron is truly amazing, as I know to my pain, having had a finger trapped between the carapace and plastron by a merciless female of the *Common Eastern Box Turtle* (*Terrapene carolina*) which is the species perhaps most commonly met with. It inhabits the United States as far south as the Carolinas, from the Mississippi to the coast.

The accompanying drawing will give you a good idea as to the shape of the Box Turtle. *Terrapene carolina*, is a dark brown of shell and spotted with yellow stripes, very variable in position. The male of the species has reddish eyes and the female brown. The skin is an olive-brown, blotched with yellow, in an irregular fashion. It lives almost its entire life on land, and is a poor, erratic swimmer. When placed in water the Box Turtle floats well out of the water and swims weakly, and in fashion that might be likened to a struggling fly, on the surface of a pond! An average specimen measures five to six inches in length and three inches in height.

When first captured the Box Turtle is very timid but it soon tames and grows to recognise its master and will often be induced to take food from hand. If annoyed or provoked the hitherto timid little fellow will hiss violently and sometimes strike at an offending finger. I can say from experience that although the "turtle" has no teeth its "beak" is very sharp and can inflict severe pain, biting in a fashion similar to a bad-tempered parrot! Apparently nothing on earth will induce the stubborn beast to loose its vice-like grip. It takes its time, inflicts what it considers suitable chastisement and calmly retires in its slow plodding way. Fortunately for the creature's popularity with vivarium keepers this is a rare occurrence!

The Box Turtle is perhaps the ostrich of the reptile world, for it eats a staggering variety of food. It most commonly feeds on insects, berries and earthworms, and young shoots of woodland shrubs. My specimens showed a fondness for salted crackers

soaked in milk, earthworms, sheep's brain, lettuce hearts, and amazingly enough, young snakes! I found this out quite by accident when a full-grown female was placed in a cage for a few hours with three young *Liopeltis vernalis* (the Eastern Smooth Green Snake), about five inches long and about the thickness of a large earthworm. This was on Sunday, June 10th, 1945. To my amazement the Box Turtle suddenly struck at the middle of one of the snakes, bit and clawed the front and hind portions away, devoured it and then ate the two other portions. Meanwhile, a second young snake had been striking viciously at the "turtle" and at the hand of the intruding onlooker. (This is apparently contrary to the peaceful nature of this little snake, which is stated never to bite, however provoked). Having finished its unusual meal the female turned to continue her slaughter, and similarly ate the second snake! It had eaten the first in five minutes, but it took considerably longer to get down the second. Meanwhile the third snake had been wiser than the second and I could not find where it had burrowed. However, on the afternoon of June 11th, at 3.40, I found the gluttonous old lady finishing it off. She blinked twice, gulped, and walked to a shady corner of the vivarium for a rest! Other foodstuffs reported by various American vivarium keepers are: grasshoppers, crickets, cantaloupe, watermelon, peaches, pears, apples, grapes, green corn (i.e., maize), mealworms, strawberries, cherries, meat (raw), pork, berries of various sorts, sliced carrots, beets, clover, tomato, banana, and slugs. Towards autumn the Box Turtles often grow so fat that they are unable to close their plastron. However, they are able to shut up the side which is touched. Thus, if the "turtle" is picked up and poked on alternate sides of the hinge it will keep opening and shutting alternate sides while either fat legs and tail, or a swollen chest, bulge amusingly from between the plates.

Like many tortoises the Box Turtle lives to a great age, some have lived from thirty to sixty years, and there is a report of one having lived for 123 years.

The Box Turtle's are not used for food, though Babcock says that in 1902 some coal miners from Siranton, Pennsylvania, ate some and were poisoned, though it is thought that the Box Turtle's had been

eating toadstools which did not harm themselves.

My specimens never bred in captivity though Miss Marion Bush of America says that the female lays her eggs in early evening in June and July. From three to six eggs are laid. These are oval in shape and Ditmars says they are very thin-shelled though brittle. The eggs hatch in 90 days, the young being about the size of a half-crown piece and flatter and more keeled than their parents.

The other three members of this genus, perhaps less commonly met with are: *The Three-toed Box Turtle* (*Terrapene triunguis*), which has a keeled carapace and usually lacks the yellow markings on the upper surface; the *Southern Box Turtle* (*Terrapene major*) which attains the size of seven inches, has a higher, more globular shell, which bears a number of closely set green lines which radiate from the centre of the shell; and finally, the *Ornate or Painted Box Turtle* (*Terrapene ornata*) which has no keel. With this species the green stripes of the latter are replaced by similarly placed, though thicker, yellow ones. The leg scales of this species often bear a pinkish hue.

In the hopes that some readers might have American friends willing to send them Box Turtles, I will describe a suitable vivarium for them. (They can be sent from America by post, in a tin or cardboard box, containing sphagnum moss. The long journey of four or more weeks by ordinary surface mail does not appear to bother them at all, for I have received several specimens in perfect condition in this way. Be sure to give them a good soak on arrival and also after hibernation).

An outdoor pen, about four feet by three feet, will suit four to six Box Turtles, though, like everything else, they are best not overcrowded. The cage sides, whether wire or wood, should extend below the surface for about 18 inches, as the creatures are good burrowers. Above the surface the sides should be about 18 inches above ground with a very small overhang. The latter refinement, although not absolutely necessary, is perhaps advisable. The pen should be in a shady location and the floor should be covered with a three inch layer of good clean sand. The top surface of this should be replaced by fresh material weekly during the summer months. A small pan of water may be given in very warm weather, though normally the "turtles" derive sufficient moisture from their succulent food. A few "durable" shrubs, such as young conifers, may be planted and, perhaps, a piece of grass sod to make the pen look more scenic. Hibernation need present no difficulties, merely let the creatures "dig in" themselves in autumn, and, perhaps, cover with hay or leaf mould for the winter. I have hibernated all except the *Three-toed Box Turtle* successfully in the north of England, but have never had a specimen of the latter on my hands in winter time. They have all been wintered in America, out of doors, from Maine to Kansas. It is often advisable to dig the ground to a depth of a foot below the pen to facilitate "digging in" in winter time.

POET'S CORNER



Those readers interested in poetry will no doubt be familiar with the name of Ada Jackson, one of the most distinguished modern poets, whose last book, "Behold the Jew," was a world's best seller, published in Britain, America, South Africa and Australia.

She is a member of the Wolverhampton Aquarists' Society, and her latest work, "In England Now," to be published shortly by Macmillan's in New York, contains a description of a tank in her kitchen. Since this rather unusual full-length poem is likely to become a classic, the aquarium will find an honoured place in the realm of literature.

Our photograph was taken by Mr. J. T. Jackson, husband of the poet, himself a keen aquarist, whose skilful work with the camera adorns our pages from time to time.

THINKING OF A POND?

(Continued from page 196)

The general scope of this account has been to give you an overall view of what is involved in the construction of a pool, and detailed information at each step should be sought in the special articles we have published in the past. There are also many excellent works of reference, of which a short, and by no means comprehensive, bibliography is appended.

A Simple Pond for the Amateur, by T. Brown. "Aquarist" booklet. (1/7½ post free.)

A Stream in Your Garden, by "B.B." Eyre and Spottiswoode.

Water Gardening, by Frances and Amos Perry. Country Life Ltd.

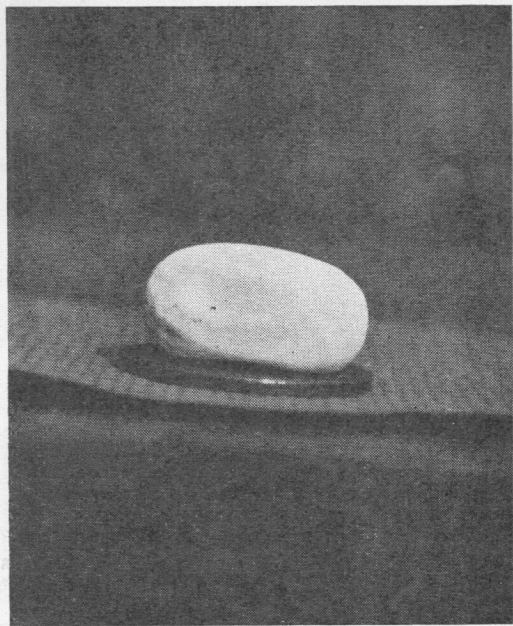
Fish Ponds and Home Aquaria, by F. Austin Watson. Collingbridge Ltd.

HATCHING THE EGGS OF THE GRASS SNAKE

By _____ VINCENT BUTLER, F.Z.S.

MANY keepers of reptiles have had the grass snake (*Natrix natrix*) lay eggs in captivity; these can easily be hatched and are a very interesting study. This summer I have hatched out a large number, some two hundred and fifty. My first hatching consisted of three batches of eggs, all laid in my vivaria; each egg is the size of a starling's, and they stick together in bunches of (usually) about 25 to 30. The method I use for hatching is quite simple. A small box with a perforated zinc bottom is half-filled with damp moss and is stood on a thickness of wet felt over the source of heat (in my case the bottom is heated by gas). The eggs are placed on the moss, covered over with another piece of damp felt and the box covered with a sheet of glass.

The thermometer registered 85 degrees F., sometimes falling to 70 degrees, under these conditions, and in forty days the eggs hatched out. It is



Egg of grass snake placed upon a penny for comparison of sizes

important to keep the eggs in a moist, but not *too wet* atmosphere. If allowed to get too dry they shrivel up, and if too wet they become mildewed. My method was to lift the box daily and keep the felt under it fairly wet so that warm moist air was passing over the moss constantly. After hatching out some fifty eggs from my own snakes, a man who frequently obtains specimens for me brought a huge mass of eggs (about three hundred) to me. On September 8th I placed this mass in the incubator; the eggs were very far advanced and were hatching out in batches of a dozen or so, until, at the time of writing (September 18th), about forty remain, and these mostly have the little snakes' heads sticking out from them. The eggs undergo several changes during the incubation; at first they swell out full and firm, but on nearing the hatching period they shrink and look half the size, so that the inexperienced might well think that they had gone bad. But on the fortieth day the tough skin is split by the little snake using the egg-tooth. Several slits are seen and then the tiny head is pushed out. On no account should they be touched at this stage. In three days after showing the head they will have absorbed their yolk-sacs and emerge as plump little snakes, surprisingly large for the size of the egg. At this stage the average length is six or seven inches and they are darker in colour than older snakes. They vary much in size, as do the eggs themselves, and in a large quantity many very beautifully marked specimens are to be expected. After hatching I place the young snakes in an old aquarium tilted up at one end to form a small pond (about a pint of water), and at the high end I place some dry moss and pieces of bark. In three days the snakes slough and appear brighter in colour; at the twelfth day they slough again.

Now, regarding their feeding. Bateman, in his *Vivarium*, suggests feeding them on worms and slugs, but I have made a careful study of this matter and I do not think they can be induced to eat worms in a regular way. I did once actually see one eat a small piece of worm, but though I have constantly placed worms in front of them I have never again seen one eaten, and I do not think that in the natural state worms are eaten by the snakes at all. Small newts are their natural food at this stage, and in my opinion, even small frogs in late September are too large for these young snakes. My collector brought me about sixty tiny newts. When I placed them in the vivarium with some 150 hungry little snakes, it was a

(Continued on page 241)

survive. In some places the sedge has been cut too frequently and so time has been provided for rapidly maturing plants to make their appearance. One of the chief competitors is the Purple Moor Grass (*Molinia caerulea*) which, where the right conditions have prevailed, has become entirely dominant. Therefore, two distinct areas can be distinguished apart from the pure sedge. They are the "mixed sedge" area, which consists mainly of *Cladium*, with some *Molinia*—the crop being known locally as "sedge litter," and the area providing litter which consists of *Molinia* and Rush (*Juncus subnodulosus*); this crop is used for bedding cattle. Many flowering plants are found at Wicken Fen including seventeen species of true sedges (*Carex*), and but for the effective steps taken by the National Trust they would rapidly cover the area at the expense of all other vegetation.

Water Voles and Water Shrews make their homes there, and they include a black variety of Bank Vole peculiar to the district.

Smooth and Crested Newts are common in St. Edmund's Fen, where they winter in the roots of trees. A few frogs and toads make their home there, while some years grass snakes are very much in evidence swimming across the lodes; lizards (*Lacerta vivipara*) are quite a common sight on the banks and among the dried litter.

Because the lodes, dykes and ponds are permanently filled with water, many varieties of fish are found including pike, chub, roach, bream, dace, tench, gudgeon and rudd, while both species of sticklebacks regularly nest among the weeds. Lamprey, loach and eel pout are found in the waters, and, because of the numerous microscopic plants, many varieties of water-fleas (*Cladocera*, *Ostracoda* and *Copepoda*), and other tiny animals abound, some being peculiar to the district. Several varieties of flatworms make their homes at Wicken, and the majority of the British Leeches can be seen. These are mostly blood-suckers of fish, newts and snails, but the Medicinal Leech is almost extinct, owing to the drainage.

There are thirty-four kinds of aquatic molluscs,

which include the Freshwater Mussel (*Anodonta*)—this being used as food by the people until the end of the last century. Some Pearl Mussels (*Unio*) are in Monk's Lode, while a species of fresh-water Sponge and *Polyzoa* and Rotifers can also be seen. There are many water snails, including the large freshwater winkle (*Paludina vivipara*), which can be seen crawling about in the clear water.

Among the forty-five species of "water bugs" to be found are Water Boatmen, Water Scorpions and *Ranatra*, as well as the Pond Skaters, which are so light that they are able to glide over the surface film.

There are at least one hundred and thirty water beetles at Wicken, including the cannibalistic *Dytiscus*, the vegetarian *Hydrophilus*, and the Whirligigs (*Gyrinidae*). An interesting species is the tiny *Staphylinid* beetle belonging to the *Stenus* genus. It is a terrestrial beetle which lives in flood rubbish, and places which are liable to flood. It is unable to swim, and in water performs a jet action by ejecting minute quantities of fluid from the hind end of the body, and so is propelled to either dry land or vegetation, where it climbs out to safety. Wolf spiders skim the surface, and Water spiders (*Argyroneta*) live beneath it.

Many insects who, during the early part of their lives, are dependent upon water abound, May-flies, Dragon-flies and Caddis-flies flourish, and the majority of the British species are found here. If the sun is shining the dragon-flies will be seen on the wing, but during dull weather they will be found clinging to the reeds.

Most of the fifteen species of mosquitoes are innocuous, although some of the females do bite fairly persistently. Malaria or ague, as it was formerly known, has disappeared, probably due to the fact that another type of mosquito has replaced the *Anopheles maculipennis*.

It is the aim of the National Trust to preserve Wicken Fen, and all its hosts of inhabitants intact; due acknowledgements must be made to Dr. Thorpe of the University of Cambridge for his kind permission to publish these facts and the accompanying photographs.

A FLOATING FEEDING DISH

Cleanliness being a very important factor in fish culture, the use of a celluloid or perspex dish suspended in the water to a suitable depth would appear to be an advantage, and fish educated to the idea after continued use soon acclimatise themselves to this form of feeding. The simple idea is to utilise a floating celluloid feeding ring or cork disc of suitable weight carrying capacity to support the dish suspended by the ring or cork disc which allows the removal of surplus food when the fish have had sufficient, thus preventing the dispersal of the remainder to pollute the water. The cork or celluloid disc can doubtless be obtained from dealers or the cork variety fashioned to shape by hand, and sandpapered to one's wishes, thereafter being finished with a coat of filler, and one or two coats of suitable varnish to prevent it becoming waterlogged. Then insert three small screw eyes and suspend the celluloid or other dish by means of very light chains, preferably of chromed material. The cork or celluloid ring could conveniently be about 3 ins. outside diameter, and the supporting chains 4-5 inches long. The device should be floated in the tank and the food placed within the ring from which area it will fall into the dish, and can be removed when sufficient food has been taken. The life of the gadget will be lengthened if it is not permitted to remain in the aquarium continuously.

A. W. C. Copping.

HATCHING GRASS SNAKE'S EGGS

(Continued from page 237)

pleasure to see the excitement and struggling that ensued—sometimes two or three snakes hanging on to one small newt! It will be in October before the last of my eggs hatch out and I am inclined to think that these late-hatched snakes go into hibernation without eating at all.

I am giving these little snakes to those of my herpetological friends who would like to experiment in their rearing, and if, at the time this article is in print, any remain, I should be pleased to give them to any reader of *The Aquarist* who would be interested to have them.

(Readers wishing to take advantage of Mr. Butler's kind offer should write to his address at 8, Riverside Court, Cambridge.)

J. K. GOODY relates his experiences

with

A DESERT VIVARIUM

BEFORE the recent troubles closed communications with Palestine the writer was pleased to receive a few representatives of the fascinating herpeto-fauna of that country known but slightly to vivarium keepers here. Considerable experimentation is doubtless still needed before these creatures can be kept by private enthusiasts.

Of the specimens in my collection the chameleons (*Chameleon chameleon*) were the most difficult. The specimens, varying in size from three to eight inches arrived a sickly yellow colour which turned to brown when placed in their sunny, warm, humid vivarium (3 feet) criss-crossed with branches for them to climb over. It should be noted here that the colour background does not affect the lizard's colour—rather light, temperature and temperament. If a light was suddenly turned on during the night the chameleons were found to be green. Yellow appears to be the colour when cool, underfed, and in dark surroundings; brown is the normal colour in optimal conditions. From the start they fed very well on house flies and even gentles, with their incredibly elastic tongue flicking out so quickly as to be hardly visible, and making a noise like the snapping of a rubber band. (In a similar manner they lapped up water.) Prior to eating they would deliberate carefully in the manner of a connoisseur caressing a glass of wine, whilst rolling their telescope eyes into focus! They are ludicrously helpless on a flat surface as their feet are bifurcated like a pair of pincers. Their general appearance is too well known to merit repetition here.

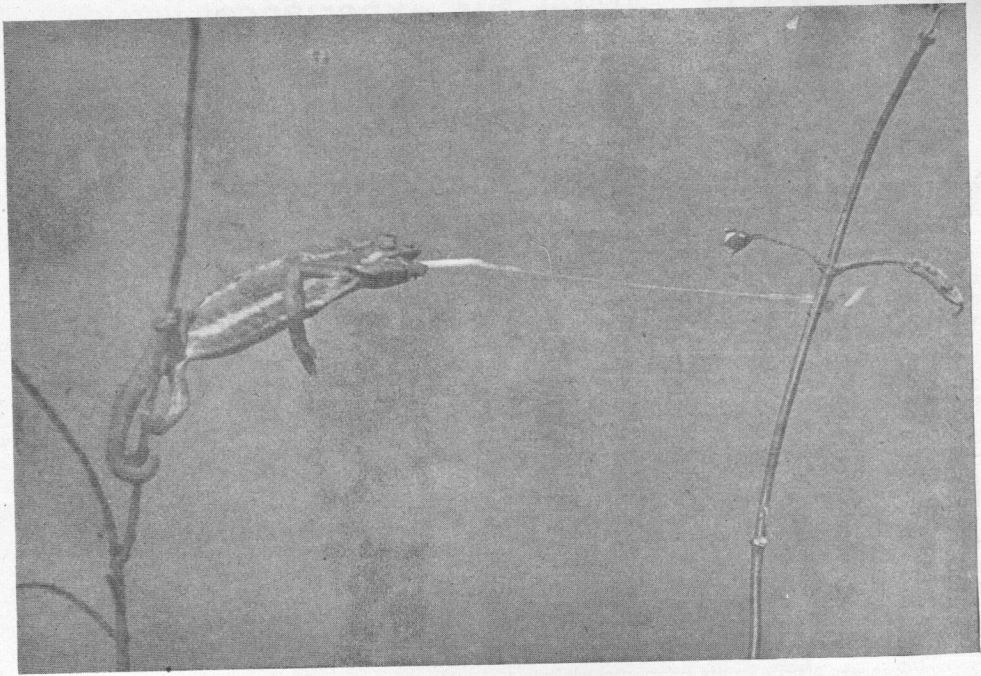
Alas, after about two or three weeks the lizards went off their food, languished and eventually died one by one. The temperature throughout was maintained at 75 to 80 degrees F. and the atmosphere kept humid by spraying. A change in diet had produced no effect; obviously therefore, in our attempts to keep these creatures we lack some essential environmental factor. This may be space, humidity, or merely something in the lizards' temperament.

The beautiful little skinks, however, settled down well in a vivarium floored with coarse sand and artificially heated. During the day they largely remained burrowed, appearing at night, feeding on

gentles and even strips of raw beef about 1 in. \times $\frac{1}{4}$ in. from the fingers of a starving, but sacrificing, would-be amateur herpetologist! The little lizards are superlatively beautiful, glistening and scintillating like little china figures, so smooth and shiny is their surface.

The sand-skink (*Chalcides sepioides*), with its very degenerate legs is a lovely deep ivory colour with sandy dorsal bars running from its wedge-shaped snout to tail. The ocellated skink (*Chalcides ocellatus*) has beautiful brown and gold eye-like markings over the sandy-coloured dorsal surface. Both of these species "swim" through the sand with snake-like movements, their limbs tightly pressed against their sides. (To those who would keep some of these creatures I would tender one word of warning—rather than place a water dish in their case, wet a small area of sand. The reason for this precaution is connected with the amazing ability several of my specimens had for drowning themselves in $\frac{1}{4}$ in. of water!)

The huge skink (*Mabuia vittata*)—well over a foot long—is also beautiful and enduring, feeding well on grubs, beetles, etc. The little "Warty Gecko" (*Hemidactylus turcicus*) was found to be extremely delicate and easily bruised by handling. Although they fed on flies and maggots in the evenings, they never seemed happy, and some died. These creatures are just over 2 ins. long and have a grey surface stippled with irregular black spots and small granules over the back. Two rows of enlarged tubercles stretch down the side of the body and tail, which is somewhat broader in the male. Their eyes are bright and prominent. One day in the spring of this year several escaped into a friend's fish house and although seen from time to time on the warm pipes could not be retrieved. They evidently found ample food in the escaped flies in the fish house. At the beginning of August a number of tiny little geckoes, about an inch long, little thicker than a matchstick, were observed. These were doubtless the progeny of the A.W.O.L.'s, but unfortunately, still prove as elusive as their parents—so far, only one has been caught! We failed to keep them happy in a vivarium but they obviously have become well established in the fish-house. Apparently two



The Chameleon "in action"

eggs are laid at a time, at intervals, throughout the season.

Correspondents in the Near East find that this species does not keep too well in captivity even in their native climate, so we have accidentally succeeded where they fail with it. This gecko has been naturalised across the world and is found from Persia to the Red Sea, Somaliland, Egypt, across the Mediterranean coastline to Morocco and the Canary Islands. Surprisingly enough it is found in the New World, in Florida, Cuba and Yucatan.

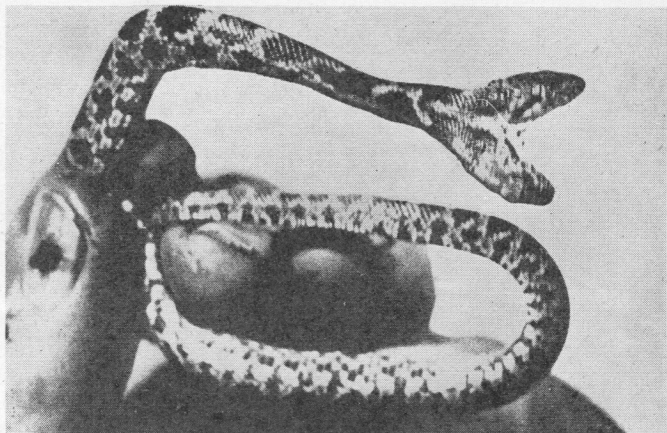
The fearsome-looking, though very nervous and jumpy Agamas (*Agama stellio*) proved rather puzzling captives. The approach of an observer to their vivarium led to violent sideways scuttling and frantic attempts to hide. Hence it is impossible to keep any other reptiles in the same vivarium. They were observed to feed on caterpillars and maggots, but were not seen to take flies. The Arabs loathe this creature—which they call the "hardim," and kill it whenever possible. The apparent reason for their violent distaste for this harmless creature is the Agama's habit of nodding its head up and down, thus appearing to mimic the Mohammedan mode of prayer. Our Agamas never fully settled down in captivity and most died off in the fifth and sixth weeks of captivity. However we have now heard facts from correspondents in Palestine which may account

for our failure. In its natural habitat the Agama is regarded as hardy and tenacious of life in captivity. There it is provided with vivaria of great height as the creatures are dependent on *vertical* living space. Hence, two or three walls of a vivarium, several feet high, should be lined with an irregular brick wall of sandstone and the floor covered with sand and gravel. In one corner a drinking bowl should be placed and the surrounding soil kept moist. Temperature is maintained at not less than 60 degrees F. throughout the year, rising to 85 degrees F. for about four to six hours a day in the summer months. Much sunshine is essential so that a bright fish-house or greenhouse is practically a necessity.

Herpetologists in the Near East breed Agamas in their vivaria. The females lay up to a dozen eggs in the sand of the vivarium; they are removed from this and hatched in glass containers kept in the dark. The eggs are placed on moist cotton wool at a temperature slightly higher than that of the ordinary vivarium, and hatching occurs in eight to ten weeks.

We are now more confident in our attempts to keep these and other species—which are surely not beyond the scope of the amateur vivarium keeper if willing to undergo a little trouble, a little expense, a little heartbreak and if imbued with no more than a little patience.

REPTILIAN MONSTERS



By _____ ERIC HARDY, F.Z.S.

Photographs by the Author

WHAT is a monster? At the time when the Loch Ness monster filled up a lot of vacant news space in our daily papers it encouraged a train of lesser monsters to follow, and many of these were not monsters at all but merely large animals of some sort or other. For a monster is unnatural, a freak, abnormal in shape or structure, the market for menagerie proprietors and curio dealers.

The photographs of double-headed reptiles which appear here illustrate a very interesting example of freakishness which probably originates as an injury, an abnormality in the inheritance factors of the embryo cells, or the fusion of two developing embryos, for these creatures are so born from apparently normal parents. A double-headed water-snake (*Natrix tessellatus*) came to me in an interesting way. Found by an Arab on the Transjordan side of the famous Jordan Valley, it was first taken to a British military hospital in Jerusalem where, as with most specimens that come the way of a laboratory biologist, it immediately went into a jar of methylated spirits. Only the chance discovery by a medical member of the Jerusalem Naturalists' Club brought its interesting history to light and it was already well dead when it reached me. But with the aid of herpetologists it was possible to conclude, from its size, that it was a yearling and possibly it had never fed at all. The X-ray photograph subsequently taken showed clearly that the division for the two perfect heads started at the neck, but if only the serpent had been brought to us alive we should have had the

fascinating opportunity of seeing how it fed. These particular snakes by the way are very common in the waters of the Near East and apart from biting freely are harmless. I watched them frequently swimming in the middle reservoir at Solomon's pools, Jerusalem's historic water supply, where they kept out in the deepest water, swimming with the body at an angle of 45 degrees, wriggling the flattened, oar-shaped tail, and keeping the head a couple of inches above the water surface in order to scan out for their prey—young frogs, and toads, aquatic beetles and fish fry.

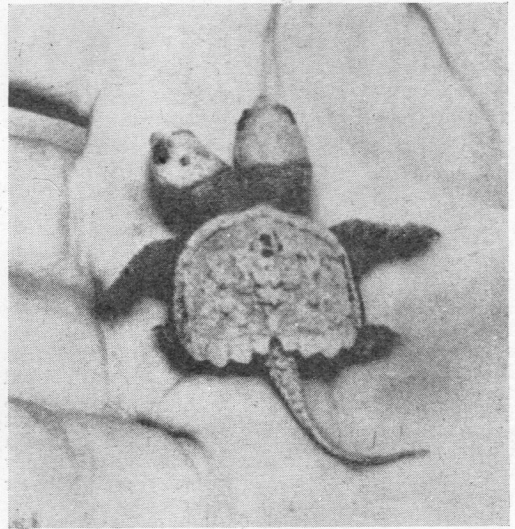
This Colubrine may also be found in the waters of South Europe, as far across south Russia as to Siberia, also in Western China, North-West India, Persia and from the Euphrates valley in Iraq to the Nile in Egypt so that it is numbered amongst the most widely distributed of reptiles. It is common in those wealthy eastern gardens which make such extensive use of the cooling effects of water in pools and fountains as well as irrigation channels, and of course the aqueducts and drains like those flowing through the streets of Teheran, the Persian capital, are its elysium. It seems to adopt a very fierce attitude when handled, despite its non-poisonous nature, but I have not yet heard of any previous example of "double-heading" in this snake's many haunts.

However, double-heading has been known before in other species of snake, chiefly from U.S.A. collections. They usually arise from an accident

where two developing embryos fail to become individualised and a double-headed snake is born. A large double-headed Milk Snake lived for some months in New York Zoo before the war, while an even larger double-headed Copperhead Snake was caught wild in the woods of Pennsylvania.

Collectors of reptiles will, no doubt, have other instances of "monsters" and freaks. Sometimes they may be seen at the Zoo, perhaps in the form of an "albino" or one otherwise abnormally marked. For example in 1932 London Zoo received a white python, marked with a number of orange patches, but with the usual dark colouring absent. Like true albinos it had pink eyes. Incidentally, later in the same year a double-headed turtle was found and photographed near New York, but it was a young specimen which had apparently not eaten despite its strange appearance.

Scientists of course dismiss much of the interest in freaks and monsters shown by the layman and prefer more attention to be paid to the functioning of normal structure and to the habits of the animals. That is true in itself, but a large number of amateur zoologists follow the subject in their leisure because it interests them, and because they get some enjoyment out of it. I certainly found that for every person I could interest in a "straight" collection of reptiles in pickle jars, twenty were interested to see the double-headed snake. Indeed, I failed to interest anyone else in a specimen of the Sand-Boa which lacked the normal dapples and blotches by which this reptile is distinguished. However, if people who are fortunate enough to find a double-headed snake or some other "monster" would not kill it,



Double-headed young "turtle"

observation upon any possible feeding habits would afford much more interest than could come from a dead specimen in a pickle jar. Worst of all is the case where a collector drops his specimen into formalin for preservation, instead of into alcohol.

Blind Cave Fish

ACCORDING to a newspaper report, a species of blind fish has been found in the Padirac Cave, Southern France. M. Guy de Lavour, who made the discovery, descended thirty feet into the cave in a diving suit and then penetrated ninety feet of underwater gallery before reaching the lake where the fish were located.

During the last decade or so a number of blind cave fishes have been found in various parts of the world. One of the best known to devotees of the aquarium hobby is *Anoptichthys jordani*. This fish is a Tetra or Characin. It was found in 1936 by Indians exploring subterranean waters in some obscure caves in Mexico. News of the "find" was communicated to C. Basil Jordan, of Dallas, Texas, who soon organised an expedition to collect some of the fish for the benefit of science and the aquarium-keeping hobby.

The general body colour of *A. jordani* is translucent pink. The species grows to a length of about three inches. The eyes are rudimentary and quite blind. The fact of being sightless, however, does

not appear to handicap the fish in any way, for it finds living and dried food easily, and rarely collides with fixed or moving objects, such as other fishes, possessed of normal sight.

Much to the joy of tropical fish keepers, the species has bred several times in captivity. A few American fanciers have witnessed the spawning procedure. It is quite simple. The female takes up a position close to the floor of the aquarium, and rocks her body from side to side. During this sideways motion she extrudes some eggs. Then the male swims to the spot and repeats a similar rocking motion. It is presumed that during this performance the male releases his fertilizing fluid (semen). After spawning is over, in aquaria, the parent fish usually eat their eggs.

A. jordani has been hybridised with *Astyanax mexicanus*, from which species it is said to be descended, on several occasions. At least one brood of fry resulting from these matings possessed normal eyesight.

J. H.

A HERPETOLOGICAL CALENDAR

compiled by _____ W. G. RUFFLE

THE study of reptiles and amphibians probably brings far more surprises than most branches of zoology, although perhaps not as many as does the study of insects. Having received several inquiries last year regarding the times of emergence, breeding, etc., of the British reptiles and amphibia, I have worked out a complete "calendar" of authentic details, based upon personal observations over a period of twelve years.

January

Venturesome newts and *male* viviparous lizards are liable to appear in small numbers around noon on a mild day. In 1937, an adult slow worm was found on January 7th.

February

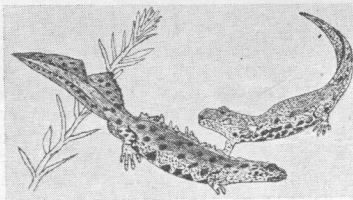
Provided there is a fair number of fine days, male viviparous lizards become quite active, and even appear a few hours after a stiff frost. Frog-spawn may appear as early as February 2nd, and newts become easy to find. Adders often appear.

March

About the middle of the month croaking toads are to be found in dozens, hopping towards the nearest pond. Blindworms emerge on suitable days, and by this time female and immature lizards are active.

April

All reptile and amphibian life is in full swing. Blindworms and grass snakes are fully active, whilst in the ponds the male newt, complete with nuptial crest, can be seen gaily "courting" his mate.



May

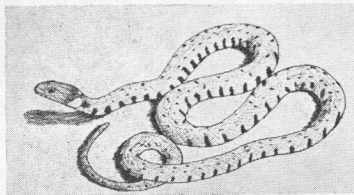
Courtship of lizards and slow-worms. In the case of the viviparous lizard this consists of selection by the male of a suitable mate, which he seizes by the middle of the body and then manoeuvres himself into such a position that the cloacae of the two animals meet. The compiler of this calendar has never seen slow-worms in the process of mating, but males become very aggressive at this time.

June

A quiet month for reptiles. All tend to begin to seek the shade around mid-day. Newts begin to lose their crests, and the Smooth and Palmated kinds leave the water, become nocturnal in habit.

July

The birth month for viviparous lizards and adders. The young are laid in sheltered spots and soon escape from the flimsy "egg-sacs." Young frogs and toads leave the water, having completed their tadpole stages. Newt tadpoles are growing, and have fully developed limbs, but the external gills are still prominent.



August

Young grass snakes hatch and are active. Specimens only a few weeks old disgorge 3 inch newts when captured. The Great Crested newt leaves the water.

September

Relaxed temperatures cause all true reptiles to bask in exposed places throughout the day. Young slow-worms are born in this month. They are silvery-grey above and dark underneath, with a dark medial line along the back.

October

The eve of hibernation. Adult lizards and slow-worms are the first to retire. Young lizards, frogs and snakes remain active all the month. Toads and newts are seen on mild evenings.

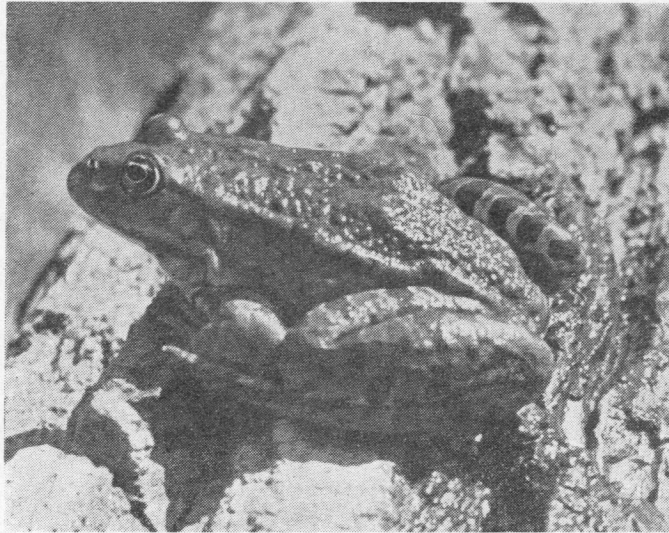
November

On a suitably fine day a very venturesome young lizard or snake may still be found. A young lizard has been known to appear as late as November 27th. Frogs still not settled down at the beginning of the month.

December

This is the only month of the year for which my records, so far, are completely blank!

Here to Stay_____



The Marsh Frog
(*Rana ridibunda*)

(Photos by
Douglas Fisher)

By _____ MAJOR MAXWELL KNIGHT, O.B.E.

(Foundation member of the British Herpetological Society)

THE establishment of a new creature in a country is always a matter for discussion and controversy. You will note that I say "creature" not species, for it is not yet fully established whether the Marsh Frog (*Rana ridibunda*), is indeed a separate species or a variety of the Edible Frog (*R. esculenta*). Boulenger, in his work, *The Tailless Batrachians of Europe*, was of the opinion that *ridibunda* had no claims as a species, and it appears that naturalists in Hungary and elsewhere in Eastern Europe still confirm this view; nevertheless to a field naturalist like myself there appear to be many marked differences in the two frogs—differences in both behaviour and appearance. This point of classification will, no doubt, be solved before long, and in the meanwhile those who are interested in the amphibia can welcome a highly decorative and lusty addition to our fauna.

The history of the introduction of the Marsh Frog into Kent is a striking illustration of what may happen when such experiments are undertaken.

In 1935 four pairs of *Rana ridibunda* were placed in a garden pond by a keen naturalist living on the Romney Marsh. The frogs seemed happy, but before long they disappeared and evidently left their garden quarters for the wider and more natural attractions of the dykes which intersect this vast area of marshland. There can be no doubt that the

move suited the frogs, for by 1937 the local population was grumbling about the croaking made by the males in the breeding season. At the present time any visitor to the Romney Marsh, during the month of May, will be sure to hear the frogs' chorus at night, no matter what part of the Marsh he may visit, for the frogs have spread in all directions in countless numbers. It is difficult to understand how the frogs became a nuisance in two years, as it is unlikely that even under the most favourable conditions the offspring of the original eight individuals could reach maturity in so short a time; but it is quite certain that complaints were made. Perhaps all the early complaints were about the same four males—even four males in full voice can make enough noise on a still night to keep a person awake!

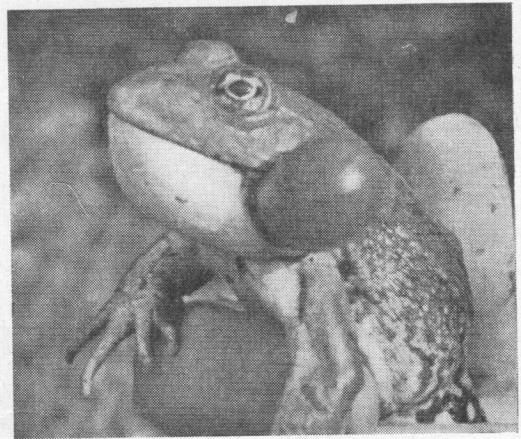
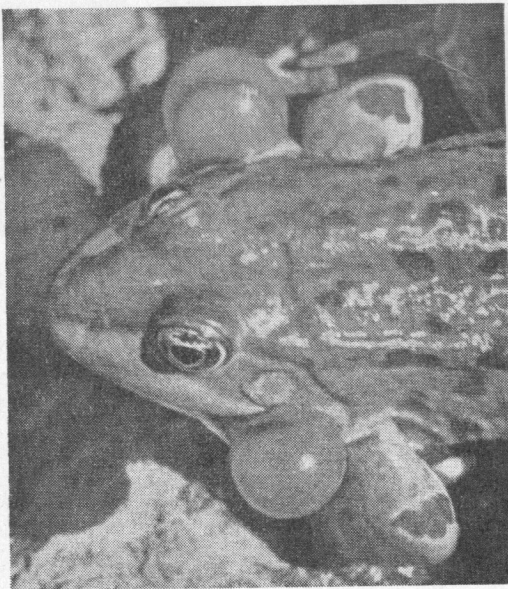
As you will see from the illustrations, the Marsh Frog is a large batrachian. A fully grown female exceeds our Common Toad in size, and both males and females are considerably larger than the Edible Frog. In colour the Marsh Frog is just as hard to describe as any other member of the family, as it has to a very marked degree the ability to change its colour to suit its surroundings and lighting conditions. Normally it is a drab greyish hue with large square brown spots on its legs and smaller spots dotted over the back. On a sunny day the frogs like

to sit on the banks of the dykes and bask, and then they assume a very lovely grass-green colour. The vertebral stripe, conspicuous in *Rana esculenta*, is seldom present in *ridibunda*.

At all events you will have no difficulty in identifying *ridibunda*, for as you walk along the banks of the dykes you will, on any warm day, see the frogs leaping into the water ahead of you. The Marsh Frog is very aquatic and is never more than a few yards from the water, and if you sit quietly after having frightened the frogs into the dyke, in due course you will see heads popping up; by using binoculars you will get good close-up views. If your visit is in May you will certainly be able to watch the croaking as well as hear it. The vocal sacs of the male, which are shown on the accompanying photographs, inflate to the size of a small grape, and you may well see two rival males engage in a croaking contest. If you are lucky you may see them "fight," which they do by butting each other and even snapping at each other in an effort to drive a rival away from the vicinity.

The appetite of the Marsh Frog is voracious, and the range of food is very wide indeed: land and water beetles, dragonfly larvae, moths, grasshoppers, spiders, water shrimps, worms and, of course, tadpoles of any kind—including its own! Food is taken in and under the water as well as on land, and the frogs will feed even in quite chilly weather. Last year I observed some feeding all through October and well into November.

One of the startling things about this frog is its rate of growth. I have had some specimens under close observation in conditions differing very little from those of nature and I have watched a frog which



The male Marsh Frog has inflatable vocal sacs, and these are plainly shown in the photographs on this page. Above, a protesting croak is delivered as the frog is held in the hand

measured 48 mm. in length in July, nearly double this length by September, and reach 103 mm. a year later.

Regarding the breeding of *ridibunda*, spawning takes place in May, as with *Rana esculenta*; the eggs are smaller than those of the Common Frog, (*R. temporaria*), and they do not float in masses but are to be found submerged. The tadpoles grow quickly but it is not certain whether they sometimes over-winter, like those of the Edible Frog. It is noticeable, however, that they vary a great deal in size and development in different places on the Marsh. The tadpole is as voracious as the adult and they devour each other with vigour. Judging by the really remarkable spread of this frog over the whole area of the Romney Marsh it can have few predators, and this raises the question of its relative value or otherwise as an introduction.

Personally, I like the Marsh Frog. It is handsome to look at, amusing in its habits, does well in captivity, and is valuable for scientific research; but much as I should like to give it a blessing I am not sure that I can. The folk who live on the Marsh say that the mosquitoes have diminished since *ridibunda* became established, which is a good point; but against this must be reckoned the falling off in the numbers of Common Frogs, newts and probably toads, to say nothing of Dragonflies. Now all these creatures are beneficial to gardeners and farmers, but the Marsh Frog cannot put in such a claim, for he never goes sufficiently far from his dykes to take a toll of small slugs and garden pests. No, I am afraid that *ridibunda* is, like most introductions, a doubtful blessing. All the same I still like him and admire him and, anyway, I think he is here to stay!

HUGH WALKER describes the construction of An Indoor Vivarium

WHEN contemplating building an indoor vivarium herpetologists can usually be placed in one of two groups: (a) those building to their own specification with a more or less unlimited amount of space, or (b) those limiting the size of the vivarium to the space available.

I am one of the unfortunates in the latter category, and I feel sure I have a goodly number of ardent herpetologists with me in this respect. It is to meet their requirements in some measure that I will describe my efforts in this direction.

In one room there is an alcove 4 ft. 11 ins. long by 11 ins. deep in which I had previously built a framework and installed four 24 × 12 × 12 in. tanks, three housing tropical and cold water fish and one containing Axolots; under these were two shelves running the full length of the alcove, made of 9 in. × 1 in. wood and having a depth of about 12 ins. each.

After a time these two shelves became a dumping ground for all the household's "bits and pieces" and, of course, being open to the sight of any visitor, drew forth recriminations from the lady of the house.

Several abortive attempts on my part to obtain the "playroom" for my indoor vivaria finally gave way to a determination to install at least one indoor vivarium on one of the shelves: this suggestion meeting with very little opposition, I struck whilst the iron was hot.

Material was the main problem, but by scouting around I was able to procure all I required. A piece of three-ply wood 54 in. × 16 in. was obtained for the back, and 30 feet of 2 in. × 1 in. wood provided the uprights and crosspieces, whilst the top shelf met the requirements for the base.

First, I lowered the bottom shelf 3 ins. and the supports for the upper shelf 6 ins., thus giving clearance on the bottom shelf of 9 ins. for books and equipment, and giving me 18 ins. above.

The space now available was 4 ft. 6 ins. long (allowing for the shelf uprights) by 18 ins. high, and I decided that the width, although only 11 ins., could accommodate at least 13 ins. (giving an overhang of 2 ins., this being 1 in. beyond the tanks above).

There now only remained the matter of glass and perforated zinc. The latter I obtained from an ironmonger in the form of small pieces (remnants) for a matter of a few pence. Half a dozen sheets of glass 18 × 12 ins., screws, nails and clips for the glass were also purchased.

The actual construction of the vivarium was comparatively simple; for the base I used the upper shelf (4 ft. 6 ins. × 9 ins. × 1 in.) and added two

4 ft. 6 in. lengths of 2 in. × 1 in. by battening across the underside with three pieces of 1 in. × 1 in., setting the two end pieces 1 in. in from either end, finally sawing out a piece 2 in. × 1 in. at each corner to accommodate the uprights, and two pieces 1½ in. × ¼ in. on the front edge (these latter were spaced according to the glass available). For the rough layout see figure.

Next, I cut a 4 ft. 4 in. length of 2 in. × 1 in., at the same time making two slots 1½ in. × ¼ in. on a 2 in. side to correspond with those in the base. This piece was now fixed along and on the top of the front of the base, giving a retaining surface of 2 ins. The corresponding piece for the top was now cut, this being 4 ft. 6 in. long and slotted in a similar manner to the bottom piece. The four end pieces were now cut, the two bottom pieces being 9 × 2 × 1 ins., and the two top pieces 11 × 2 × 1 ins. The bottom pieces were now fixed in their appropriate places on the edge of the base, thus making a three-sided shallow box 2 ins. deep.

The cross piece for the back consisted of a 4 ft. 6 in. length of 2 in. × 1 in. and to this I fixed the three-ply, thus giving me the back of the vivarium ready for assembling. (Plastic board can be used quite successfully in place of three-ply.)

The uprights were the final consideration, and these were perhaps the least trouble of all. Two front pieces 14 × 2 × 1 ins., two of 16 × 1½ × ¼ ins. (where this wood originated from I have no recollection), and two pieces of 14 × 2 × 1 ins. for the back.

The four corner uprights were now fitted into the corner pieces of the base, the two central uprights being fixed into the slots provided. To the top front piece were now fixed at right angles the two pieces of 11 × 2 × 1 ins., one at either end and behind the cross piece, leaving the two 1½ in. × ¼ in. slots in front. To the other end of the 11 in. pieces the back was fixed.

The fixing of the top pieces on to the uprights was of a very elementary nature. I cut four right-angled triangles of three-ply wood, each with two 4 in. sides, from a scrap piece sized 8 ins. × 4 ins., and used these to fix the top on to the uprights, using two pieces at each end and fixing them on the inside of the vivarium. There only now remained the back to fix on to the uprights and the base, thus completing the construction of the framework.

On the front of the vivarium I fixed twelve clips to hold the glass, which in my case consists of two pieces of 18 ins. × 12 ins., and one of 15 ins. × 12 ins. in the centre (this latter I had to cut down). The ends were completely covered with perforated zinc.

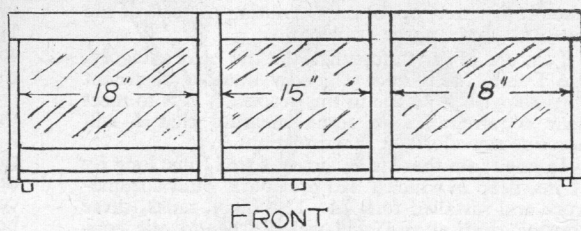
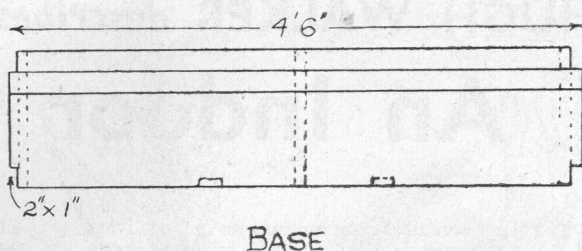
Inside and outside have been painted and enam-

elled a deep cream to match the aquaria already installed. The question of waterproofing the base of the vivarium was solved by using undertakers' wax coffin lining, which I have found singularly effective, and which should be obtainable from any undertaker. Regarding the use of this wax, I have two very important things to say: after heating the wax until it is in a liquid form, brush it on with a paint brush, allowing each coat to set before applying the next. Do *not* pour it into the bottom of the vivarium, especially if there is coconut matting on the floor! I speak from bitter personal experience.

Finally in the construction, on the top I fixed perforated zinc for a distance of six inches from either end (but this could be dispensed with), and covered the rest with glass. Being anxious to finish the vivarium, I just rested the glass on the top, but have since discovered that this is far from satisfactory if one is keeping snakes—it is surprising how easily a snake can lift the glass, and then discover the most out-of-the-way places in which to hide.

It was only after a considerable amount of experimenting that I discovered the best way of setting up the inside of the vivarium—this, of course, is dependent on the position in regard to the window, fireplace, etc., and I have found that a two to one bulk mixture of peat-moss and silver sand is a very suitable medium for all normal purposes. It holds the moisture quite well, and ferns thrive in it if kept moist. At the present moment I have a number of cactus plants installed, which with the rocks in the vivarium give quite an effective setting. The mixture of sand and moss has proved satisfactory for hibernation, and so far, for uneaten worms.

A "pond" has been installed in the form of an enamelled photographic developing dish $24 \times 9 \times 2$ ins. This I have placed on two tiles, which gives a clearance of $\frac{1}{2}$ in. between the bottom of the pond and the base of the vivarium. I found this



necessary to prevent worms from becoming trapped and subsequently dying and decomposing.

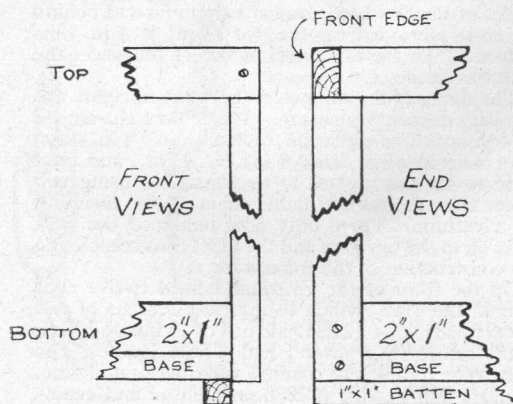
Just behind the front retaining piece I have fixed a row of small rocks to hold back the compost. Over the top are fixed two 25-watt lamps.

At the present time the occupants of the vivarium consist of about a dozen adult slow worms and the same number of youngsters; two spotted salamanders; half-a-dozen Viviparous lizards; four Fire-bellied toads; two Yellow-bellied toads; three Alpine newts, and a pair of Crested newts. I would, at this point, add a word of warning: if you do install a pond in a vivarium in which you have any slow worms, be sure to provide an easy escape by means of sloping rocks for any youngsters that may be born and inadvertently find their way into the water.

This is only an account of what I have done with a limited amount of available material and space. The methods used are elementary but can be adapted to a vivarium of any size. If you have an old all-glass aquarium that has been laid aside owing to a crack or other slight defect, this can easily be converted into an attractive vivarium for amphibians.

I have in mind a $24 \times 15 \times 10$ in. aquarium which was cracked from the top to within 2 ins. of the base, which had been more or less written off as an aquarium. This comfortably housed half-a-dozen Crested newt tadpoles which were brought up to maturity in these surroundings. I have only mentioned the newts as being the original occupants of this vivarium, but it has since served as a "nursery" for baby *Rana esculanta*, as well as Fire-bellied and Yellow-bellied toads.

Finally, I would mention that a good growing plant for this type of vivarium is the common-organ "Creeping jenny," which flourished even to the extent of overcrowding the "dry land."



Further Fame for Frogs—

AS if to honour this journal that has looked after their interests now for twenty-five years, the generally despised amphibia have made another effort which—when it becomes generally known—will make them more famous and more sought after than ever.

Readers may remember articles that have appeared on these pages on *Xenopus laevis*, the South African claw footed toad, and its usefulness in pregnancy diagnosis. Since the test depended on the readiness of the females to spawn, after injections of pregnancy urine, only females were caught and imported; apart from those males that slipped past the scrutinising sorters, no males were kept at the laboratory because we had little use for them. This aspect of the matter has changed, and if recent reports are confirmed, the male toad or frog will prove an even better indicator for pregnancy than the female.

The discovery was made by a South American, Dr. Galli-Mainini, and published in *Semana Medica*, in 1947. His test animal was *Bufo arenarum* (Hensel). Other species like *Bufo marinus*, *Rana pipiens*, *Rana esculanta* and *Bufo d'Orbigny* have proved equally useful, and the ordinary toad, *Bufo bufo*, has recently been investigated in Sweden with equal success. Normally the testicles of these animals are at rest and do not produce sperms. Sperm production only occurs in the spring, under the influence of the pituitary gland (which is connected with the brain) and under the influence of the presence of females. The pituitary gland then excretes a soluble substance (gonadotrophic hormone), which circulates in the blood and stimulates the testicles into temporary activity.

The urine of pregnant women contains a very similar substance; it is not produced by the pituitary but by the placenta. There it is poured out, all during pregnancy, in considerable quantity, and we have no idea why this is so, or whether this placental hormone is in any way useful or essential for the development of the pregnancy or not. But on the toad or the frog the placental hormone has the same effect as the pituitary brand of hormone: it makes the female lay eggs and the male produce sperms.



Xenopus toads—used in the earlier tests referred to in this article.

by

Dr. EDWARD
ELKAN



The sperms are excreted into the cloaca, where they mix with the urine. All that remains to do is to inject a responsive male with a few cubic centimetres of the suspected urine and to wait one to three hours. If a drop of the toad's urine is then placed under the microscope and live spermatozoa are found swimming about in it, then the urine was from a pregnant woman. Galli-Mainini tested this reaction on 1,400 cases and found it reliable in 99.7 per cent. The male toad's urine can either be collected by placing the toad on a platform in a perfectly dry jar—the urine then collects at the bottom, and can be taken up with pipette—or by introducing a short blunt pipette into the cloaca and aspirating a drop of urine. A toad can be used several times for this test.

So far so good, but I am sure the snags will not be long to appear as well. First of all toads seem to be more reliable than frogs, and even they must be kept in the warmth of an indoor cage for some weeks before they respond properly. Secondly: what is going to happen in the spring? Can we be sure that these males will not produce sperms on their own, even if we keep the females entirely out of their sight? Thirdly, *Bufo bufo*, useful as it may be, is by no means a very common toad even here, and I have not heard that anybody has succeeded in breeding it in large numbers. If any reader has experience in breeding large numbers of toads—here is a field for the enterprising. The trouble is that full grown males are most wanted, that toads grow very slowly, and that all batrachians (with the exception of *Xenopus*) are very difficult to feed after the metamorphosis. However, collaboration may, as elsewhere, produce results in this field. In any case we shall have to readjust our memories: the frog in its little house on the window sill may, from now on, not necessarily be kept there to indicate the weather!

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Hedberg, G. T. *Läkaretidningen*, Stockholm, No. 2, 1949.

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EDWARD ELKAN, M.D. Early activities: worrying his poor mother by going out with the fishing net and coming home with hundreds of beautiful black "fish" promptly denounced by the family doctor as common leeches. Also renowned for carrying snails, caterpillars and anything else that would crawl, home in his satchel and for having May-bugs escaping from his pockets during lessons. Very interested, in later years, in all branches of biology and in breeding tropicals of many colours. A microscope, donated by a benevolent uncle, started him at the age of 17 on a more scientific career, and his life is now divided between looking after patients on the one hand and after a large population of *Xenopus* on the other.

REPTILES

in the Garden

by ROLAND H. FUSSELL

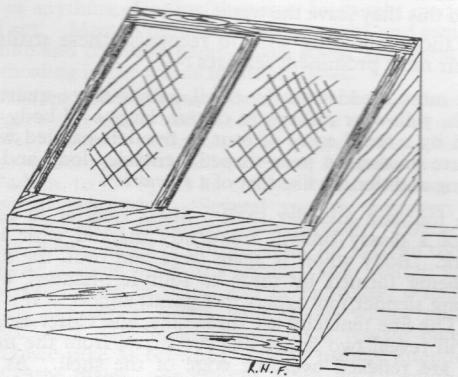
(Illustrated by the author)

THE aim of all who keep wild creatures in captivity should be to reproduce, as nearly as possible, the natural surroundings in which their pets normally live. Whilst it is often convenient to keep reptiles and batrachians in indoor vivariums, there can be little doubt that for the summer months at least, they benefit greatly by being kept out of doors in the fresh air and sunshine. Furthermore, it is generally possible to allow them more freedom and more natural vegetation when they are housed in the garden, and they certainly appreciate the natural food which often finds its way into their enclosures.

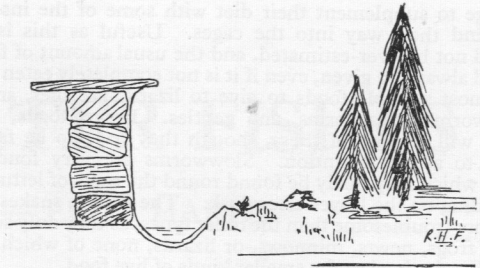
Of prime importance to the success or otherwise of the outdoor vivarium is its situation. Generally speaking, referring solely to our native species, batrachians require a damp, shady habitat, lizards like as much sun as possible (they, too, need water of course), and snakes are content with something of a mixture of these two types. A little common sense is all that is required in the choice of a site, and one can always be on the safe side by avoiding extremes. Whatever type of surroundings is required, it is always as well to provide a trough of water, and some vegetation beneath which the animals may shelter from the sun.

Rockwork is also useful for those species which like to clamber about and bask in the sunshine.

The majority of outdoor vivaria consist simply of a wooden framework, to the sides of which are nailed sheets of fine wire netting or perforated zinc. The top consists of a sheet of glass which slides in a groove, giving ready access to the interior. The bottom six inches or so should be buried in the ground to prevent escape by burrowing.



This type of enclosure will meet the needs of most species, but I will describe another which I have found quite as successful, and which has certain advantages of its own. This, as shown in the figure, closely resembles an ordinary garden frame, except that it is rather taller, and the glass is substituted for by perforated zinc. The wooden sides afford



a certain amount of shade from the sun at all times of day. Also, the ventilation is restricted to the top only, helping to keep a moist atmosphere, and making the type an excellent one for the shade-loving batrachians.

If you have a large enough garden, and sufficient enthusiasm, it is a good plan to build a "reptiliary," consisting essentially of a small rock garden surrounded by a smooth wall, which, though only a few feet in height is sufficient to prevent the escape of the inmates. This method is, of course, only suitable for snakes and certain other kinds which are incapable of scaling the surface of the wall. Many lizards can climb out of anything!

A figure shows a section through the wall of a typical reptiliary. Directly inside the enclosure is a moat, about a foot wide and a few inches deep, intended to further hamper the progress of any reptile intent on escaping. Although it is generally used, I do not like the idea of this moat, and would prefer to rely, if necessary, on a slightly higher wall. A far better way of providing water, in my opinion, is to build a garden pond somewhere in the middle of the enclosure, which can be naturally arranged with aquatic plants, marginals, etc., and in which frogs and minnows can be bred to provide natural food. The inside of the wall should be made as smooth as possible, and it is a good idea to bury some stones or brick rubble beneath the wall to discourage burrowing. If it be thought desirable to keep venomous species, the reptiliary just described is certainly the best place to put them. When showing the collection of reptiles to ones friends, it is very gratifying to watch their reactions when you calmly state, "Oh, that one is poisonous, you know. People have been known to die from its bite." Then, as you are about to move on to the next enclosure, you casually remark over your shoulder, "I caught that one with my bare hands, last year." The effect is usually terrific.

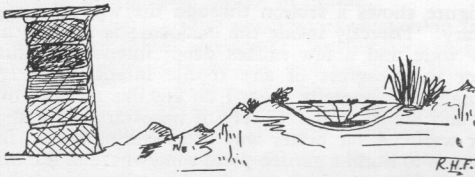
Apart from all this, there is a certain fascination in keeping poisonous snakes, though you are unlikely to obtain any others besides the common adder. Once the other side of the reptiliary wall they are no more trouble than other species, it being in the collecting that great care and thought are needed. Some authorities recommend the use of such implements as forked sticks, or a walking stick, complete with a little leather noose to slip over the reptile's head. These sound all right in theory, but in practice I would be inclined to say that they were little better than useless. My experience of snakes is that they are so fast and cautious that the only way to capture them is to pounce on them at first sight, forgetting all about such niceties as slipping nooses over their heads, or pinning them down with a deft sweep of the forked stick!

When I go snake hunting I wear a pair of Wellington boots, and a pair of large, stout, leather gauntlet gloves, and walk slowly around places where adders are known to exist. At the first sight of a snake, I simply pick it up and gently place it into a canvas bag. Nothing could be more straightforward.

Reptiles and batrachians that are kept in the open often

manage to supplement their diet with some of the insects that find their way into the cages. Useful as this is, it should not be over-estimated, and the usual amount of food should always be given, even if it is not completely eaten up. The most suitable foods to give to lizards are flies, small earthworms, mealworms, and gentles. Frogs, toads, and newts will eat any of these, though they have to be fairly lively to attract attention. Slowworms are very fond of slugs, which may easily be found round the roots of lettuces, or feeding on the leaves after dusk. The British snakes are far more troublesome than the other types, as they only seem to eat frogs, newts, minnows, or lizards, none of which are so easily obtained as the smaller kinds of live food.

Towards the end of the summer the inhabitants of the vivarium should be given as much food as they can be induced to eat, in order to prepare them for the winter hibernation. All the British species, and many European ones, may be safely left out for the winter, providing there is a sheltered crevice filled with dried leaves or hay, in which they are protected from frost and rain. Some kinds, however, particularly those which are used to a warm climate, fare much better if placed in an indoor vivarium, where they will continue feeding, and provide entertainment during the winter months.



The Bladder Snails

by FRANCIS MAPSON

MOST aquarists are agreed upon the value of snails as scavengers, for in any tank, other than one devoted to egg-layers, they do valuable work in turning surplus fish food (which if left would eventually foul the tank), into useful plant food. But with the exception of the *Planorbis*, or ramshorn snails, very few of our native species appear in aquariums; the favourite varieties are invariably imported ones. Yet there are English snails which are at least the equal of these foreigners, and one family, that of the bladder snail, is, in the writer's experience, unequalled as an aquarium inhabitant.

There are two members of this family of snails, the moss bladder snail (*Physa hypnorum*), and the fountain bladder snail (*Physa fontinalis*); together they form the family of Physidae of the order Pulmonata, that is, snails which breathe with a lung and are hermaphroditic. For the purpose of classification the principal distinction of the Physidae is the possession of *sinistral* shells, of which the body whorl occupies nearly the whole length of the shell.

The moss bladder snail is the larger of the two; its glossy yellow or reddish shell gives it a most attractive appearance, but unfortunately it is by no means a common snail, being extremely localised, mostly in the south of England. The fountain bladder snail is more widely distributed—one of its favourite haunts being watercress beds.

These snails are probably the most active of our native species; they never seem to have an idle moment and are capable of travelling at a really remarkable pace when they so desire, especially over the smooth glass surface of a tank. Ceaselessly questing over the aquarium they miss no scrap of waste food, their small size and attenuated shape enabling them to investigate the smallest nooks and crannies, just the places where particles of food are most likely to lie undetected. Being principally bottom feeders, they are thus first-class scavengers, with the added virtue that they will not attack the most delicate plants. But they will, and do, eat algæ, which also forms the staple food of their young, and their eggs are invariably laid on such parts of plants as carry the most algæ. I wish I could also say that they have the virtue of disliking fish eggs, but at least they are not such gluttons for them as some other species are. Although they will eat eggs occasionally, they do not appear to be keen enough to hunt for them, and are quite content to subsist on Bemax or the usual fish foods. I have raised danios successfully in a tank which held also several of these snails, without appreciable loss.

Their characteristic habit of "thread spinning" is most amusing and never fails to surprise and mystify the uninitiated visitor. These threads are used to take short cuts from bottom to surface, and *vice versa*, but as the threads are fine, and composed of mucus, they are practically invisible; the result is that the snail appears to be travelling in space. Occasionally one will improve on this performance by acting as a lift for the convenience of its fellows, the "passengers" sitting placidly on its shell until the top or bottom "floor" is reached. They also have the trick of travelling in an inverted position upon the surface film, like the *Planorbis* snails, to which they are related.

The eggs of the bladder snails are laid in small round clusters, each cluster being about the size of a large pea. They are usually attached to the oldest leaves of the plants, where algæ grow thickest, and hatch at summer temperatures in two to three weeks. At such temperatures the young grow fast, but as they form tasty morsels for the larger types of fish, few survive to reach maturity in the average community tank.

The snails thrive equally well in cold and tropical tanks, although, as is to be expected, they are more active in the warm tank during the winter months. The only condition they will not tolerate is that of polluted water; at the first signs of this they leave the water in a body.

For those who may wish to recognise these snails here are their most prominent features:—

The moss bladder snail: Shell, half to three-quarters of an inch, yellow or reddish in colour, large oval body whorl topped by a small spire of four to five left-handed whorls. Aperture of shell is pear-shaped, tentacles long and slim, foot long and slender like that of a *Planorbis*.

The fountain bladder snail: Shell, quarter to half an inch, of a glossy brown, frequently marked with a dark network. Body whorl is again large and oval, the minute spire being formed by three to four left-handed whorls. The long slender foot tapers to a point, almost as if it had a tail. The fine tentacles are threadlike, and closer examination will reveal two finger-like processes, from the mantle, which are reflexed over the edge of the shell. As these snails are not at all nervous they will quickly emerge from their shells if left for a few moments on a wet surface.

It is hoped that these few notes will tempt those aquarists who are not yet acquainted with these interesting and useful snails to give them a trial in their tanks. Small as they are, they are giants for work, and after long experience the writer is satisfied that they are to be numbered among the very few really trouble-free scavengers.

The GRASS S

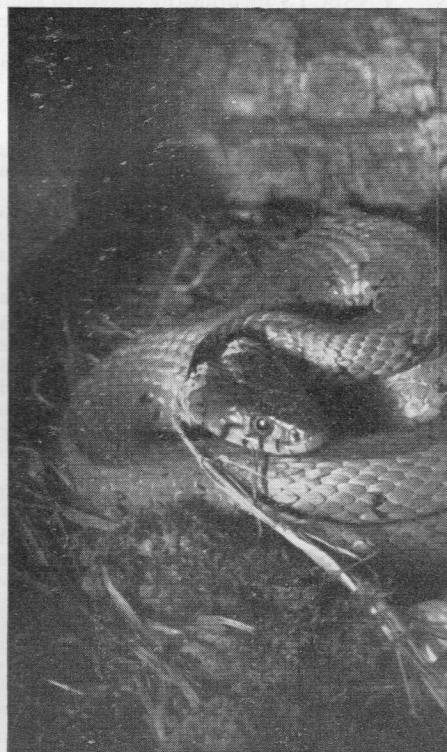
Photographs and notes by

*THE grass snake is the commonest re
the vicinity of rivers and ponds where
Often seen basking in the summer sun,
olive-green scales and conspicuous yellow
that it makes, possibly nature's most dr
of air through the nostrils. Winter m
long; the first warm days of March b
are laid in June or July, and the young
unusual series of photographs, some lesse*



Snakes have no eyelids. Sleeping or waking, their eyes always remain open. When sloughing occurs, the cast skin contains the old scale over the eye, complete with the rest of the skin of the head.

Grass snakes have many tricks to frighten possible enemies. Sometimes they go through violent contortions, throwing themselves on their backs in convulsive figures of 80 (left). Handling often causes a fluid with an abominable smell to be exuded.



The eggs are usually laid in dung-hills, c
picture of a grass snake actually laying egg
children for a pet, had her "confinement
skin, the eggs hatch in the heat provided b

The strangest act of the grass snake is the
"death trance" (left). If all its strata-
gems to defeat an enemy fail, its head falls
sideways, its eyes glaze and its tongue
draggles from its mouth.

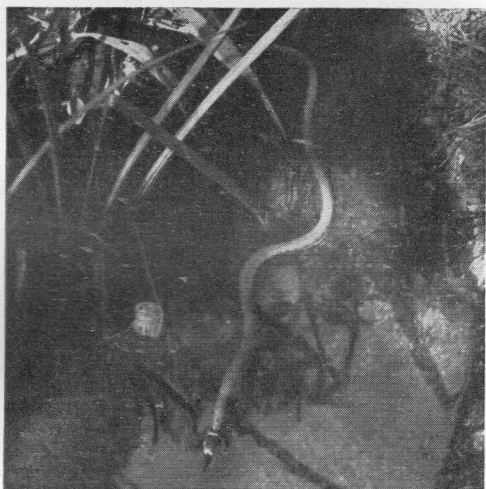
NAKE in Pictures

WALTER J. C. MURRAY

of this country. It prefers moist areas in
the frogs and newts on which it feeds are found.
It can easily be recognised by its black-flecked
collar just behind the head. The hissing noise
it makes, is a result of the forced expiration
of air through its mouth. It does not hibernate, but not for
long periods. A dozen or more white eggs
are laid in a hole in the ground. In this
the habits of the grass snake are portrayed.



Snakes dart forward by curving their bodies into hairpin bends (above), gripping the ground with the under scales of their tails and suddenly straightening. They can move very fast, frequently faster than humans can walk.

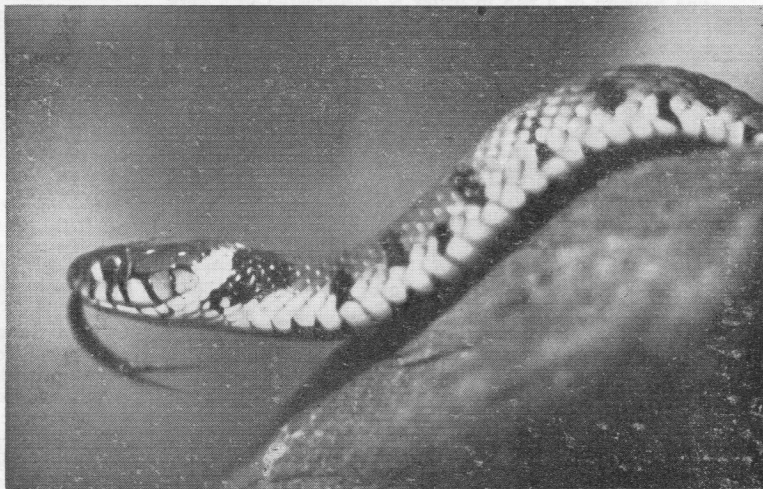


Grass snakes love water (right). They swim easily with their heads above the surface; they also career about on the bottoms of ponds. It seems as if they do not, or cannot, catch fish unless the fish is ill or maimed.



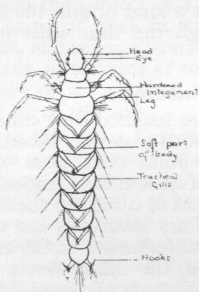
leaves of rotting vegetation. This remarkable
specimen (above), was taken when a snake, caught by some
one the same evening. Enclosed in a tough leathery
sheath, their surroundings.

The forked tongue of the snake is constantly darting in and out. This can be done without opening the jaws. In the grass snake the tongue is so long that it often dangles (right).

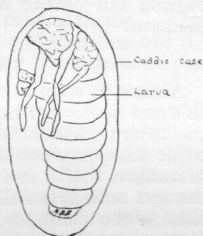


it is imperative for the circulation to be maintained inside the case, and this is provided by undulatory movements of the abdomen. These movements are not incessant, but carried on at regular intervals. If a caddis-worm is removed from its case and placed in a container with a number of cases it will invariably find its late home, and if it is the tapering kind of case it will enter it head first, and turn round, so that its head and legs protrude from the larger opening. If it is a case which has almost parallel sides it will not trouble to turn, but will push its head and legs through the opposite end. Although the weight of the case is quite considerable for so small a creature, it must be remembered that any object weighs less when submerged, so the larvae are able to walk and crawl about on the bottom and over aquatic plants quite successfully.

When they are about to pupate—usually in late spring or early summer, they become more sluggish, and lose their appetites. In order to protect themselves they seal the ends of their cases, taking care to allow free access of water necessary for respiration, different species using various methods. Some spin a silken web, some partially seal the ends with the same kind of material which goes to the building of the case, while others bury one end in the mud, and leave the anterior exposed.



Caddis-fly larva



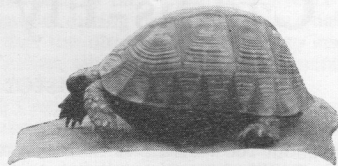
Pupating larva

After a few days, the larvae cast their skins, and the mummy-like pupae are revealed. The wings are visible, and the legs are folded under the body. For the next two or three weeks the pupae remain motionless, and at the end of that time they release themselves from their cases, and endeavour to leave the water either by swimming or climbing up the stem of an aquatic plant. Each pupa is covered by a loose skin, and this period is one of very great danger, as many aquatic animals are always ready for a dainty meal. It is thought that many of the insects never reach safety and that the greatest mortality is among the females who are heavy with eggs. Those grubs who are fortunate enough, climb out of the water on to a plant, and as they dry the skin splits, and the imago emerges. The wings unfold, and after a short period the wings have dried, and the adult caddis-fly flies off, to begin a new life-cycle.

Caddis-worms can be kept in confinement, but they need plenty of room, and as most of them are herbivorous they should not be kept with expensive weeds.

Interesting experiments can be carried out by forcing them out of their cases, and placing them in a saucer with various materials such as beads or small pieces of mica with which they can build. Some species will respond more readily than others, but nearly all will use the materials supplied if they find no other is available; care must also be taken to keep them in moving water, even if it is only under a dripping tap.

TORTOISES are Back!



LIMITED numbers of tortoises and terrapins have been imported in the last few months, and have proved very popular with reptile keepers deprived of their acquaintance for so long. These few hints on their management and requirements may be found helpful.

Chief requirement of both tortoises and terrapins is sunshine—and plenty of it. Only on hot sunny days will they feed well and accumulate reserves necessary to see them over the winter hibernation period. If you have an enclosed garden, and you are not too jealous of your plants, you may allow your tortoise to roam about it at will. But they are very fond of biting off choice blooms and are easily enclosed in a sunny spot by placing four planks together, or by making a light wire netting frame similar to a portable chick run. Tortoises, unlike terrapins, do not climb, so that the enclosure need not be high or covered.

Terrapins will require a small pond with an easy access to the water for them. Remember that they are meat eaters, and as they feed in the water the shreds of food soon pollute it; arrange an easy means of cleaning it out regularly by providing a sump and waste. An old kitchen sink let into the ground is ideal if a bank of rocks is made at one end to form a way in and out.

At this time of year terrapins should be fed once a day. They should be given as much meat—horseflesh, liver, earthworms (and some will eat fish scraps), as they can clear up at a time. They normally become so tame as to take pieces held in their owners' fingers, and when they refuse further helpings you know that they have had enough! Tortoises, confirmed vegetarians, require green food to be available throughout the day. Cabbage and lettuce leaves, dandelions and fruit are readily taken; tomatoes and cucumber slices are favoured tit-bits. With an adequate green-food intake they will not require water to drink. A pair of tortoises is far more fun than just one; try to get a male and female (the under-side of the female's shell bulges more than the male's).

Tortoises and terrapins hibernate with the approach of winter. About October time, when they go off their food and become somnolent, they should be tucked up in a box of hay or dry leaves and stored in a cool place away from draughts and frosts until the next March or April. They show great thirst on awakening, so make sure that water to drink is near at that time.

Healthy tortoises and terrapins have strong limbs, bright open eyes and make vigorous movements when picked up. Freshly bought tortoises should be examined around the soft skin inside the shell openings for ticks. When these are seen, pull them off with pliers and burn them. They are about the size of a small pea and are far more frequently found on imported reptiles than many imagine. Sunshine and good management and food will keep your tortoises in health for many, many years.

J. FRANCIS

THE AQUARIST

AXOLOTLS (*Amblystoma tigrinum*)

by _____ J. FRANCIS

AXOLOTLS are amphibians, related to the salamanders and newts. They are unusual in living their lives entirely in the water and in never losing their external gills, normally found only in the larval forms of the Amphibia. Although they present this immature form they can reproduce themselves without first metamorphosing to the "adult" stage. In some areas of the American continent the land-frequenting adult, or amblystome, does occur, and its eggs, laid in the water, give rise to larvae indistinguishable from axolotls.

The phenomenon shown by creatures capable of remaining in the larval form is termed neoteny, and is occasioned by some factor delaying or preventing metamorphosis.

In appearance axolotls resemble overgrown newt larvae. They grow to about nine inches in length and are black in colour. Albino forms are also obtainable and in these the tufted external gills are red, since the blood within them is unmasked by pigment. The mouth is large and the eyes are situated on top of the rather flat head; the large flattened tail joins in its upper part with a low "fin" extending along the back of the animal. They obtain most of their oxygen from the water by means of the gills and also from over the whole of their body surface, but they rise to the top of the water and use their lungs occasionally—a further anomaly.

Axolotls do not appear very active during the day in the aquarium, for they are nocturnal animals and should have protection from strong light, in the form of rock caves or submerged flower pots. The water should be shallow, not more than a foot in depth, and does not require to be heated. A temperature of 60°F. is ideal, but they tolerate temperatures well below this. The tank should be decorated with rockwork, for plants soon become uprooted; large leaved bunches of *Elodea* may be used but fragile plants are wasted on the axolotl. It is better to keep axolotls in tanks without other occupants.

The animals are carnivorous and are most easily fed on earthworms. Raw meat and fish are accepted if dropped in the water before the creatures' noses. Tadpoles, freshwater shrimps and small fishes are also eaten. A considerable amount of detritus forms in their tank and should be siphoned out regularly or the water soon becomes smelly; the water removed should be replaced by fresh.

In the excitement of meal times axolotls sometimes bite

off a companion's leg or his gills, but this does not occasion any harm for new members are soon grown by well-fed specimens.

Axolotls can go without food for long periods without damage but regular feeding about twice a week, giving as much as they will take at each feed is necessary for full growth to occur, and to avoid the attacks which they may make on one another. Newly bought axolotls may be shy and refuse to feed but earthworms are a great temptation to them. Worms form the best food of all, for digestion of

these is complete and no fibrous matter is passed in the axolotl's excreta to pollute the water, as is the case when horse flesh or other muscle is given.

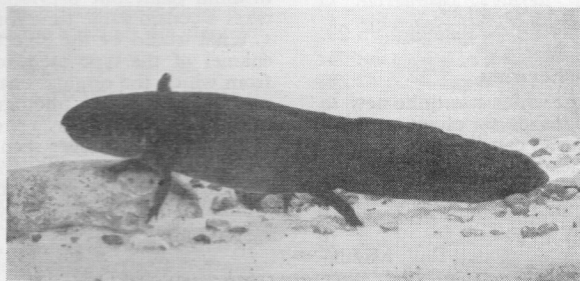
Breeding the axolotl is not always readily carried out; large specimens should be used. Sexing the animals is difficult, particularly the smaller ones, but in large males the cloacal parts are more protrusive than the same parts in the female, as seen when the animals are looked at from the side.

A change of water is conducive to breeding and a mass of water plants, allowed to float in the water, should then be introduced. No food is given for a period before this and will not be taken until spawning is over. The males place small cone-shaped "packets" (spermatophores) of sperms on the sand and the females take these up with their cloacae. Numerous eggs are afterwards laid all over the tank and many adhere to the water plants.

The eggs form small masses not unlike frog spawn, and each gelatinous globule surrounding a dark egg is about one centimetre in diameter. The depth of the water should be reduced to six inches or less after the eggs appear. They hatch out after about four weeks, and in the meantime development is readily followed visually through the transparent envelope. Newly hatched axolotls are about a quarter of an inch long and first feed on semi-microscopic life in the water.

They soon graduate to *Daphnia* and small aquatic insect larvae, and white worms may also be given at a later stage. Live food is essential to the youngsters and they need a lot of it. They are not so shy of the light as when older, and as with most young animals, sunlight is beneficial.

Axolotls may be induced to change to the land-living form, either by gradually reducing the depth of water, thus forcing them to use their lungs, or, a more certain method, by administering thyroid extract.



Lower photo:

Albino (above) and black axolotls

W. S. Pitt

The VIVIPAROUS LIZARD

by W. G. RUFFLE

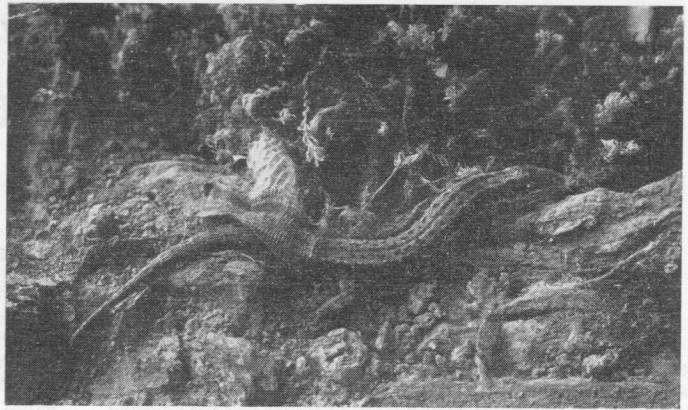


Photo:

Walter Murray

This lizard has been caught in the act of sloughing its old skin

ENGLAND is a disappointing country from the herpetologist's point of view. Our six native varieties of reptile and eight of amphibia compare very poorly with their foreign counterparts, so many of which are larger, more gaily-coloured and exhibit a greater diversity of habits. Yet, it is felt our own species have a charm and attraction of their own, so often forgotten when their foreign cousins are available, but all the more readily appreciated when imports from abroad are negligible.

The present writer has made a special study of the viviparous lizard (*Lacerta vivipara*) which abounds on heaths and sandbanks over a wide area in Southern England, and also exists throughout Great Britain. It is not very easy to spot one of these lizards, whose habit it is to lie half-hidden in the grass, basking in the sun with body flattened out to ensure that the widest possible area is exposed to the sun's rays.

The viviparous lizard awakens quite early in the year. The males are the first to be roused by the growing power of the sun, and may be seen on sunny days from about mid-February. The females emerge about three weeks later. The sexes may be most easily distinguished by the coloration of the underparts. Those of the male are orange or red with black spots, while the female is pale yellow underneath, the spots being scanty or absent. Courtship takes place in May. The male approaches the lady cautiously, then suddenly grabs her very firmly in the middle of the body. Sometimes she will resist, but if she is acquiescent the male swings his body round that of his mate until their cloacae meet, and fertilisation takes place. After mating is over the males are less often to be seen basking—probably they are more active after food; but the females on the other hand bask the more owing to the necessity of stimulating the development of the young.

Baby lizards appear in July or August. The female repairs to some spot that is sheltered from the rude interruptions of man or other large animals, and deposits the flimsy, shell-less "eggs" from which the already fully-developed baby lizards escape. They are almost immediately able to fend for themselves, and establish little homes near tree-tops or under piles of leaves from which they emerge to hunt food. It is probable that a number of specimens fail to get sufficient food for the hibernation period, and thus waste away by the spring. In any case the youngsters have a busy time from July until October, finding tiny flies, spiders, larvae, etc., on which to feed, ready for the winter.

Hibernation for the adults usually commences in mid-October. The lizards then choose a spot well beneath the surface, usually under tree roots and there await the coming

winter. It is a long time before they really settle down, the males in particular being liable to appear on mild days as late as 20th November. Similarly any unusual burst of sunshine may bring a few males forth in mid-January. The youngsters are later than the adults in commencing to hibernate but strangely enough, are also later to appear in the following spring.

In captivity the viviparous lizard needs a little care. A little dampness is essential, and the sun should not be allowed to shine into the vivarium through two layers of glass, although of course some basking facilities are essential. The creature's favourite foods are spiders, crane-flies, small grasshoppers and smooth caterpillars or grubs including mealworms. New-born youngsters need tiny fruit-flies or baby spiders. The species does not survive the winter well, and is best liberated, or hibernated in a frost-proof box. If however, a food supply is certain, then the lizards can be kept awake at a temperature of not less than 60°F., but in some individual cases the feeding instinct seems to be impaired in winter whatever the temperature. Individual specimens will feed by hand, and can become extremely tame.

September Pond

FISHES in ponds will require special attention during the next few weeks. Any live foods in or around the pool will commence to die off as summer draws out, and in order to prepare the fishes for the winter period, during which they will not feed, it is necessary to give some nourishing and fat-store forming foods.

Cooked porridge is useful and is greedily eaten by goldfishes. Brown bread crumb or crushed biscuit may also be given. As always, take care not to give more of these foods than the fishes can clear up in a short time. Uneaten food will not improve conditions in the wintering pond.

It is not advisable to leave fishes out in ponds that are no deeper than two feet. These afford no protection during icy weather. At least three feet depth is preferable. Common goldfishes, comets and shubunkins may stay in the pool but other fancy varieties should be moved to an indoor aquarium now. Remove all leaves that fall into the pond to prevent an undue amount of vegetable decomposition souring the water.

J. F.

Painted Frog (*Discoglossus pictus*)

by _____ D. O. CARR

THIS attractive little frog seems to be very much overlooked by most vivarium keepers, and yet I find from experience that it is one of the easiest species to maintain in good health and even to breed, in quite a small vivarium.

The painted frog (*Discoglossus pictus*) occurs in Southern Spain, Portugal and North Africa; it is also to be found in some of the Mediterranean islands, notably Corsica, Sardinia, Sicily and Malta. It is usually to be found in the proximity of water from sea-level to quite high altitudes. In passing, it is interesting to note that it sometimes frequents areas where the water is quite brackish. In habits it is active by day and night in a state of nature; however, the specimens in my possession spend the daylight hours buried in the moss of their vivarium, only appearing at night to feed. The only time I have noticed them active during the day has been just prior to spawning, when the male spends a day or two taking a hip bath in the water, whilst "calling"!

In size *Discoglossus* is much the same as a medium sized common frog. The body is fairly broad, as is also the head, which gives the creature a very compact appearance. The head is rather pointed, and the mouth is set a little back from the tip of the snout. The tongue (as can be seen from the general name) is disc-shaped, and cannot be projected far — unlike the members of the genus *Rana* (common and edible frogs, etc.) who are able to flick their tongues quite a distance to catch their prey. It is for this reason that *Discoglossus* has to make a sideways grab at its food, at which it appears to be very adept. Once the food has been grasped, it is cleaned and crammed into the mouth with the forefeet as is usual with most frogs and toads. It has been stated that the painted frog is able to take its food beneath the surface of the water, in the manner of newts. I am rather inclined to disbelieve this from my own personal observations, as I have repeatedly put earthworms in the pool in the vivarium and they have remained for days without being touched. Also, I notice that *Discoglossus* is largely terrestrial as is borne out by the relatively incomplete webbing of the feet; it goes to the water only for the purpose of spawning. My observations are only made on specimens kept in indoor vivaria, perhaps they are more aquatic in nature.

In colour the painted frog is most variable. The commonest colours would appear to be a dirty olive brown and russet backgrounds dotted with darker spots and splashes. There are, however, two fairly constant markings that occur in most specimens; they are—the triangular dark patch between the eyes on the top of the head, and the dark bars on the legs.

The breeding season is a long one, extending from January to the end of September in North Africa, but being a bit shorter further north. During the breeding season, the females can lay up to three batches of spawn. The spawning embrace, unlike the common frog, is a short one, usually only lasting whilst the eggs are being deposited. When spawning the embrace is lumbar, the male grasping the female round the waist just in front of the hind legs. The male painted frog is surely one of the quietest of all frogs when calling, as it cannot be heard more than about eight feet away, and it sounds like the distant cranking of a non-responsive lorry!

The spawn is laid in a flat mass which is spread over the plants and mud at the water's edge. Each egg is about four to five millimetres in diameter, and the little tadpoles, which hatch in less than forty-eight hours at room temperature, are about the same length. Growth is very quick and the maximum length of 3.5 centimetres is reached within six weeks; metamorphosis is complete within two months. The

little froglets are very small when they leave the water, being even smaller than the common toad. However, with good feeding, the rapid growth continues apace.

In captivity the painted frog is one of the easiest to cater for. My own trio are kept in a 17-inch by 9-inch by 8-inch aquarium; this I agree, is rather small, but circumstances do not allow for larger accommodation. However, in this aquarium, one half of which is banked up with stones and slabs of moss, the rest being a pool, they have now lived happily for about five months and have spawned twice during that time. During the day they hide amongst the stones and moss, emerging at night to look for food, which can consist of a variety of things. Slugs and earthworms are favourites, with gentles and flies being a good stand-by.

As I have already mentioned, my painted frogs have spawned twice this year. The first spawning took place



Photo:

Lionel E. Day

A good inmate for the vivarium, the painted frog is similar in size to our British frog but shows greater variety of markings

The Mississippi Alligator

described by _____ IRIS MURRAY

WHEN the word alligator is mentioned, it would not be difficult to define many people's feelings, as this creature always seems to fill them with a certain amount of fear and revulsion. They may conjure up visions of the hot steamy atmosphere, with subdued lighting, at the zoo, or camouflaged, log-like creatures basking in the brilliant sunshine of their natural surroundings.

A few alligators were recently imported for pets, and this article describes one which has been kept most successfully for the past four months in a six-foot tank. This twenty-six inch Mississippi alligator began life in one of the river mouths or creeks in either Central America or the southern United States. Although it arrived in fairly good condition, it had obviously lost weight, and had knocked itself on the chin. Now after a diet of whale-meat and freshwater fishes it has grown at least four inches, is much plumper, more alert, and the chin wound has completely healed. Each summer day it was allowed to run loose in the garden, becoming lively in the sun's rays—which guard animals from rickets. When removed from the tank, it lashes its tail from side to side, and hisses if not allowed to have its own way. Any unwary cat who happens to investigate this unusual object is promptly chased, and will beat a very hasty retreat, to the sound of much hissing.

During the summer months the alligator has lived at room temperature, but with the approach of colder evenings the tank is now heated, and the creature stands for hours just beneath the surface with the tip of its snout protruding above the water-line. Although eventually, as it becomes larger it will find its way to another home, its present owner will be most reluctant to part with it; it has become so tame

that it will slide up to the people with whom it is familiar, so that they may stroke its chin!

There are now only two types of alligator in existence—one which comes from China, and the second variety which hails from almost any creek or river mouth from North Carolina to the Rio Grande. These ascend the River Mississippi as far north as the junction of the Red River, and can be seen either lying in the shallows of the smaller ponds and streams with their eyes and snouts exposed, or lying immobile on the flattened grass-verges and the black mud which has become smooth through the repeated movements of the alligators sliding in and out of the water. They will bask in the hot sun for hours and, owing to their natural camouflage, look like great logs but with the approach of danger, they will disappear into the water, either lying still on the bottom or digging themselves into the mud. Although when cornered an alligator will make a formidable enemy, wherever possible the creature will slink away offering no fight at all—their every movement has a suggestion of furtiveness. For many years they have been hunted by the natives who sell the skins, and also the egg-shells as curios.

During the summer when the streams tend to become dry, alligators move to deeper water. In the breeding season, fierce battles are waged between the excited males for the possession of a female. The average size of a male Mississippi alligator is eleven feet and it has a more powerful head than the female, and brighter colouring—especially during the breeding season. Brighter patches become more apparent on the sides of the body and head, a creamish or light yellow in colour. The females are much smaller,

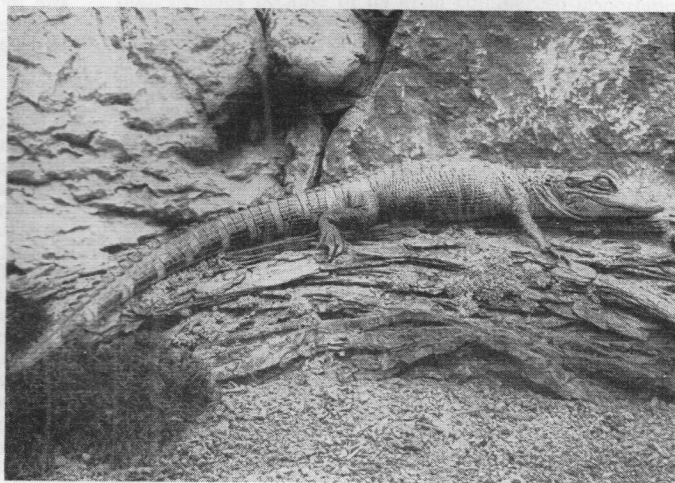
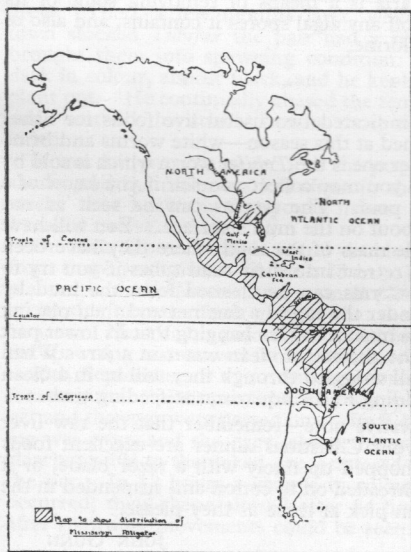


Photo:

Lionel E. Day

The shaded area on the map shows the regions in which the Mississippi alligator is found; a young specimen is illustrated above.

averaging only about seven feet in length; the young reptiles are the same dingy walnut shade above, and dirty yellow on all the under surfaces. The tail has serrations running backwards, and is also banded with dirty yellow.

In older specimens a peculiar appearance is sometimes acquired from a tooth piercing the upper part of the snout. Most of the upper teeth lap over the teeth on the lower jaw, but in the young alligator the fourth mandibular tooth fits into a pit, which is gradually worn away into a hole. There are between seventeen and twenty teeth on each side of the upper jaw, and eighteen to twenty on the lower jaw. Every scale on the belly, sides and tail has a small pit, and as the skin is being constantly replaced these pits often become filled with fragments; in time the pits become so choked that they form warty protruberances, especially on the chin. The under surfaces are less heavily armoured than the back, although the horny scales encircle the tail towards the tip. The tail is often used as a means of defence, as well as a propeller in the water.

Both sexes possess two pairs of skin-glands which secrete musk. One pair is situated on the throat, and the other pair is just inside the cloaca; these glands become decidedly more active during the mating season. The natives hunt the alligators for the sticky brown musk secretion, and they consider their tails to be a great delicacy.

During the breeding season, the calls of the alligator become louder, and can be heard as far as a mile away.

The female builds a large nest of dead branches, leaves and humus to form a mound about three feet high, with the base sometimes as much as eight feet across. Nearly beneath the surface of the water, she digs a cave in the bank. The eggs are laid in four or five layers within eight inches of the top of the nest, but in no uniform arrangement. The number varies greatly, but they usually average about twenty-eight, and are two and a half to three inches long, while although most of them are about the same size, occasionally a few may be slightly smaller. The shell is hard, rough and white, and the shell-membrane consists of two layers. During the incubation period and on cloudy days the alligators make a tremendous bellowing, but in spite of the fact that the adults may remain in the same vicinity for some time, as soon as the eggs are hatched the young are left, and are forced to find the water and to fend for themselves.

AQUARIST'S Notebook

Seasonal notes on pond and aquarium interests

ALMOST displeasing sight is a tropical aquarium in which the fishes are all to be found swimming at the surface. It is worrying to their owner, and he sometimes jumps to the conclusion that they are experiencing lack of oxygen; such is not always the case however. Layering of warm water at the surface is often responsible for the fishes' migration to this level. Water warmed by the heater rises (the "treacly" looking currents may be seen ascending above the tube when it is on), and water cooled at the surface sinks to the bottom. The net result is that quite a big difference occurs between the temperature at the bottom and at the top; for example, last year at this time I checked the temperature of a three-foot aquarium heated by one 150-watt heater. Just above the sand the thermometer read 76°F; six inches above this the temperature was 85°F, and at the surface there was a full ten degrees difference.

It will thus be seen that it is necessary to stir the thermometer about in the water when taking its temperature, and to set the thermostat so that the middle region of the tank keeps at about the desired temperature level. A thermometer placed with its bulb only just below the surface may give an entirely false idea that the whole of the tank is at the temperature indicated. This layering of cold and warmer waters can to some extent be broken up by the mechanical agitation of bubbles from an aerator, but it is not necessary to use one just for this purpose. Have your heater as nearly horizontal as possible in the aquarium—this at least ensures a wider distribution of the ascending heated currents. In the summer these marked temperature differences are not found, and so it is at this time of year, when outside air is much colder than the 75 or so degrees we are trying to maintain in the tank, that fishes are noticed seeking the warmest spots.

* * *

Another sight detracting from the appearance of the set-up aquarium is the presence of a white residue on the glass around the water's edge. This layer of salts from the evaporated water should be removed regularly by wiping it off with newspaper. Do this before you make up the evaporation losses with fresh water. Some aquarists use only distilled or rain water to "top up" their tanks; this certainly avoids the concentration of salts in the water that otherwise slowly develops.

This increase of lime salts is also reduced by snails kept in the aquarium. As they grow they actively remove the salts from the water to make their shells, and when the snails die, these present an easy means for the aquarist to remove the salts from the tank.

While on the subject of aquarium water I would like to set right a fallacious notion that I recently encountered: this concerned the use of boiled tap water for fishes. Some people appear to believe that because boiling removes the dissolved oxygen the water is therefore unfit to be used. This is wrong. As the water cools again oxygen is once more dissolved from the air, and any agitation of the water, such as occurs when pouring it into the aquarium, hastens this process of re-solution, so that it is soon again fully saturated with the gas ready for the fishes' use.

This is of some importance because boiling tap water for use in small aquaria is a means of removing some of its hardness, killing off any algal spores it contains, and also of driving off the chlorine.

* * *

Last month I indicated two useful live foods for fishes that can be obtained at this season—white worms and brine shrimps. Another one is the *Tubifex* worm which is sold by dealers, or which you may collect yourself if you know of a muddy stagnant pool. The worms can be seen as red threads waving about on the mud's surface. You will have to dig out a whole mass of the mud where they have been seen, for *Tubifex* retreat into their mud tubes if you try to net them. The worms can be cleaned from the mud by first washing it under the tap in a fine net and then placing the remainder in a muslin bag, so hanging that its lower part just dips under the surface of clean water in a jar. When the worms have all wriggled through they will be in a clean state ready for adding to the aquarium at feeding time.

To end on a festive note—remember that the raw liver and heart from your Christmas dinner are excellent foods for all fishes if chopped up finely with a razor blade, or if small pieces are threaded on to cotton and suspended in the tank the fishes can pick at these as they please.

JOHN GUNN

THE AQUARIST

IRIS MURRAY introduces some colourful and interesting vivarium inmates, the

Frogs that can Stick on Glass

Photographs by LIONEL E. DAY

TREE-FROGS belong to the largest group of amphibians; there are approximately 150 members, and although they are generally considered to be green, this is not always the colour of every variety. They are well distributed through most continents, but they are absent from the British Isles, the tropical forests of Africa, also from those of Malay and parts of the East Indies. The greatest number of varieties are to be found in South American and Central American forest regions; in Europe there are two varieties.

European tree-frogs (*Hyla arborea*) are green, and hold the unique position of being Europe's only climbing batrachians. When in captivity they sit for hours on leaves such as geraniums or laurel and resemble tiny plastic toys. They



Pictures on this page are of European tree frogs, *Hyla arborea*. An attractive green in colour, the frogs are perfectly camouflaged when among the leaves



are so sure of their natural camouflage, that even when detected, they remain perfectly still—that is to say, unless they see a fly! Then they will make stupendous jumps or acrobatic turns, and hardly ever fail to catch their victim. The tree-frogs live well in confinement, and owing to their passive nature make ideal pets; they do, however, exude a poisonous secretion, which if brought into contact with a cut causes great pain, and if brought into contact with the eyes can cause temporary blindness.

In their natural surroundings these frogs normally live on the leaves among the tree-tops, during the fine weather. As soon as a storm or rain approaches they either cling to the under-surface of the leaves or descend entirely, and hide in the grass, croaking almost incessantly. Theories have developed that these small frogs can act as weather prophets, but they are not too reliable. Tree-frogs greatly favour fields of Indian corn, and can be seen springing from leaf to leaf catching all kinds of insects, and the common cabbage white butterfly is a very great favourite. Once the prey is captured it is seldom released, but rapidly devoured, being pushed into the frog's mouth by the tiny fingers.

When on the ground, the tree-frogs' greatest enemy is the grass snake. In spite of the protective poisonous secretion, the snake considers the frog to be one of the greatest delicacies of its diet.

Colour changes

The tree-frogs are capable of changing their colours according to the environment: if they are on bark they will adopt a brownish hue, while if they are on grass they will become a grey tint. In summer they are much more lively, night being the favourite hunting time, but in winter they become very lethargic, and lose their brightness. Day and night make no difference to the colours, but when in ill-health or sloughing their skins they tend to become dull. In the typical European variety, there is a black line running along the side of the body from the groin to the nose, and it is bordered with a white line on the upper surface.

The large females are only two inches in length, and the males are smaller. They are distinguishable by the large external vocal sac, which when inflated becomes larger than the creature's head. When not in use it hangs in folds across the throat; sometimes during the breeding season small granules become apparent at the base of the inner finger of the male. The arboreal frogs are closely related to toads except that they have teeth in the upper jaw and the toes and fingers are modified to enable them to climb.

The toes are claw-shaped and swollen at the tips. The fingers are webbed at the base, and the toes are webbed about half-way.

Various suggestions have been made about the function of the modified discs, which are one of the most important and interesting features of the tree-frogs' toes. Each disc is provided with longitudinal muscular fibres which, when contracted, form furrows on the under-side. When the creature is adhering to any kind of surface the disc is flattened. It is supplied with mucilaginous glands, and has many lymph spaces, but it has been ascertained that adhesion is due to the molecular attraction of two closely compressed bodies. This is enhanced by the introduction of a sticky fluid, and the expulsion of as much air as possible. When these frogs hop on to a vertical pane of glass they slide a little, probably until the sticky secretion dries. Wet surfaces such as leaves and glass afford no adhesive properties, and so we find the frogs either get on the under-surface of the leaves, or descend to the ground. Their moist bellies also enable them to cling to dry surfaces, while it has been known for dead frogs to cling to a pane of glass.

Pairing takes place shortly after the hibernation period, the males entering the water first, making a great deal of noise while they are congregating—their calls can be heard miles away. When the females are almost ready to spawn they enter the water. They are grasped by the males near the shoulders—usually at night, and swim about together until the normal 800 or 1,000 eggs have been expelled. Deep ponds containing clear water and a rich growth of vegetation are usually selected, while the eggs are laid in clusters about the size of a walnut, and attached to weeds beneath the surface. The spawn swells within a very short time, and the tadpoles hatch out in approximately ten days. Within two days the adhesive sucker beneath the throat is visible, and within four days the hair-like external gills have made their appearance.

A fully-grown tree-frog tadpole measures about two inches, owing to the fact that it has a very long tail—approximately three times as long as the body. At about twelve weeks the complete metamorphosis has taken place, and the baby tree-frogs which are barely half-an-inch long, hide in the grass for the next two years. As is usual with some other amphibia, they do not reach maturity until the fourth year.

Owing to the fact that the mortality of the spawn is low, the meadows surrounding the breeding pools literally swarm with baby tree-frogs—so much so that they have been alluded to as "frog armies", but comparatively few of them ever reach maturity.

Watch the Tortoise!

VERY soon now your hibernating tortoises and terrapins will be waking up. Keep an eye open for the first movements in their winter sleeping quarters, and be ready to provide their first requirement—a long drink of luke-warm water.

When fully awake, terrapins can be placed in an aquarium or shallow bath of water and tempted to eat with earthworms and pieces of raw meat. Do not place either terrapins or tortoises out of doors just yet, however, unless they are in a sheltered spot and the day is sunny; but the risk of frosts is too great to leave them unsheltered at night.

It takes a week or two before the newly awakened tortoise regains his appetite, but plenty of fresh green food should be constantly available for him. Perhaps your tortoise was purchased late last summer, so that it had little time to make body stores of food before hibernating. Then you must ensure that it starts to eat as soon as possible, and keeping it in warm surroundings under an electric lamp will encourage feeding, so that full strength is built up.

J. FRANCIS

Concerning the WATER GARDEN

in MARCH-APRIL

by ————— H. A. DAY

THIS time of year is opportune to sow seeds of certain annual plants in the water garden or home pond surrounds, so that a profusion of brilliantly coloured flowers will brighten up these areas later on in the summer. It is true that the plants are not permanent. They will last only during the year they are sown, but they are very useful and it is no trouble to sow them afresh each season. Annual plants will often flourish where more permanent plants will not grow.

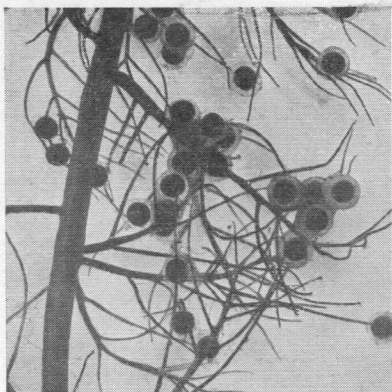
One of the annuals favouring moist conditions is *Limnanthes douglassii*. Sown here and there, in little groups, the seeds germinate quickly and the seedlings should be thinned out to about four to six in each group, allowing a few inches of space to each plant. Little "mounds" of fern-like foliage and scores of bright yellow and white butter-cup-like flowers will result. In partial shade the blossoms last a very long time.

A plant of contrasting appearance is *Mimulus*. Although classed as a perennial it does not, as a rule, survive more than a year out of doors unless in a warm district or kept under glass. Treated as annuals however, the plants provide a brilliant array of scarlet and yellow flowers, especially in a sunny season. Seeds may be sown in the greenhouse, and each plant will form a good-sized clump when transplanted; they can also be sown where they are to grow towards the end of May and in June. A cloche or sheet of glass tilted over the seeds will ensure germination. Other annuals worth a trial are candytuft, *Bartonia*, and the scarlet flax.

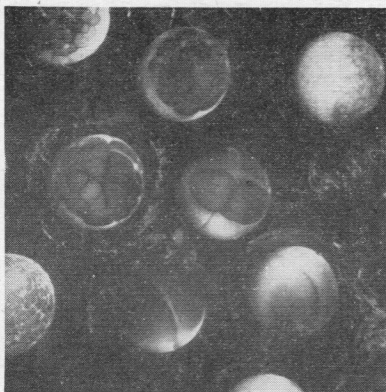
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The primrose is worthy of being introduced into our gardens more often than it is at present. There are now available primroses of lovely shades of colour—the native yellow, white, pink, red, crimson, lilac, light, medium and dark blue, and purple. Primroses like shade, a good deal of moisture, and cool conditions. They grow well on the banks of a stream or pond, under shrubs, in grass and in woodland. Once planted they continue to give a fine show each year and provide plenty of new plants to replace any that die off. From February to May they can make the water-garden a truly wonderful sight.

Water lobelia (*Lobelia dortmanna*) is another plant well worth obtaining. It is an underwater species found chiefly in the Cumberland and Westmoreland lakes. The plant has a fleshy root-stock which produces fibrous rootlets. In July and August it throws up a stem bearing a cluster of light blue drooping flowers, standing quite a foot out of the water. It likes growing in a gravelly medium.

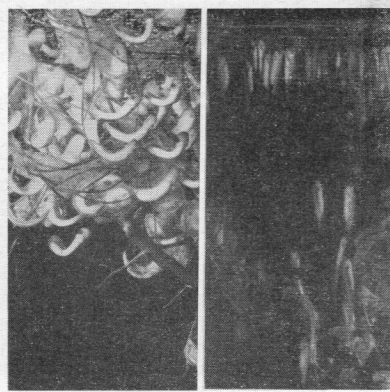
* * *
As an oxygenator for the water of a shallow stream or pond, hornwort (*Ceratophyllum demersum*) is ideal. All its growth occurs underwater, and it is suited to wide stretches of water. It has cone-like masses of bristly leaves, and is very useful in association with pond fishes and other animals. The horn-shaped leaf masses give the plant its popular name, and the Greek derived scientific name is also descriptive of its appearance (*ceratos*, horn; *phyllon*, leaf).



Eggs of *Xenopus* are different from those of common frog; they are laid singly and one or two can easily be removed from the plant for examination



After fertilisation the egg begins to divide, furrows appearing over its surface; these eggs are between one and two hours old



Left: the tadpoles just before hatching cannot move freely owing to the egg membrane that still contains them. Right: after hatching the tadpoles are suspended by fine threads

MY apologies to readers of this magazine for persistently linking my name with one and the same batrachian. They must, when they see the two appear "arm in arm" again, feel as the Romans did when they said: "I am afraid of the man who reads one book only".

Yet it is from the dogfish that the student has for many years learnt the basic facts of vertebrate anatomy. Term after term has this unfortunate creature been served up to new audiences eager to learn, without ever losing its charm to those armed with scalpel and scissors. Why then should not I, having known the *Xenopus* toad for only ten years, continue to find it most interesting, considering that it is still so full of secrets and unsolved problems? And why should I not, from time to time, draw our readers' attention to the fact that here is a toad at their disposal, an easily available "Empire Product," which, like no other, is the ideal animal both for the home, the laboratory and the school? It can be kept like a fish, it makes no noise; it feeds on earthworms or any scraps of meat available; it can be made to spawn and breed at any time of the year and I should like to see an object more fascinating to the biologist than the *Xenopus* tadpole; and—it lives, as far as I know, for 15-20 years.

True, it is, by ordinary "pretty-pretty" standards, not a beauty. I am sorry to admit that no veiltail toad has as yet been bred and that I shall make no attempt in that direction either! To look at a batch of freshly-laid fertile *Xenopus* eggs through a low-power microscope is as gratifying to me as the view of the most contorted goldfish. We all know from books how the fertilized egg divides and develops, but how many of us have ever seen it happen? How many teachers of biology have been able to demonstrate this most thrilling process to their pupils other than in pictures? And yet with a few male and female *Xenopus*, a small syringe and a few ampoules of chorionic gonadotrophin, which the chemist can provide, they can obtain such eggs at any time of the year.

It is not only because of its eggs and their beauty that I recommend *Xenopus*. Every step in the development of the tadpole is equally interesting. British frogs and toads unfortunately produce pitch black opaque little wrigglers, which defy the lens and the microscope. *Xenopus* tadpoles are in many parts so transparent that the light shines right through their bodies. We can see their heart work, we can see their muscles and nerves, and we can see the blood flow

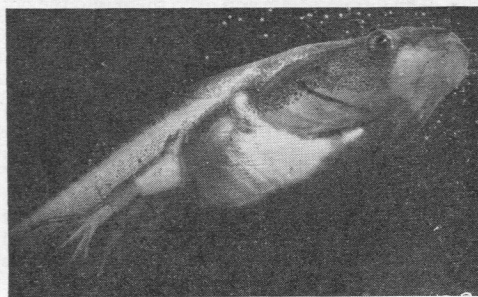
New Observations

by

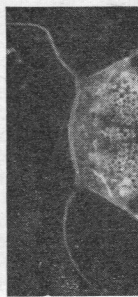
(With photographs)

through the capillaries; to see all this, only a microscope of low power is required. We can see how the yolk, originally derived from the egg, is gradually consumed, how the tadpole escapes from the egg and attaches itself to the water weeds or the surface film by an invisible thread, made by a cement gland in whose place later on the mouth develops.

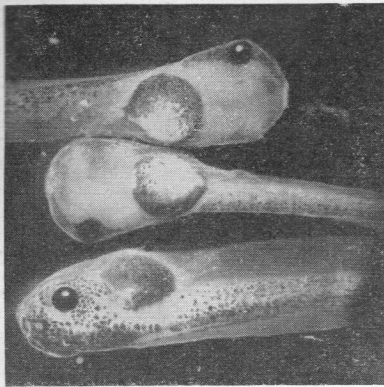
Up to the very time of their metamorphosis these tadpoles are so transparent that we can see the nerves and muscles in their heads and it is by no means necessary to kill them for observation. Some of the illustrations here produced, show the development of the legs. Fore and hind legs do not develop in the same way; the hind legs come first and appear as ordinary "buds". Not so the fore legs. They appear as a "bulge" because they develop in a closed sac



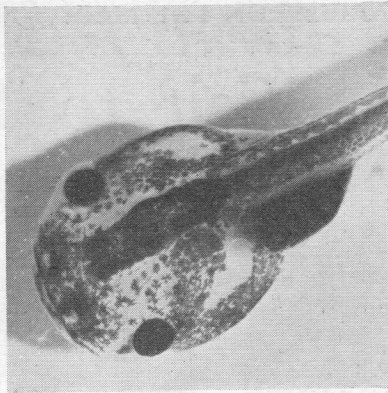
Unlike the hind leg, which develops as a bud, the growing fore leg first shows itself as a bulge as it develops beneath the skin before breaking through. Pigment cells in the skin can be seen in this specimen



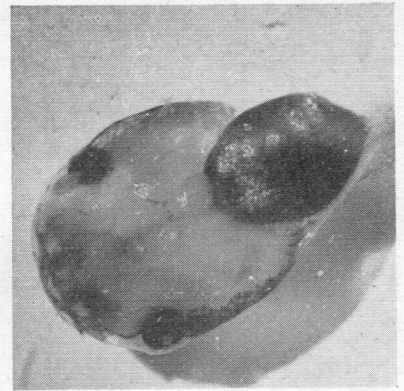
The right fore leg is first seen as a bulge as it develops beneath the skin before breaking through. The left leg is already feeding on fine threads



At the end of the first week after hatching the tadpole still has some unused yolk and possesses a cement gland in the place the mouth will appear



A twelve day old tadpole with normal pigmentation—view of the dorsal surface



Ventral surface view of twelve day old *Xenopus* tadpole showing the normal pigmentation of the peritoneal cavity. This and the previous picture should be compared with abnormally pigmented tadpoles shown below

on the Clawed Toad

—Dr. EDWARD ELKAN

(by the author)

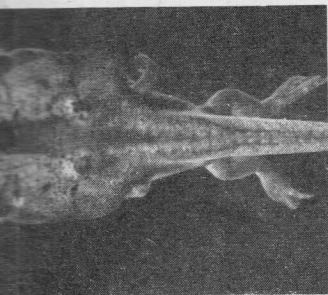
under the surface of the covering skin. Eventually this sac bursts and the tiny leg slips out. It is a measure of the change the tadpole undergoes during metamorphosis if one considers that eventually the toad can use these legs for feeding. When they first appear, the fingers are "miles" away from the mouth. They have to grow, and the head has to shrink considerably, before everything is in proper proportion.

It is one of the most attractive features of *Xenopus* that large batches of tadpoles very often produce a percentage of misfits, and the study of these, even with a very low power microscope, is most interesting. In normal tadpoles f.expl. the development of the intestinal canal cannot be observed because the peritoneal cavity, from an early date

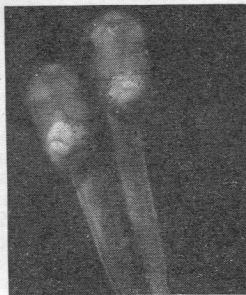
onwards, is obscured by heavy pigmentation. Maldeveloped tadpoles on the other hand, show varying degrees of absence of pigmentation and in such specimens the growing intestinal coils can easily be seen through the abdominal wall.

These specimens also often show a faulty development of the eyes. Some tadpoles appear cyclopic (having one fused eye only); in others the eyes are separate but connected by a thread of pigmented tissue; in others again they are hardly developed at all. The skeleton of these tadpoles too, shows peculiar anomalies very interesting to compare with the normal. As to the future of these sub-pigmented tadpoles—they have no long life to look forward to. Most of them die within a fortnight after hatching; a few get as far as a very delayed metamorphosis and die soon after that; none develop into adult toads. But here as elsewhere it is well worth while to observe the abnormal side by side with the normal since one helps to explain and to understand the other.

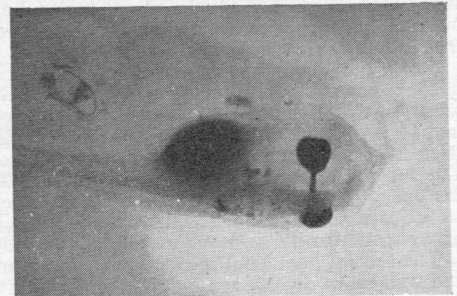
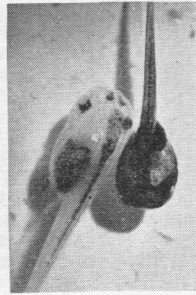
These are only a very few of the events that can be studied in the life cycle of *Xenopus*. As an object of biological study it is difficult to beat; for the very beginner as well as for the most advanced microtometist it is equally suitable and fascinating.



The leg has broken through the skin and is just about to break through. The mouth is already wide, though the tadpole still has not started feeding, and the "balancers" are still conspicuous features



Right: two ten day tadpoles, one over-pigmented and one under-pigmented; both have deficient eyes. Left: seven day tadpoles lacking pigment, so that intestine development is easily seen



An abnormal *Xenopus* tadpole possessing eyes that are joined across the head. The chondrocranium—cartilaginous forerunner of the skull—is also abnormally shaped

Two Vivarium Toads

by ————— D. O. CARR

TWO species of toads often overlooked by vivarium-keepers are the fire-bellied (*Bombina bombina*) and the yellow-bellied (*B. variegata*) toads, and yet their interesting and amusing habits make them a welcome addition to any vivarium.

The fire-bellied toad is a small one, averaging an inch and a half from the tip of the snout to the vent, the legs being slightly shorter. It is almost entirely aquatic in habit, and the hind feet are nearly all webbed, the un-webbed toes having flattened edges.

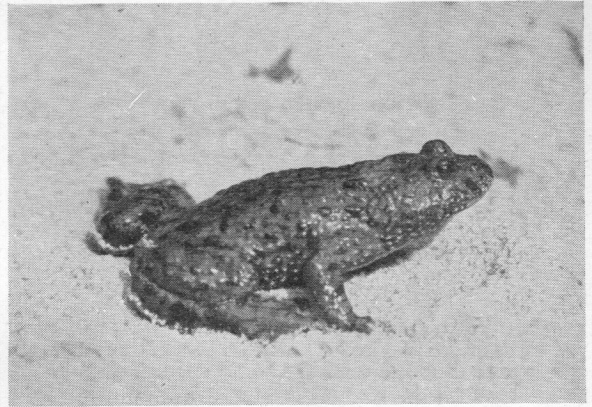
The eyes are situated on top of the head—another characteristic of the aquatic amphibian. In colour it is a slate-grey above, dotted with olive-green glandular swellings. As the name implies, the belly is bright red, traversed by irregular pale grey markings that are flecked with white. In some specimens the belly is almost devoid of grey markings, and in others these predominate.

The sexes are rather difficult to distinguish; the only reliable guide is the small glandular patches and swellings on the fore limbs of the male. In older males the throat becomes "baggy," no doubt as a result of the continual use of the vocal sacs therein.

Yellow-bellied toads are similar to the above but appear to grow somewhat larger and are more robust looking. There are no glandular markings on the back, which is a uniform brownish-grey, and the belly of this species is bright yellow, dotted with grey spots and splashes. Yellow patches also occur on the inner parts of the hind legs and on the soles of the hind feet, though the marks are often absent. Sexes are even more difficult to determine than in the fire-bellied toads. The males' glandular patches on the fore limbs are one indication, and the females can sometimes be picked out by their more plump appearance.

In both species the call-note is a soft "hoo-hoo," uttered at intervals. The toads occur in Europe and Asia, but whereas the yellow-belly extends its range as far west as France and Belgium, the fire-belly is more confined to the eastern European countries. Hybrids of the two are found in the localities of joint distribution, and experiments have shown that these are fertile.

Natural habitat of these species is around the margins of ponds, lakes, streams and ditches, where they spend most of their time floating at the surface of the water with eyes and



nostrils awash, hind legs outstretched, waiting for insects to drop near them. They dive immediately when alarmed and bury themselves in the mud and debris at the bottom. Each species is active by day as well as by night.

Breeding season extends from May until September, and during this period the females can spawn as often as three times. Eggs are laid in small batches of up to twenty, dropped among the waterside plants or on the bottom mud. Hatching takes place within a week, and the tadpoles grow to a length of two inches; in colour they are brown above and pale grey below, the red and yellow markings of each species appearing on completion of metamorphosis.

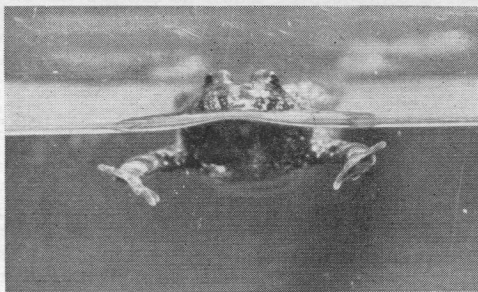
Both species do very well in captivity and soon become tame enough to scramble from the water to take worms and gentles from a pair of forceps. They have almost insatiable appetites, and feeding them can be quite an entertaining pastime, especially when two specimens get hold of opposite ends of the same worm. As with most other amphibians there seems to be a tendency to stage a general "free for all" at feeding time, but no injuries result, and the business of feeding soon diverts their attention.

Besides worms and gentles, slugs, flies and small beetles are eagerly taken. Providing a tight fitting cover is available for the vivarium fly, pupae can be put in it in a tin with a hole punched in the lid. As the flies hatch out and emerge from the tin they are eagerly snapped up by the toads. This is a useful method for feeding when vivarium inhabitants have to be left, as during holidays, for the flies usually hatch over a period of four to five days.

The vivarium for housing these aquatic toads need not be elaborate. An 18 ins. by 10 ins. by 10 ins. aquarium will house up to six specimens, though if more room is available it should be provided. Part of the aquarium should be banked up to form a number of steps, giving water of varying depths, and one third of the area should be above water.

I find that the little fire bricks (often to be purchased at the 3d. and 6d. stores) most suitable for this. The advantage of having this arrangement is that all the excreta and debris congregates in the deepest part of the water, which should here be about three inches, and it is a simple matter to siphon it off without disturbing the toads. A few sprigs of *Elodea* can be floated in the water, and the banking above the water surface can be covered with slabs of moss and planted with a few strong ferns.

A piece of bark is useful for the toads to crawl under at hibernation time, though they will also burrow under the moss. A cover is required for the vivarium, for apart from preventing the escape of food insects it keeps in the toads, which are very agile and can soon slide up a vertical pane of glass.



The position of the eyes is well suited to the fire-bellied toad's favourite resting posture in the water

News and Reviews

HOLLAND

THE latest issues of *Het Aquarium* have appeared in a greatly improved form. The journal has increased in size and its new and striking cover contains well designed pages attractive to the many new aquarists in Holland, where aquarium-keeping is becoming increasingly popular.

Articles on tropical fishes in the May issue include an account of one of the smaller barbs—*Barbus vittatus*, a fish less popular than it used to be, but one deserving to be brought to the fore again now, as the writer says, that characins are so *en mode*. It grows to about one and three-quarters of an inch long, withstands fairly low temperatures and at breeding time is certainly worth looking at. Up to 200 eggs are deposited at a spawning—a large number for such a small fish.

Anabantids (the bubble nest builders) are described, and it is shown that though most of them exhibit parental care, there are some that do not: fishes such as the kissing gourami (*Helostoma temmincki*), climbing perch (*Anabas testudineus*) and some *Ctenopoma* species, are free egglayers. Most eggs in these species are expelled near the water surface and several thousands spawned at a time. One species imported again since the war is the chocolate gourami (*Sphaerichthys osphromenoides*) a dirty green-brown coloured fish with four or five silvery-white to yellow bands on the body. Its breeding in aquaria is difficult and the breeding habits are still in doubt.

Also in the May issue re-importation of the live-bearing "pike" (*Belonesox belizanus*) is announced and its breeding habits are described. A humorous report from a reader describes his fears and emotions when he first saw his mouthbreeders female take the fertilised eggs into her mouth. A Rotterdam member suggests the formation in Holland of a similar society to the British Guppy Breeders' Society, and he wishes to follow the same standards for size and colouring as those laid down by it. The Editors of *Het Aquarium* have fully endorsed his suggestion.

A supplement to the issue sets forth the purposes of *Het Aquarium's* newly formed Study Committee, and gives an article on the investigations concerning tuberculosis in fishes.

Accompanied by a colour plate there is a description of *Helostoma temmincki* in the June issue. This fish reaches a length of about twelve inches and provides a popular meal with rice for the natives of the East Indies, where there are large hatcheries established for its forced propagation. Although it is a labyrinth fish it builds no bubble nest, its thousands of eggs hatching at the surface of the water, where they float. So far there have been no breeding successes with it reported from Europe.

In an article on how to grow *Cryptocoryne* species quickly a writer recommends a loose bottom mixture of clay and unwashed coarse sand about four inches deep, shallow water and a not too sunny position.

A feature headed "Pros and Cons" sets out to give the opinions of different writers on various topics, the first being "Should tanks have a layer of soil under the gravel?" This subject should be particularly interesting to British aquarists for as far as I have been able to ascertain, most people in this country seem to be against the use of soil in tanks. I have kept aquaria and bred fishes for 25 years and most definitely advocate a mixed layer of clay, peat litter, sieved garden soil and coarse sand topped with a thick layer of well washed builder's sand (not gravel). Really luxuriant growth of plants such as *Cryptocoryne*, *Myriophyllum*,

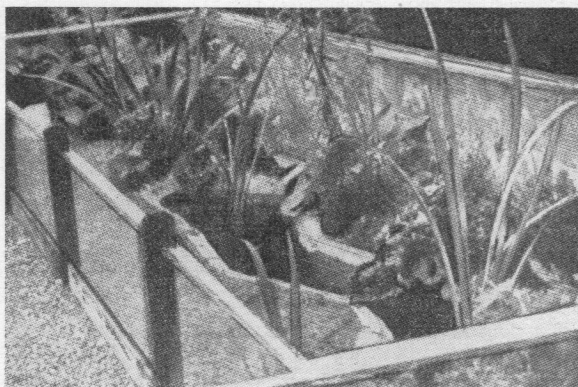


Photo:

J. Th. ter Horst

Garden reptiliary suitable for frogs, lizards or terrapins, described and pictured in June's "Het Aquarium"

Ambulia, sword plants etc. is obtained only when a sufficiently nutritive layer of soil is present in the tank.

The construction of a terrarium is detailed in a three pages long well illustrated article by J. Th. ter Horst, and the fascination of the hobby of reptile and amphibia keeping is made apparent. Dutch aquarists closely follow all aquarium news from abroad, as shown by the pages devoted to foreign reports and reviews of foreign books.

W. J. VAN DER KOLK

U.S.A.

OPPOSITION to the Goldfish Society of Great Britain new names for goldfish varieties is not only coming from Britain. In the May issue of *The Aquarium Journal*, Henry A. Nichols questions the necessity for proposing fresh nomenclature. This author considers that fish names should be simple, appropriate and distinct; in his view the Goldfish Society names do not meet these requirements.

A report on the Los Angeles Fish Show in the same issue mentions troubles experienced by exhibitors showing a piranha, the world notorious South American devil fish. In past shows this specimen had "severely bitten its owner," but this year it contented itself with biting through a net. Other unusual exhibits for an amateur aquarists' show were an octopus and sea horses.

PHOTOGRAPHIC confirmation of a fertile cross mating of a male blue acara (*Aequidens latifrons*) and a female *Aequidens portalegrensis* is given in the May issue of *The Aquarium*. Development of the eggs was observed microscopically but the embryos failed to grow beyond the early stage of blastulation. Dr. C. W. Coates, of the New York Aquarium, gives an account of a double-tailed sword-tail with two gonopodia which arrived at the Aquarium in a hatchery bred consignment, and goes on to discuss other cases of organ duplication in fishes. Experiments are being made to see if the double tail is an inheritable characteristic.

In the June issue occurs a discussion of aquarists' usually stated superiority of red coloured *Daphnia* as food for fishes. *Daphnia* blood becomes more red when its haemoglobin unites with oxygen in water, and as shown by a British scientist, Dr. Munro Fox, this mechanism operates in the crustaceans when water oxygen content is below normal. It is suggested that red *Daphnia* are preferred because haemoglobin is then in increased amount and its high protein content makes a rich food.

European Pond Terrapins

by MONICA GREEN

THIS year there has been a large importation of European pond terrapins (*Emys orbicularis*) at a price within reach of most pockets. A half grown specimen costing about 7s. 6d., with proper care could live anything up to fifty years.

The following is an account of the keeping of three young specimens whose measurements and estimated ages are:—

Length of carapace ..	52 mm.	57 mm.	70 mm.
Width of carapace ..	51 mm.	53 mm.	66 mm.
Height of shell ..	21 mm.	22 mm.	24 mm.
Age ..	4 yrs.	5 yrs.	6 yrs.

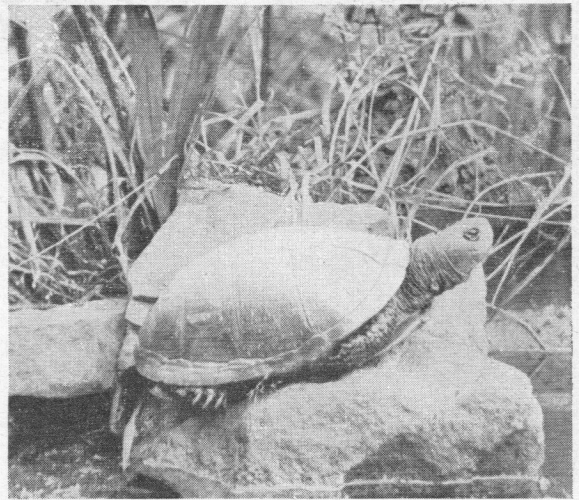
Their colour varies greatly, the two largest are black with yellow spots on the head and neck, with carapaces black and oval in shape. The smallest one has a brown carapace which is inclined to be round, and his neck is brown.

During the late spring and summer they are housed in a greenhouse, in a run 48 ins. by 22 ins., with an enamel pan sunk level with the earth. I found a movable pan more serviceable than a fixed concrete pond, as the pan needs fresh water and cleaning daily. The pan, which is 14 ins. by 12 ins. by 2½ ins. deep, has aquarium shingle to cover the bottom, because when the terrapins fall on their backs the enamel was too slippery for them to right themselves again. A square flat stone is put in each corner for use as a stepping stone in and out of their pond. Around the pond young grass is growing; this offers protection from the sun, which I find they do not like. Another form of shelter provided is a flower pot broken in half lengthways, for use at night.

When there is a likelihood of frost they are brought indoors to a home-made vivarium. This is made from a box 18 ins. by 18 ins. by 14 ins. deep, with glass in the front and a movable perforated zinc lid. There is an 8 in. by 10 in. by 2 in. enamel pan sunk into aquarium compost. Moss is provided for sheltering under; a 40 watt bulb heats this vivarium very satisfactorily. The three terrapins spent the whole of last winter in this vivarium, eating about once a week.

On sunny days it really seems impossible to over-feed them. The two largest eat earthworms cut into two inch lengths, but the smallest will only eat white worm. Raw meat is not eaten very quickly and consequently fouls the water, so if this meat is used for food it is better to feed them in a shallow dish away from their pond. Gentles are also taken readily. I tried getting rid of my surplus young livebearers as food, but the young fish were too quick and darted away, quite often right out of the water altogether. Terrapins are an asset to a fish breeder in that the water in their pond is teeming with Infusoria, and *Daphnia* thrive well in it too.

Newly bought terrapins seem very shy and reluctant to eat while being watched, but they will soon overcome this fear and if their food is put in the same place each time they will run to the corner awaiting a meal. The younger they



European terrapin (*Emys orbicularis*)

are the better, for they soon get used to being handled; with older ones I find they are nervous and have a tendency to urinate when picked up.

If terrapins are kept in foul or dirty water their eyes become affected, but this is easily cured by sunshine and fresh water. In young specimens the shell may become soft; sunshine and feeding on small livebearer fish may improve this. It is my experience that in very small terrapins the shell does not harden until about eighteen months of age.

My smallest terrapin whose measurements are:—Width of carapace 30 mm., length of carapace 28 mm., width of plastron 17 mm., length of plastron 22 mm., height of shell 12 mm., is kept in a deep Pyrex casserole dish, with half an inch of water, two flat stones for him to climb on, and moss for protection from the sun. He eats three meals a day of white worms. He is put in the greenhouse during the day but brought indoors at night.

Recently a London store was selling young terrapins with their carapaces painted. Apart from looking very unnatural and hideous, this is very cruel. The paint prevents the shell growing and the result is either a deformed terrapin or a dead one. Terrapins are attractive without artificial decoration and really do repay the little care and attention they ask for.

Twenty-Five Years Ago

WHICH is the world's best aquarium? This problem the New York Zoological Society tries to solve in this year's annual report of the Director of the Aquarium. Should age precede beauty or should size, the number of exhibits, unique features, or popularity, take precedence? Frankly, we do not know which is the most beautiful within or without; as to size, those of Philadelphia, London and New York are in the lead. For popularity, New York holds first place, and it is also the oldest in the United States. The palm for number of exhibits goes to San Francisco. Most unique are Frankfort with fifty-seven and Berlin with sixty-six tanks devoted to insects, Naples with its world-famed exhibit of beautiful marine invertebrates. *From The Aquarist, September 1925.*

may be used. The pH of the water is indicated by certain colour changes.

In theory, then, it is easy enough to test water for pH value. In practice, however, complications arise; for water extracts alkali from glass (with a consequent rise in the pH value of the water in a new aquarium) and even in an old aquarium, from which the alkali from the glass has for long been extracted, it is necessary to take into consideration that as water at a low temperature is saturated with carbon dioxide, and some of this is lost as the temperature

rises, there is a resulting increase in the pH value of the water. Finally, there is a greater acid content in the morning than at the end of the day, after the plants have had the opportunity to absorb the carbon dioxide. This means that as the pH value of water rises with a rise in the temperature and progressively during the hours of daylight, to obtain the most accurate result, tests for pH should be taken at the same temperatures and allowance made for the length of time that the aquarium has been lighted.

To be continued.

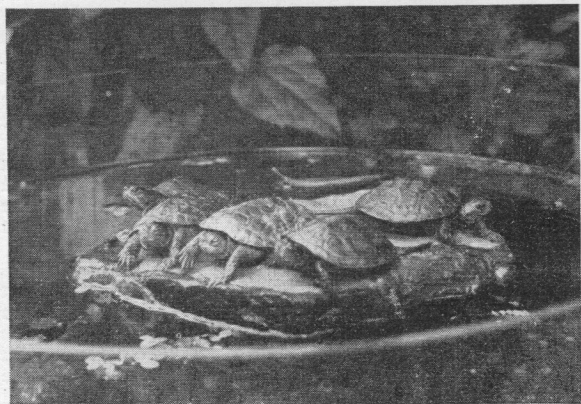
Baby Terrapins

by J. FRANCIS

ONCE again on the market are those attractive tiny terrapins or "freshwater turtles." They are difficult to resist, with their bright colours, unusual markings and amusing ways, but their life in captivity is usually very short unless special attention is given to their needs.

Although often recommended for the tropical aquarium this is not the best home for them; they are best kept apart from fishes, whose fins they may nip. They do need warm water, however (70°-80° F.), and in unheated surroundings they cease to feed and very soon die. Terrapins are amphibious, and their quarters should be arranged so that a bank of sand (which may be planted with pincushion moss) or stepped stones, provide an exit from the water for basking—a favourite pastime of the baby terrapins. A wooden raft of bark on the water can also be used. The water need not be more than six inches in depth, and old sinks or damaged aquaria make useful aqua-vivaria for them.

Next in importance to warm water is the provision of overhead lighting. In winter an electric lamp should be switched on over the terrapins for several hours each day, and in summer every opportunity of placing the animals in the open in sunlight should be taken. Water plants weighted with lead strips, and floating plants such as duckweed can be provided, for although mainly carnivorous,



Quite a small glass dish makes a home for these youngsters basking on a stone

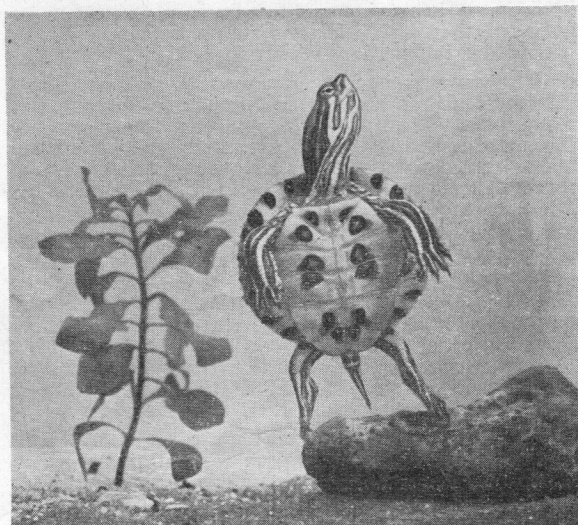


Photo:

W. S. Pitt

The under surface of this elegant terrapin is seen in a graceful below water pose

young terrapins sometimes take green food. Their carnivorous diet demands that their water should be changed regularly; dirty and odorous water causes them to lose interest in food and promotes eye infections.

Newly imported terrapins require live foods, for they have to be educated to take non-moving food. Very small specimens will accept *Daphnia*, *Tubifex*, and white worms. Larger ones delight in small earthworms, freshwater shrimps and garden wood lice. It is not very long before they begin to eat meat—raw beef, heart, liver, and chopped worms form a good introduction to this new mode of feeding for them. Vary the diet as much as possible. Remember that terrapins feed in water and not out of it; remove uneaten food before it pollutes the tank.

Growth is usually extremely slow in captivity and for it to occur at all plenty of lime salts for bone and shell formation are necessary. Hence any foods giving a source of these are specially useful. Small freshly dead fishes, the wood louse, the freshwater shrimp and louse, are examples.

When buying young terrapins choose active specimens with clear bright eyes. Should eye troubles develop—closed and suppurating lids—bathe the eyes with warm water, gently wiping them with soaked cotton wool, and then apply Golden Eye Ointment. Any ailing terrapin should be given plenty of light and clean water at the right temperature.