

WATER LIFE

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Another Albino Frog

By LOUIS C. MANDEVILLE

THE recent notes in WATER LIFE on Albino Frogs have had a remarkable sequel. A reader wrote to the Editor saying that he had a light coloured frog with pink eyes; would she like to see it? The Editor replied that she would very much like to, and a few days later the specimen arrived. There was little doubt that it was a true albino.

The frog, which is a male about $2\frac{1}{2}$ -in. long, is two years old. It is extremely active and virile, as I can well testify after spending some considerable time photographing it. Often abnormal animals of this type are rather more delicate than their normal fellows, but this frog is well to the fore at feeding time, and catches flies with the characteristic accuracy and speed of his family.

The general body colour is a pale gold, with some slightly darker spots. The belly is golden, with a pink reticulation. There is a slight green patch on each side of the abdomen, but this is probably due to the viscera showing through the thin translucent skin. The eyes are pink and have the strange and characteristic deep, translucent appearance of the typical albino. As can be seen in the illustration, the tympanum stands out particularly clearly, and is so transparent that the bones of the ear can be seen through it quite distinctly.

The frog is a sport of the English species, *Rana temporaria*. The spawn was laid in a Walthamstow garden. Most of the tadpoles were fed to fish. The one which metamorphosed to be a perfect albino was raised and still lives in a small fish pond. Until the notes appeared in WATER LIFE the owner did not realize he had acquired a specimen at all rare or unusual. Considerable regret might be expressed that the other tadpoles were lost, because, of course, it is probable that there were several more albinos in the batch.

The Editor took the frog on a round of visits to several zoological centres in London, in all of which it created a great stir, the physiologists and geneticists being particularly impressed and enthusiastic. Needless to say, the owner is not anxious to part with his beautiful specimen, but great care should obviously be taken to preserve it alive and, if possible, to spawn it next year. It would, of course, be best if the resulting eggs could be hatched and the tadpoles raised under the carefully controlled conditions of the experimental zoological laboratory, such as they have, for instance, at Cambridge University, where the rearing of tadpoles has received particular attention.

The frog will have to be spawned with a normal female, and the resulting tadpoles are likely to be all apparently normal, but all of them will carry the albino



The Albino Frog

factor, which will not appear until the following generation, so that as long as five years or more must elapse before any tangible results can be obtained from breeding. This frog is, of course, the chance of a lifetime and the unfulfilled dream of many an experimental geneticist, and it would be a great pity if the specimen were not perpetuated by his offspring. In fact, one might say that a major responsibility to science rests on the shoulders of his owner.

The frog will be on view at the forthcoming show of the Leyton Aquarium Club, where it will no doubt be the exhibit of greatest attraction and interest.

* * *

Dip Tubes

Making a dip tube is quite an easy task. Heat one end of a piece of $\frac{1}{4}$ -in. glass tubing in a gas flame until it closes up. Heat the tube evenly about 2 in. from the closed end, and when it is red hot remove it from the flame and blow down the tube until you have formed a bulb about $\frac{1}{2}$ -in. in diameter. You may have to heat the glass two or three times before you have a bulb the right size. You can make two or three bulbs in the tube if you like. The more you have, the greater the amount of sediment you will be able to remove at once.

To use the dip tube, first moisten your thumb and place it over the end farthest from the bulbs. Next, insert it into the tank over the piece of decaying food, or whatever else you wish to remove, and gently lift the thumb from the top of the tube. When the particle has ascended the tube, replace your thumb and remove. With practice, you will be able to remove unwanted deposits from four or five different parts of the tank without taking the tube from the water.—R. J. AFFLECK.

leaves which rarely exceed 12-in. in height, spring directly from a long, creeping rootstock.

The racemes of attractive golden yellow, star-shaped flowers, with orange-scarlet anthers, are thrown well above the leaves and remain in character from July to August. After the flowering season the blooms are followed by decorative orange-yellow seed capsules, and the leaves turn from green to a deep vermilion.

Its specific name, *ossifragum*, means "bone-breaker," and indicates the suspicion with which the plant was hitherto regarded, it being thought that the bones of sheep were rendered brittle and that the animals eventually succumbed to the rot through feeding on the plant.

Modern science, however, gives another explanation, it being contended that in the marshy localities where Bog Asphodel grow the grass is found to harbour Marsh Snails, and as this little creature is known to be one of the hosts of the dreaded liver-fluke, which in turn is the cause of rot in sheep, it looks as though our little bogland beauty will have to be dismissed from the case without a stain on her character.

The Bog Asphodel can be readily grown in the bog garden, its only requirement being a moist position in full sun; it can be increased by division at planting time in March and April, and, once planted, will need very little attention, except to restrict the size of the plants when they exceed their allotted space.

* * *

The Walthamstow Albino

Following the article on the Albino Frog from Walthamstow, which appeared in last week's issue of WATER LIFE, we have received this letter from Professor J. B. S. Haldane, F.R.S. (Weldon Professor of Biometry at University College, London):

"Sir,—It is probable that the Walthamstow Wonder is a true albino. However, this is not quite certain. In rats, mice, and guinea pigs there are pink-eyed varieties with a little yellow colour, but no black in their hair. These breed true, but if crossed with albinos, give dark-eyed young. So it is just possible that a true albino frog would have less yellow colour in its skin.

To judge from what happens when albinos or pink-eyed yellows crop up in other species, it is probable that about a quarter of the albino's brothers and sisters would have been like him if they had grown up.

Albinism, complete or partial, is likely to be more of a handicap to a frog than to a rabbit, mouse, or guinea pig. For the frog uses his eyes to catch his prey, while the above animals do not rely on them. This is why, though albino poultry are known, the character is not established in any breed. For poultry rely very much on their eyes, and an albino hen cannot see seeds on the ground, and has to be put in front of a large trough of food if she is not to starve to death. So I hope that this frog will not be expected to find all his own food.

J. B. S. HALDANE.

[Strangely enough, in this actual specimen the eyesight appears to be perfectly normal, for the frog was well able to compete with other frogs and toads in catching bluebottles in the aquarium.—EDITOR.]

The Madagascar Lace Plant

TOM C. SAVILLE

THE Madagascar Lace Plant (*Aponogeton fenestralis*), the rarest and most beautiful of all aquatic plants, is quite common throughout the island of Madagascar, to which island the plant is indigenous. It is found in varying localities, and is therefore subject to different conditions. This difference of conditions results in a wide variety of forms; not only may the shape and size of the leaves be altered, but the very form of the leaves, which makes this plant so distinctive from all other plants, may be changed, and, instead of a network of holes, the leaves may be little different from the leaves of the Cape Water Lily (*Aponogeton distachyon*).

The plant is entirely submerged, and usually consists of a spray of large, oval leaves whose stalks spring straight from a central root stock. The leaves consist entirely of four-sided holes formed by the flat veins, and give the impression of lovely pieces of green lace

rather than growing leaves. The young leaves are a delicate copper shade at first, but change to green with age.

The roots develop a tuber, rather like a potato, which the natives use as an article of food.

Aponogeton fenestralis will sometimes flower in the aquarium, providing that conditions are suitable.

In August a stout stem grows from the crown of the plant. This stem grows about 3" out of the water, and bears two 3" spikes, which are covered with small, creamy, star-like flowers which have a very pleasant smell.

The Lace Plant is tolerant of most conditions found in aquaria, and can stand a wide range of temperature, though the very high temperatures are apt to be dangerous. 70°-75° F. is fairly safe. Hard water is, in time, apt to cause the plant to die, on account of its chalky nature. To be on the safe side use rain water.

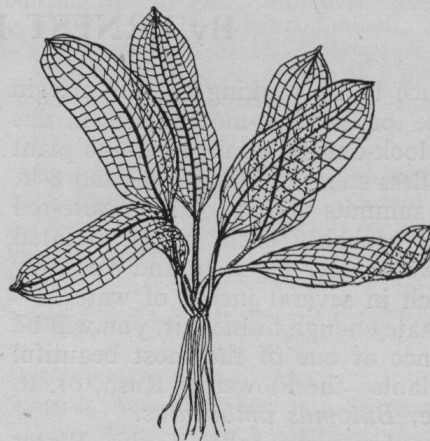
The plant is a heavy feeder, and should be planted in rich loam mixed with well-rotted cow manure. Snails may be kept in the same tank, for, although the leaves look fragile, they are really quite tough, and will not be harmed. Also, the snails will be useful in clearing the algæ which tends to clog the leaves.

The Madagascar Lace Plant was formerly known as *Ovvirandra fenestralis*, but, although this name is still used by American aquarists, it is incorrect.

[Last summer Mr. Saville went abroad to Madagascar, and brought home three specimens. After keeping them for almost a year he wrote the above article from his observations.—ED.]

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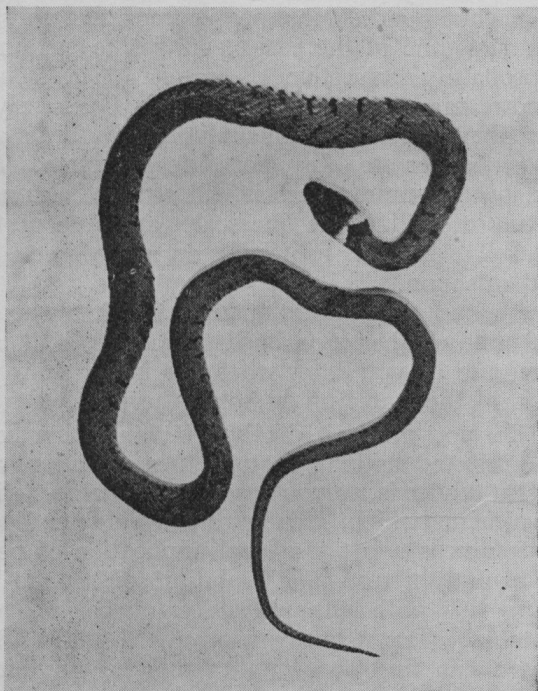
Be sure to make careful arrangements for the care of your fish and reptiles while you are on holiday.



The Grass Snake

By ALFRED LEUTSCHER

OF our three British snakes, the Grass or Ringed Snake is perhaps the best known, being most commonly met with. It is the largest of the species found in Great Britain, the male averaging, when fully grown, some 3-ft., and the female being even larger. Exceptional cases go to over 4-ft. The poisonous Adder, on the other hand, measures little over 2-ft. at maturity. This also is the average length of the Smooth Snake, our third representative of the legless reptiles, which is now, however, so rare that it is seldom seen or even heard of by most people. The



[Photo: R. Burgess]

The English Grass or Ringed Snake. Note the yellow collar on the neck and also the long slender tail.

last living specimen I saw was in the London Zoo last summer, having come from Dorset, where it still occasionally shows itself.

The Grass Snake, though not so attractively marked as the Viper, is certainly the more graceful of the two. It possesses a slender body for its size, especially in young specimens, which tapers from about midway to the tip of the tail. In the Adder, the thick body and short stumpy tail form an obvious and rather ugly contrast. This characteristic is typical of the Viper family in general.

In the Grass Snake the second point to notice is the rather long-shaped head, with its large scale-plates on top and a prominent pair of eyes to each side, which bulge out somewhat and have dark brown pupils rimmed with gold. Behind the head are two well-defined patches of colour, varying from yellow to orange, forming a distinct "collar" from which the Snake derives its alternative name of Ringed Snake. An elderly snake may sometimes lose this marking. These two patches

are bordered behind by a similar pair of black marks. The general ground colour of body and tail is olive or brown, usually some variation in between. The back is free of markings as contrasted with the diamond pattern on the Adder's back, but slightly to each side is a row of black spots, with a similar row of black, vertical bars below, which may unite with the under-surface colouring. This is generally of a chequered black and white pattern on the broad scales of the belly.

On occasions, like many reptiles, this Snake will remove its outer skin by a process of sloughing. Separation occurs along the angles of the jaws, and by slow reversion the skin is peeled off as the Snake glides through the grass and undergrowth. Such skins may be found on one's rambles and are interesting to study. I have one skin so complete that even the eye scales are present. Sloughing no doubt has a lot to do with the varying reports on colouring of Snakes. Preparatory to the operation, the animal looks very drab in its dark and lifeless outer skin. Afterwards it becomes very lively once more and looks a picture in its shiny new coat of resplendent hues.

Hibernation in these Snakes occurs during the late autumn months, when the Grass Snake will retreat to some hole beneath the roots of trees, underneath the leaf mould of thick bushes or ditches, or even beneath a wood pile. All it seems to be concerned about is that its sleep should remain undisturbed and that it should avoid frost. Often it will coil up into a bundle with other Snakes for the purpose of conserving moisture, and hence the frequent report of the discovery of a "nest" of Snakes during digging operations.

At the advent of sunny weather, usually about April, the Grass Snake reappears and is then best sought after if required for the vivarium, since at this stage it is more concerned with absorbing moisture and the sun rays than in seeking food. It is mostly found within the vicinity of farmyards, along woodland borders, where plenty of undergrowth exists, in the hedgerows and ditches of fields, or among the vegetation of old river beds. One usually finds it coiled up in the sun, and it is a comparatively simple matter to step forward and catch it. The bright yellow collar and slender tail give it away as harmless, but—is it quite so defenceless as one would imagine? This question is very quickly decided, for when one holds the struggling captive in the hand for the first time it has a rather disgusting habit of voiding an extremely foetid secretion of waste matter which, if it comes into contact with the hand or clothing, may linger for many days. I find it best to wear thick leather gloves when snake-catching. These have a twofold advantage—they prevent the hands from getting fouled and they also prevent one from paying the very costly mistake of grasping an Adder by accident. This is quite easily done, for the time between discovery and the subsequent retreat of a Snake is very short, since these reptiles, especially Grass Snakes, seek to escape at the slightest indication of danger.

(Continued on page 345)

Some Queer Frogs

GIANTS among frogs are *Rana goliath*, from West Africa, which reaches a length of 10", and *R. guppyi*, from the Solomon Islands, which grows to about 9". Incidentally, that is the same Mr. Guppy who gave his name to the most popular of all tropical fishes, *Lebistes reticulatus*, but whereas the frog is a giant, the fish is a midget.

Dimorphognathus, another West African frog, shows a queer difference between the sexes. The males bear a series of long, sharp teeth in the lower jaw, a unique condition in a frog, but the female has no teeth at all.

Another strange frog, which, as far as is known, has never been seen alive in Europe, is reputed to bear its young alive, like the Salamander. This frog is *Pseudophyrne vivipara*, from East Africa.

Ants are in many respects highly developed animals, and they wage a fairly successful war against other and higher animals. The mammals have produced the anteaters, those strange creatures with highly modified snouts, which live upon ants. In Mexico lives a frog, *Phrynophymis*, which has adapted itself to the task of feeding upon ants.

* * *

Another Fish Parasite

Reprinted from the "Scottish Aquarium Herald"

IT appears from discoveries made last winter by three of our members that still another name must be added to our already lengthy list of fish parasites.

At our last show, in January of this year, a Shubunkin was exhibited, and, on account of the clearness of the water and the bright illumination, all the features of the fish could be easily observed. It was noticed that one of the rays of the tail fin presented a peculiar appearance, somewhat as if this one ray had hardened and become "bony" and opaque. At first no particular notice was taken of this feature, but about a fortnight later a closer inspection revealed that this ray had taken a kink, and when it was gently rubbed with the fingers it moved about. So, with a pair of tweezers this creature, which now revealed itself to be a worm, was extracted. Half the body was out of the fish and half was in the fish. Two more such worms were pulled from the same fish. They were easily an inch and a quarter long and about a thirty-second of an inch in diameter. Shortly after this two other members found similar creatures in the fins of their fish. All the fish came from the same source of supply.

The specimens were preserved in alcohol, and handed to Miss C. MacTaggart, M.A., B.Sc., Lecturer on Zoology at the Royal Technical College, Glasgow. Miss MacTaggart kindly undertook to identify the worm. Her report is now to hand.

The parasite belongs to the genus *Philometra*, a nematode worm, and it was probably burrowing itself out of the fish, and not into it, as was originally thought. The specimens given were all females, and it would be necessary to obtain males in order to identify the species of *Philometra*. This parasite has a life-cycle similar to that of the limnea worm, a parasite of man in warm climates. The female worm has, when mature, the

habit of boring its way out of its host, and coming out of the surface of the skin, in order to discharge its larvæ. The male remains in the host.

To cure the fish of the parasite, these should be removed as they appear, and the affected fin gently washed with a weak solution of Condy's fluid to destroy any larvæ that might be about. The water of the aquarium should be changed frequently for some time after. This may in time get rid of the parasite in the stock.

* * *

Green Water

AS I have for some time taken a particular interest in what is the despair of most aquarists, viz., green water, perhaps a few notes on my observations may be appreciated and developed by fellow-readers. The tank used, which gave the results under the conditions stated below, was a 24 x 12 x 12-in. steel-framed, ¼-in. plate glass all round, with a slate bottom. The tank was set up in August last with a layer of about ½-in. of sand at the back, falling to just a covering at the front. This sand was washed until it was possible to let it fall through the water without clouding, and sterilized in boiling water. A fairly thick planting with *Vallisneria*, *Myriophyllum*, *Elodea*, and *Ludwigia*, and filling with ordinary tap water, completed the tank, which was then allowed to stand for about a fortnight before introducing fish. During this time it turned quite green. I then put in a trio of *Barbus conchoni*, which soon settled down.

The tank cleared itself in about six weeks, and, apart from algæ growing on the glass, kept perfectly clear until a few weeks ago, when I increased the number of inhabitants; since then it has gone green. During the whole of this time the fish were in the best of health, and during April/May I noticed signs of great activity, but did not interfere, as I was determined to let the whole tank take a natural course for observations as to green water. It was neither aerated nor filtered, nor was the mulm siphoned off, and I have had quite a number of sturdy youngsters. The diet consisted of live and dried *Daphnia*, chopped earth worms, *Enchytra*, scraped raw beef, etc.

I have experimented with tanks having no sand, but with plants in pots, less plants than the one above, more fishes than the one above, and have arrived at the conclusion from the result of introducing extra fish into my first tank, that to keep the water clear, little sand, few fish, and plenty of plants are required, and the fish should be given a very varied diet.

Note.—My fish house is 10 x 6 x 7-ft., falling to 6-ft., having no side light, but a roof entirely of glass, heated by a "Solesse" stove, and lit during the dark days with gas, a separate bijou-type lamp for each tank, for about five to six hours daily. No covering was placed around the tank at any time to shield it from the light. I shall be pleased to read of others who have experimented in this subject, as it is certainly an asset to have clear water.—L. J. SANDERSON.

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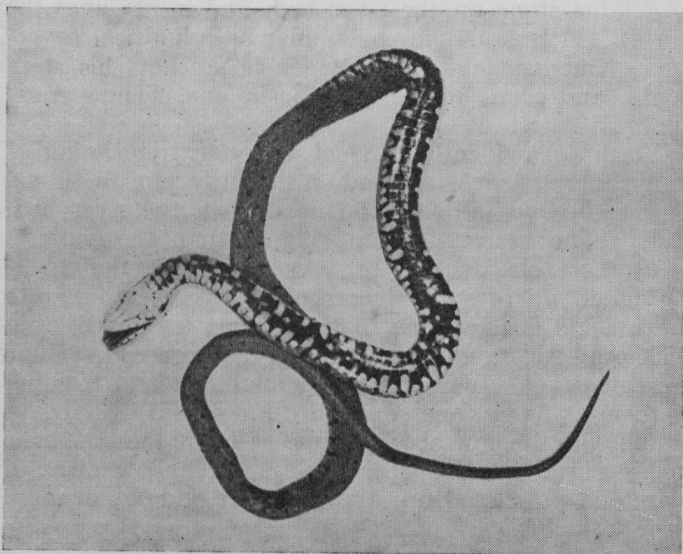
Pepys's Diary, May 28, 1665.—"Thence to see my Lady Pen, where my wife and I were shown a fine rarity; of fishes kept in a glass of water, that will live so for ever; and finely marked they are, being foreign."

The Grass Snake

By ALFRED LEUTSCHER

(Continued from page 345)

GRASS Snakes in captivity make ideal pets. They quickly settle down, become quite tame and used to handling, and soon lose their objectionable habit of producing offensive secretions. Feeding is simple with native specimens, since they will soon take to frogs. It is not so simple a matter, however, with purchased Grass Snakes, which are usually continental in origin. These Snakes are usually darker than the English specimens, tending towards an olive colour-



[Photo: R. Burgess

Grass Snake shamming dead. Notice the open mouth and pattern on the underside.

ing, and having a series of thin, yellowish lines down should, preferably, be constructed out of doors so that the inmates may have access to a maximum amount of sunlight. The vivariums I possess are of a rectangular pattern, some 4-ft. to 6-ft. long, 2-ft. in width, and the same in height. The front consists of glass in a frame which swings outwards on hinges, so that the contents of the box are easily reached. Such attention as watering the plants, filling water-bowls, etc., is done late in the evening, when the Snakes have retired. Small doors at each end may be cut out for admitting foods, larger insects, and, if one is not squeamish, live mice!

The snake vivarium is a matter of individual taste, but should, preferably, be constructed out of doors so that the inmates may have access to a maximum amount of sunlight. The vivariums I possess are of a rectangular pattern, some 4-ft. to 6-ft. long, 2-ft. in width, and the same in height. The front consists of glass in a frame which swings outwards on hinges, so that the contents of the box are easily reached. Such attention as watering the plants, filling water-bowls, etc., is done late in the evening, when the Snakes have retired. Small doors at each end may be cut out for admitting foods, larger insects, and, if one is not squeamish, live mice!

One point regarding the construction of snake vivariums I should like to stress is that the joints and corners should fit perfectly, however rough and ready the material. I have lost more Snakes than I care to remember through faulty construction.

Ventilation consists of "windows" of perforated zinc in the back and a complete covering of this material on top, supported by crosspieces of wood. Owing to the diathermous properties of glass, the sun's heat enters the vivarium quickly, causing the air inside to heat,

and were there no outlet for this air to escape by upward convection, the inmates would soon die from overheating.

The box is protected from weather by good coatings of paint and a sloping rain-roof on top of the ventilation-roof. Inside it is decorated with rockwork and plants, with stretches of sand in between, upon which the Snakes can lie and bask. The artificial water bowls may be artistically camouflaged with overhanging rock plants. Should the Grass Snakes have companions which are fond of climbing, such as the Leopard Snake, then a few branches should also be introduced.

While watching these interesting snakes one may be fortunate enough to observe the process of mating. The male will grasp a female in his jaws and the two bodies will become entwined. This lasts for an hour or two. The eggs, a dozen or more, are oval, about the size of a Thrush's egg, covered with a tough skin of leathery texture and all connected end to end by a skin-like tissue. In a wild state the female lays her eggs beneath a bracken pile or a farmyard manure heap, where subsequent heat and moisture will swell the eggs and incubate them. In captivity a corner of the box filled with a mixture of manure and mown grass should generate enough heat to hatch out the eggs. It is important though to keep the pile moist, as this encourages bacterial action and consequent heat liberation. In some eight weeks the baby Grass Snakes hatch out. They are provided with an egg tooth for piercing the egg-shell. Young snakes will feed on insects and worms, but rearing I find difficult, as the first winter hibernation usually proves fatal.

Feeding, though a gruesome sight, is instructive. The bones in a snake's skull are so loosely fitted together that prey much larger than the head can be admitted. Grass Snakes unfortunately eat their food alive. The victim, a frog, say, is grasped in the jaws and by a process of leverage the snake seems to work its way over the prey; the tiny recurved teeth in its jaws prevent escape. If necessary the two halves of the lower jaw can be separated from each other, being connected merely by elastic ligament, and can move separately from each other. One can visualize the ugly contortions involved during feeding. The food eventually reaches the stomach, its passage being simplified by a coating of slime secreted by glands. The lump of food then slowly disappears as the powerful digestive juices work upon it, and by about the fourth day the snake is of normal size again. Such a meal will suffice for two or three weeks.

Snakes are excellent swimmers and provide a beautiful sight if allowed to swim in a large enamel bath, a treat they will surely appreciate on really hot summer days.

* * *

The little brown animal which lives by streams, usually known as the Water Rat, is nothing of the sort. It is the Water Vole, and really looks very much like a large Field Mouse.

Terrapins in Summer

By SIDNEY W. WOLFF

THIS spring I chanced upon a very pretty variety of the European Terrapin, and bought two to add to the full-grown male and female I already possessed. The specimens I secured are about half grown, with clear yellow plastrons, and the carapace, head, and limbs speckled with bright golden yellow on a deep brown background.

With the heat of summer, which speeds up the actions and brains of all reptiles, these four are becoming an extremely interesting "family," and their appetites are difficult to cope with. They are quartered in an enclosure of 1-in. mesh wire netting, buried securely in the ground at the bottom, and with the top 3-in. to 4-in. bent inwards at a height of about 10-in. from the ground. Measuring approximately 6-ft. x 3-ft., this home is adequate for their needs, and, incidentally, affords "Wilfred," the smallest of the quartette, an opportunity for exercising his climbing propensities, which are considerable, for only the overhang at the top prevents his escaping altogether, and sends him, when he reaches it, flat on his back with a thwack. Unlike the Land Tortoises, these creatures can easily right themselves from such a position by a vigorous twist of the head, and scramble away none the worse.

For swimming purposes they have a galvanized iron bath, sunk in the ground and with the edges concealed by stones and overhanging rock plants. Such water plants as there are consist of sturdy marginals, securely planted in pots, so as to withstand the careless buffetings of the reptiles. At one end is a sloping piece of slate, enabling them to leave the water easily, though this is scarcely necessary, for their ability to blunder quickly over obstacles is sometimes quite surprising.

I find this accommodation ample, since with either more land or more water they would often lose themselves for days on end. In previous years the result of this has been that they were often only fed about once a week, which, of course, is not sufficiently frequent, daily feeding being necessary if they are to lay up a sufficient store of food in the form of internal fat to enable them successfully to withstand the winter in hibernation.

Formerly I fed these pets in a separate bowl of water, but now that they have lost their timidity I feed them by hand in the tank. By this method they seem actually to eat more, and another advantage of it is that it eliminates handling, which, unless they are thoroughly accustomed to it, only frightens them and discourages them from feeding. They are now learning, if outside the pond when my hand appears, to tumble in and swim near, with outstretched heads and bulging throats, striving to take the offered titbit with an eagerness sadly lacking in precision, for it is often my finger which they seize and strive valiantly to bite. I have never yet found a limit to their appetites, for though apparently sated with raw meat, blowfly larvæ, liver, etc., they will always swallow a succulent earth worm with relish. It is conceivable that the passage of food

through the digestive canal is so rapid that they can never be sated, as a Land Tortoise can.

Terrapins will eat almost any small, fleshy animal that moves, but to feed them on live frogs is rather callous, as the Terrapin, quite unconscious of inflicting suffering, seizes the frog by one leg and takes its time over the meal. Worms, we are told, are much less capable of feeling pain than higher animals, and as these are tender and nourishing, I consider them to be ideal where live food is necessary, as in the case of new specimens whose appetites need to be stimulated by the sight of moving food. To see "Arthur" paddling frantically at the surface, with tiny pink mouth wide open, snapping wildly in the hope of a worm, is comic in the extreme.

On a sunny day my pets can be seen basking in the sun on the stones by the pool. It is characteristic of these reptiles to remain in one spot for long periods, gazing placidly around them with heads held high. Those that are not nervous enough to dash into the water on the appearance of a human being, seem to take quite an interest in the phenomenon, for they gaze up at one with what seems to be a coldly critical expression. A Terrapin's face, however, being rigid, is, of course, quite incapable of variations of expression.

In my opinion, there are few reptiles more decorative than these, as, when tame and well fed, they seem naturally to take up ornamental positions on conspicuous parts of the rockery, stretching out their necks in order to get the maximum amount of sun. The sight of a few of them grouped in this way, or floating among the water plants, is enough to gladden the heart of any animal lover who possesses a true eye for beauty.

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Persecution of Breeding Herons

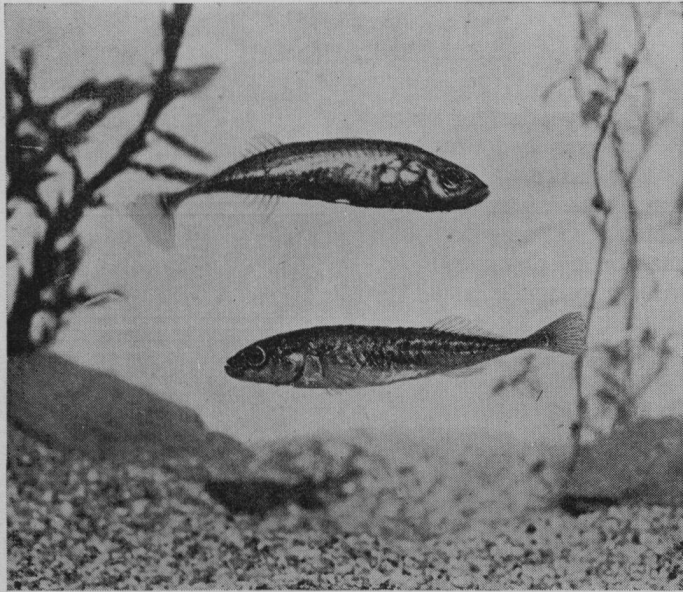
ACCORDING to E. M. Nicholson, in a report published in *British Birds*, of April, 1938 (Vol. XXXI, No. 11), "persecution of breeding Herons appears to be a serious factor in parts of the Midlands and North, and reports of destruction of colonies have reached us from Northumberland, Roxburgh, Cumberland, and Derbyshire, the birds in the last case having been shot while feeding young, which were left to starve. Staffordshire has the unenviable distinction of having lost since 1928 no fewer than four of the six heronries then extant in the county, largely through deliberate destruction. Cheshire, on the other hand, has increased the size of its Heron population considerably."

Last spring more than 150 heronries in different parts of the country were visited by volunteer observers for the purpose of making observations and collecting data, the organizer (on behalf of the British Trust for Ornithology) being Mr. W. B. Alexander, of the University Museum, Oxford.—P.M.

Breeding Sticklebacks

By T. HUNTER (Aged 14)

AS chairman of our aquarists club at school, I thought it might be of interest to other aquarists to read of our successful attempt to breed Sticklebacks in a tank 2 x 1 x 1-ft. We secured a good male from a nearby pond, who, when he had settled down in his new home, scooped a hole in the sand under some plants, into which he deposited quantities of loose algæ and other debris he collected from all over the tank. When he had gathered a good supply he hovered over the "nest" and shuddered violently; at the same time



Nine-spined Sticklebacks

he emitted a sticky substance from the lower regions of his stomach. He did this on more than one occasion, and I was fortunate enough to witness it once.

Until then we had no females in the tank, but, seeing how interesting the male was, we took a trip to the local pond and caught four wives for him, each of them larger than himself. As soon as we put these in the aquarium he began to chase and bite them just below their gills. After a time the females were so chased and harassed that one died, and the others seemed in a very distressed condition, but luckily, before any other damage was done, the eggs were laid. We all missed this event except the school caretaker, who said he saw a female Stickleback driven into the nest by the male and stay there for some time.

The same morning we discovered a hole in the nest, and, taking it for granted the eggs were laid, we removed the females to another tank. Every morning while the male was devoting himself to the task of protecting the nest he was fed on worms and live *Daphnia*.

About a week passed, and one morning, when we arrived in school, we found the nest had been shifted overnight to another spot, for no apparent reason. The hole had been left through the nest, and the male was fanning it with his tail and fins from a semi-rigid position. During that week he moved the nest back to the

same spot as before, once more leaving the hole and still fanning vigorously.

By the time we had given up all hope of ever rearing any baby fish, but, rather to our surprise, on June 28, while our science master was observing the nest he found some young. These were only a quarter of an inch in length, and nearly transparent except for their digestive systems. If by any chance a young fish strayed, the male would catch it in his mouth and return it to the nest. After two days we removed the male, and the young are now thriving on *Infusoria*, and growing at a steady rate. The *Infusoria* we breed by putting dry lettuce in an old bath which is sunk in the ground and filled with pond water plus hay.

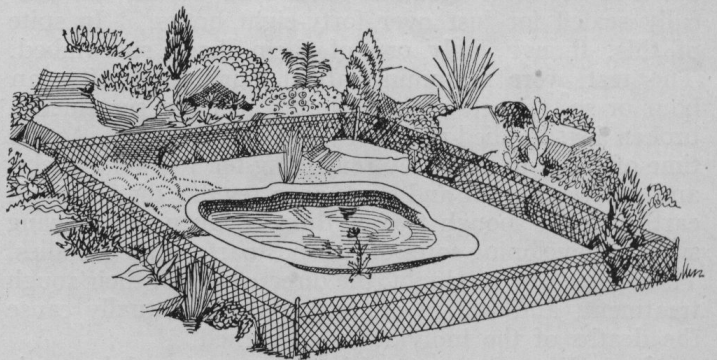
* * *

Outdoor Terrapin Keeping

By J. W. KINNEAR

THE summer months are a splendid opportunity for the young Nature lover to put his more hardy pets out of doors. Terrapins are excellently suited for outdoor life, provided that sufficient care is taken of their general well-being. I keep my American Terrapins in an enclosure about 3-ft. square, sheltered on three sides by a rockery. The enclosure is surrounded by small-meshed wire, and in the middle is a miniature rock pool.

To construct this pool, I first of all obtained a large slab of sandstone (the size will vary according to the number of Terrapins kept), about 9-in. thick. This was easily hollowed out to a depth of 3-in. to 4-in., keeping always about 2-in. from the edge of the stone. When



this was done, the loose particles of sand clinging to the sides and bottom of the pool were brushed out and the whole inside given a good coat of paint; first of all, I used a sixpenny tin of outdoor oil paint, but have since given the pool a coat of green enamel. The finished stone was then sunk into the earth. This rock pool is more beautiful than the usual concrete kind.

A little corner of the enclosure should be provided with damp moss, as the Terrapins like to crawl into or upon this. Briefly, their food consists of worms, minnows, tadpoles, small frogs, newts, and little pieces of raw meat.

The Slow Worm

By ALFRED LEUTSCHER

BEFORE entering on a description of this interesting little reptile, might I be permitted to correct one or two erroneous beliefs regarding its position in the animal kingdom, which, even in these enlightened days, still seem to persist, and no doubt are the cause of many sudden deaths among the members of this entirely harmless species.

To begin with, the names Slow-worm or Blind-worm are very misleading. At a superficial glance they may seem fitting, but on a closer survey of a specimen discovered in the field, one is very soon forced to admit that the little creature, with its complete covering of scales cannot possibly be a worm, the prefix "slow" is to be doubted when it is seen to beat a quick retreat

trend of this species. It has a small head with a fixed, bony lower jaw and eyelids; also its tongue is notched instead of forked as in a snake. These are all points specific to the order *Lacertilia*, the lizards, and not in agreement with the structure of a snake.

Slow-worms of maximum size are about a foot and a half in length, but most of them usually average one foot. The small head is rather short, and merges with a body which bulges out somewhat, and then slowly tapers to the tail, the part behind the vent, unlike that of a snake, is even longer than the head and body together. This is often obscure when the lizard has lost its tail. The original tail tapers gracefully, ending in a sharp-pointed tip, whereas a second growth results in a much narrower and shorter appendage, somewhat clumsily fixed to the stump of the first tail. Specimens are often found in this condition, since the Slow worm parts with its tail even more readily than other lizards. This is a precautionary measure in order that an enemy grasping the tail may be left behind with a wriggling and unappetizing morsel, while the intended victim has succeeded in making its escape. This device can also be noted among some birds with long tails, such as the cock Pheasant, which has fooled the fox on more than one occasion. Only the other day I noticed a male Pheasant in the woods, minus its tail.

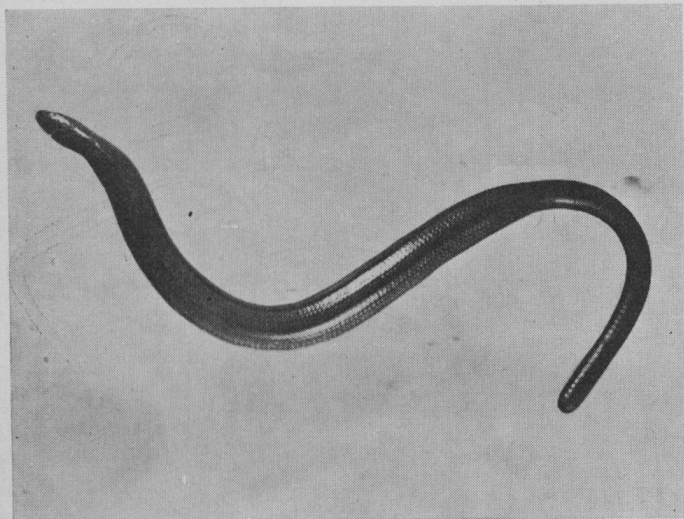
Food is governed by the size of the Slow-worm's mouth, for, unlike a snake, it cannot contort its jaws to take in large prey. It has a decided preference for slugs whilst in captivity, but will accept small worms, pieces of meat, and insects. Its quarters should cause little worry, since it only requires a soft, loamy soil in which to burrow, an open space or two on which to lie and bask, and a flat stone under which it can retire during cold or rainy weather. This can all be fixed up quite simply in a small vivarium, or even a disused or leaky aquarium. These should be free from loopholes for escape, however. Always arrange for a dish of fresh water to be available, because the Slow-worm likes to drink, especially during hot weather.

The young are kept within the body of the mother until on the point of hatching, when they are either produced alive, or within thin membranes, which however, are ruptured immediately at birth. The babies, about 2" long, are pretty little things of a silvery colour, with a black line down the back, and black underneath. Food seems to consist at first of small insects.

In the wild state, the Slow-worm's natural enemies are such animals as inhabit the same locality, and include, in particular, the Viper and the Hedgehog. Strangely enough, however, I have noticed on more than one occasion, how prevalent are Slow-worms in the haunts of the Adder, and yet the one preys on the other.

The Slow-worm feeds best in the evening, and should be given a diet of slugs and worms about once a week.

(Continued on page 398)



Slow Worm

into the undergrowth, and those bright eyes, which surely must have observed our approach, are certainly not blind! Then why the misnomer? The reason, presumably, is that common names, once applied, have a habit of sticking, even though incorrect. Why else, then, should the name "Hedgepig" be sometimes applied to a creature which is no more pig than you or I? Or again, the Water Rat, a peace-loving vegetarian of our streams, rightly called the Water Vole, yet so often named after its offensive and germ-carrying relative. These names are descriptive, and, as such, are usually accepted. It is only when the Biologist, with his careful classification and anatomical dissection, sets to work, that the animal's true status in the evolutionary tree is found, and then it is usually given in the Latin!

A more appropriate name for the Slow-worm might be the Hazel Lizard. Its colour is a distinct feature, and appears to be fairly regular. Darker specimens do occur, but the main tone is a uniform hazel brown. Down the centre of the back is a thin, dark line, with another line to each side.

As for calling this reptile a lizard—well, this is a case where there exists "a little more than meets the eye." Zoologists have brought to light the fact that, under the covering of uniform and polished scales, exist vestiges of limbs, now long discarded in the slow, evolutionary

Ponds

By H. J. HASTINGS

THE other day I saw a small pond being filled in from tip carts. With the urbanization of the countryside, the field ponds around London, North of the Thames, disappear. The sight of this pond being filled up started a train of thought, and memory went back to earlier days and other places.

As a boy, the perusal of the Rev. J. G. Woods' "Fresh and Salt-water Aquarium" and "Common Objects of the Country," bore in me the love of pond and water life. Around the field ponds of Hammer-smith, Acton, and Willesden, I served my apprenticeship with net, cotton, pin, and worm, and collecting bottles, there being many ponds in those days. Several stand out in memory and I can still visualize them. There was the "Tip" in North Acton, a partly cut and abandoned cutting, dammed by soil tipped from what is now the G.W.R. main line. This was a large and fascinating pool; we could always get the Crested Newt there in season, and it was one of two (the other near the Priory, Acton), where we obtained Carp. Another pond at Stonebridge Park on one occasion supplied three small eels. A pond somewhere between Acton and Park Royal gave me one Great Silver Water Beetle; it was the catch of the season and the first and last I have caught. All these ponds are now only memories, bricks and mortar taking their place.

About ten years ago I migrated to the open country, East of London. Ponds were even more plentiful there than on the West, with the added advantage of having good fish populations. But the same process is at work, and every year sees a few more ponds eliminated, although a few remain, incorporated into private gardens. One in particular was very notable, a sand pit pond; on one side was a 12-ft. bank covered with a tangle of bramble and gorse, the opposite side was a

shallow marshy slope; the pond was about 30-ft. in diameter, and was a veritable sanctuary for wild life. Carp and Rudd lived in it, Water Voles in the bank, and small birds in the bushes. Grass Snakes, toads, newts, and frogs in plenty, were to be found there, and, in the early summer, and last year, a Mallard, Moorhens, and Dabchicks nested there; the two former led their broods across the lawn morning and evening to and from a larger pond on the other side. Unfortunately with drainage, surface water was insufficient to keep up the water level, and in summer, patches of stinking mud were bared, so the pond is now no more.

I have not seen it noted anywhere, but have you noticed how ponds have a common and general, as well as a special and distinctive flora? For instance, I know of one which is crowded with Water Soldier; another is thick with *Polygonum*, and still another with Frogbit, and little else, seeming to specialize. Even their fauna seem to be governed by something that causes one species to predominate, whilst a field or two away another species is dominant. Last year in two small ponds I lifted scores of Ramshorn Snails, and a few hundred yards away in another I found the Great Pond Snail only. This uncertainty makes pond hunting so interesting, one can never foretell what the next pond will bring forth.

Another thought, how came these pools to be stocked with fish? I have thought of monasteries and fast days, but they are remote; the only record I can find of a religious foundation in the neighbourhood was at Upminster. There is a possible explanation in the pond on my neighbour's property. When his house was built, the footings of an ancient building were discovered, and local records mention a Tudor house being burned down 200 years ago, so that this pond may have supplied it with food as well as water.

The Slow Worm

(Continued from page 401)

It is deliberate and slow in its feeding, and a little patience is sometimes required to persuade it to eat. However, if the food is placed in front of it, any slight movement will usually catch the Slow-worm's eye.

These creatures make delightful pets, having no bad points like their reptilian cousins. They do not produce offensive smells as does the Grass Snake, cannot bite one, like the Adder, and do not make repeated dashes for liberty. Most pets have their faults from the owner's point of view, but here is one that I can fully recommend to the most exacting and squeamish. The Slow-worm is a pleasure to hold, its close-fitting scales, absent of keels, giving a remarkable smoothness, akin to velvet, when stroked. It is slow and deliberate in movement; when once used to its captor, easy to feed; in fact, "such a perfect little dear!" as a lady acquaintance once remarked, that I feel sure it will prove an immediate success if given a trial.

The Broadcast Talk

Readers who were unable to listen to the recent broadcast talk by Miss Margery G. Elwin on "Fish and Aquaria" are to be given another opportunity to do so. Owing to the enormous success and popularity of this talk, the British Broadcasting Corporation have asked Miss Elwin to repeat it. It is to be given in the London Regional Programme on Wednesday, August 31, from 4 p.m. to 4.15 p.m.

* * *

LEYTON AQUARIA SOCIETY.—The society held its sixth members' show at Leyton Town Hall on Saturday, July 23. Staged in conjunction with the Connaught Hospital Horticultural Society, it was certainly the most successful show in our history. The 103 entries in six classes were judged by Mr. B. W. Thaler, who congratulated the club on the high standard of the exhibits. Over 1,100 people visited the show, and four exhibition tanks set up by members attracted considerable attention. At our next meeting on August 24 Mr. A. H. Boughton will give a talk on "Fish Anatomy."—L. F. BEALES.

The Marbled Newt (*Triton-Marmoratus*)

By L. G. PAYNE

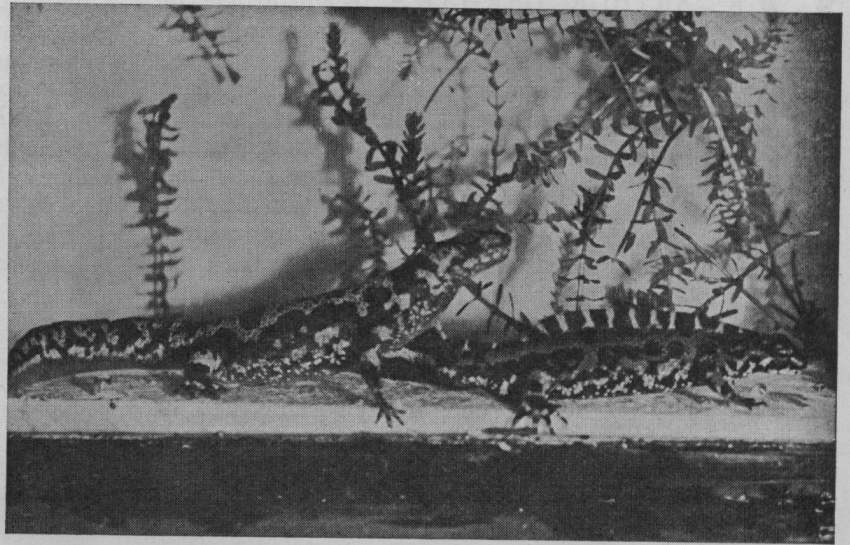
THE Marbled Newt may be considered the aristocrat of the amateur's collection. No other species approaches this one in mottled riot of colour perfection, and the least interested of one's friends cannot but be impressed by these creatures. Their European range appears to be limited to France, south of the Loire, and Spain.

The Marbled Newt attains the size of the Crested Newt but the head is perhaps broader and flatter. In the early part of the year the colouring is at its most vivid, when bright grass-green predominates, with varying sized patches of dark brown or black. In some examples the darker colouring runs uninterrupted along the flanks and parallel to the crest.

The general form of these newts is well illustrated in the accompanying photograph. On the right is the male, with resplendent dorsal crest. This crest is high, entire, and banded alternately with black and yellow or gold. There is a distinct, short, but somewhat deep break between the tail and the crest which gives the newt the appearance of having had a part of its body snipped away. Towards July the male's crest becomes absorbed, its base remaining as a raised wavy brick-red or orange line.

In the female, shown on the left of the picture, the dorsal line is invariably present, but distinctly depressed. The green and black colouring in both sexes extends to the fingers and toes, which are delicately barred to the tips. It may be of interest to state that the pair of Marbled Newts illustrated were delivered one cold January morning enclosed in a tubular pillbox, 7-in. x 1½-in. The box was marked in French "Samples only, of no value," and they had travelled from Bordeaux at a cost of twopence! An accompanying letter from the friend who sent them stated: ". . . walking round my garden one mild evening last week I saw a pair of Marbled Newts in my lily pool. I think they were ready to spawn, and so I sent them to you. . . ." It would therefore appear that in the south of France these newts breed quite early in the year. Under conditions of confinement in England they may breed about April, and it is well worth while taking some trouble to bring this event about.

The Marbled Newt is perfectly hardy out of doors, but, as in the case of all newts, beauty of colour and action is mostly lost unless they can be viewed laterally through glass. With me they live in a standard glass tank, 3-ft. x 15-in. x 15-in., out of doors throughout the year. This tank is on a stand 3-ft. high, and in it is 4-in. of water, rising out of which, at the back, is a carefully arranged bank of stone and bark, the whole matted with the dwarf, quick growing, creeping plant, *Helxine-solierolii*. After the breeding season this tank is occupied by Marbled, Japanese, Crested, and Alpine Newts. In autumn the water area is reduced and the bark increased in flat strata.



A Pair of Marbled Newts

The newts then leave the water and collect under the bark, where they remain, frost-proof, until the following spring.

The food of the Marbled Newt consists of small worms, blood worms, and frog tadpoles taken in the water, though worms may be accepted on land. He is a somewhat shy and slow feeder, and in a community tank his intended prey is frequently snatched by less deliberate companions. It is therefore desirable to make sure that he gets his share.

If it is desired to breed these beautiful newts, a pair should be isolated in the early spring as soon as they take to the water. The eggs, which are comparatively large and white, are usually leaf-wrapped in the ordinary way, but are occasionally left to fall to the bottom of the tank. I have observed that in a cold season these may take up to five weeks to hatch. *Elodea densa* is an excellent spawning medium, but it is interesting to note that if a comparatively stiff-leaved plant such as *Sagittaria* is the only one available, the female will sometimes break the leaf in two in her efforts to effect a "fold-over."

When free swimming the young are at first mere threads of pale green, most difficult to distinguish on the leaves to which they adhere. In a short time they feed greedily on *Daphnia*, which satisfies them until, at about 1½-in. long, and when they are still in the gill-breathing stage, they begin to take the food of their parents. Their gills are pink-tipped, and the tail is edged with black, but it is difficult, at this stage, to distinguish them from the young of other species. If the eggs were laid early in the spring, and the young have been well nourished, final metamorphosis occurs the same year, and the perfect newt leaves the water in autumn and seeks the shelter of the bark. If development has been retarded, however, the young will remain in the water until the following year.

I can thoroughly recommend the Marbled Newt to all lovers of amphibians.

fully out. The chief characteristic of the large circular leaves is the number of red and brown blotches which mottle the uniform dark-green background. *M. chromatella* is a very free-growing plant, and should be allowed plenty of room, otherwise the leaves will rear up out of the water, and not only look unsightly, but obscure the flowers from view. Each plant should be allowed a space at least ten feet across, and should not be in less than two feet of water. Too shallow planting is another cause of the leaves sticking up out of the water instead of lying flat on the surface and allowing each flower to make the most of itself instead of lurking out of sight under the leaves. All Lilies, and especially those which grow particularly vigorously, should be divided every four or five years. This should be done really ruthlessly, otherwise the plants will only become too dense again in a very short while. After such pruning it always seems as though the small piece that is left cannot possibly grow large enough to produce any flowers, but it will do so quite early the following summer.

There is no doubt at all that the Water Lily is the most beautiful of all the flowering plants, and nowadays the colour range is so wide that it is possible to have an enormous variety of different shades if your pond is a large one. If, on the other hand, it is quite small, you have plenty of colours from which to choose, and there are so many different sizes of Lilies available, that by judicious buying it is possible to obtain a plant to fit and suit your pond, even if it only measures a matter of inches.

By studying carefully the photographs on the opposite page you will be able to learn what the flowers of a normal Lily look like at the various stages of their life, and will be able to recognize whether you are looking at a bud which is going to open for the first time the next day or whether the flower life is nearly over, and it will not open again. This knowledge is very useful if the blooms are required for table decoration. A young Water-Lily flower picked and placed in a bowl of water, need only have a very short stem, and it will open during the day and close at night, just as it would if it were still growing in the pond, until, after about a week, its life is over, and it does not open again. One word of warning about picking Lilies for indoor decoration. The flowers look very much more lovely if they are set off by the presence of one or two leaves floating with them, but these leaves are difficult to carry for any distance, because as they dry they curl up, and then nothing will induce them to uncurl again.

At the beginning of their life Water Lily buds just peep above the surface of the water, and even when they are half open they do not really appear to float easily, but give the impression that their stems are just a little bit too short, and, when they close in the evening they seem literally to sink to sleep. It is not until about the fourth day, when the flowers are very nearly fully open, that they really come right up to the surface, but once there they remain until they fade, when they gradually sink back into the water.

Six photographs of the remaining phases of the flowers will appear next week, and in these you will be able to see the fully opened Lilies and the various stages of their gradual death. Brief notes on how these photographs were taken will be given for the benefit of those readers who would like to experiment with this form of photography for themselves.

Success

READERS may remember recently how, in a report of a visit of the Bristol Aquarists to Mr. H. Guild's establishment at Long Sutton, Somerset, it was related how Tree Frogs had bred in the fish house, and a description of the tadpoles was given. Now the tadpoles are completing their metamorphosis and emerging from the water. The illustration gives some idea of the relative sizes of an adult and a newly metamorphosed youngster.

The babies are extremely active, and capable of jumping very great distances. Most of their time is spent sitting in the angle of the branches of various plants growing in the fish house, and in this position they are



A young and an adult Tree Frog

extremely difficult to see, even though they are probably only a foot or so in front of the observer's nose.

Another aquaristic attainment of note which is worthy of record is that of Mr. Robson, of the Guppy Breeders' Society and the North London Aquarists. Mr. Robson's great aim in his fishy activities has been to produce an all-black Guppy. His efforts in selective breeding have been spread over several years, and now, although he has not yet attained his ideal, he is beginning to enjoy the first fruits of his labours.

He has a number of male Guppies whose bodies are almost completely, though not quite, all black, the black coloration also spreading into the fins. But, most remarkable of all, he has also produced a number of females who show a considerable degree of melanism. These are characterized by a black tail and dorsal fin, and some of them have black on their bodies. This is a unique achievement, and demonstrates what can be done by patience and perseverance.

Readers' Experiences

Snakes in the New Forest

WHILST on holiday in the New Forest this summer, I happened to come across a small lad who, in one hand was carrying a large tin and in the other a forked stick with which he was digging about among the heather and bracken. Assuming that he was hunting for snakes I asked him if he would show me his catch. On opening the tin he disclosed a writhing mass of grass snakes and adders—there must have been a good thirty specimens in his collection. I asked him the reason for taking so many snakes from the Forest, and whether one or two would not have been sufficient to satisfy him. I soon discovered that he received payment for each one he caught. He went on to explain that he would shortly take them to the local forest keeper, who, in turn, would deliver them to the well-known snake catcher of the New Forest, Mr. George Watridge. This gentleman regularly sends a collection of grass snakes, adders, and smooth snakes (though these last are very rare) to the London Zoo, where they are duly displayed in the snake pit near the main entrance, or given as food to other snakes.

Originally the snake-collecting job was carried out by a famous old character called Brusher Mills. This so-called gypsy, still well remembered in the Forest district, used to live in a shelter in the woods constructed from the boughs of trees and peat. Visitors to the Forest used to visit the old man to see his snakes. His grave stands in Brockenhurst churchyard, and on the tombstone is carved a scene depicting the old gypsy among the trees and in his hands a collection of snakes and a stick.

Since meeting this boy with his tin of snakes, I have discovered no fewer than ten local residents, who have made a practice of snake collecting. These include, among others, village lads, farmers, keepers, and gypsies. All snakes eventually find their way to Mr. Watridge, who, presumably, hands out the sixpences and shillings due to each collector for his catch. The continual hunting of these reptiles has led to a distinct scarcity of snakes in the district where I was staying. During the fortnight I was there I only discovered ten grass snakes and one adder, a poor average for a two weeks' search. It may only be a coincidence, but it is my belief that, coupled with the increased desire of the public to indulge in rambling and camping, more and more snakes will be exterminated or taken away, and we shall eventually find ourselves no longer able to call the New Forest the headquarters of the British reptiles, as to-day it assuredly is.—A. LEUTSCHER.

The Amateur Natator

With reference to Mr. Walker's article "The Amateur Natator," in which he asserts that bats are blind. I had always been under the impression that this was a popular fallacy, and to confirm my belief I have communicated with the British Museum's Natural History Department, at South Kensington, and am informed that—"No bats are blind. Although their eyes are very minute, they are perfectly good for visual purposes."—JOHN GRAHAM.

Dogfish at the Zoo

At the Zoo recently, we saw in the Marine Hall a small tank in which were a number of Dogfish eggs. Some of these were empty and the baby fish newly hatched from them were wriggling about on the sand. Two of the eggs were hanging by their tendrils from a glass rod; in the sea they would hang on to seaweed at the bottom of the ocean. One of these eggs was dark and apparently lifeless, but the other was very nearly transparent, and, inside, a baby fish could be seen moving about with an enormous yolk sac attached to it.

Normally, Dogfish eggs take from three to four weeks to hatch out, but in the Zoo aquarium they do not take so long, probably because the water is warmer. When the young are first free of the egg, they are quite blind, and it is not until the yolk sac has been absorbed that they are able to see. Sometimes the young fish seem to have difficulty in breaking out of the egg; in this case the yolk sac is absorbed and they can see as soon as they are hatched.—D. SEGRAVE.

Success with Dried Daphnia

I have half a dozen Common Goldfish, two Golden Orfe, and a Roach, in a galvanized tank of seventy gallons capacity. All these fish were less than 2-in. in length when I introduced them to the tank; they have been outside summer and winter for six years, and all are now between 5-in. and 6-in. long, and very deep in the body. I have never had any trouble except for an occasional slight touch of fungus which has cleared up, never had to administer any sort of laxative, and the staple food has been dried *Daphnia*. Occasionally I give them a piece of white fish or a cut-up worm, and I find they are rather partial to salmon and shrimp paste, but five nights out of seven it is dried *Daphnia*, and they seem to prefer it to anything else. I have never bothered to look for young, so I do not know if they have bred or not, but, in any case, youngsters would stand a very poor chance in the company of nine big fish.

I also have five 3-ft. x 1½-ft. x 15-in. glass tanks outdoors; these are all planted with *Myriophyllum*. In July last year I put five Fantails and a Veiltail, all about 1½-in. long, in one tank. In another I put four 1½-in. Shubunkins; in the third six 1½-in. Comets; all these fish have also been fed principally on dried *Daphnia*. The Fantails are now nearly 4-in. long and spawned at the beginning of June, in July, and again last week. I kept the first spawning and fitted them up in my fifth tank. The Shubunkins have also spawned three times. I do not aerate any of these tanks, but find it necessary to change part of the water about once every three months. Also I do not siphon off the mulm or remove algae from the glass except in the front. I have all the youngsters together in one tank, and now that they are past the *Infusoria* stage, they are being fed on finely sifted dried *Daphnia*, and they are growing very fast. Nothing would persuade me to go away from the methods which I have found, by my own experience, are highly successful in every way.—G. TAVERNER.

The Chinese Three-keeled Terrapin

(*Chinemys reevesii reevesii*)

By "AMPHIBIUS"

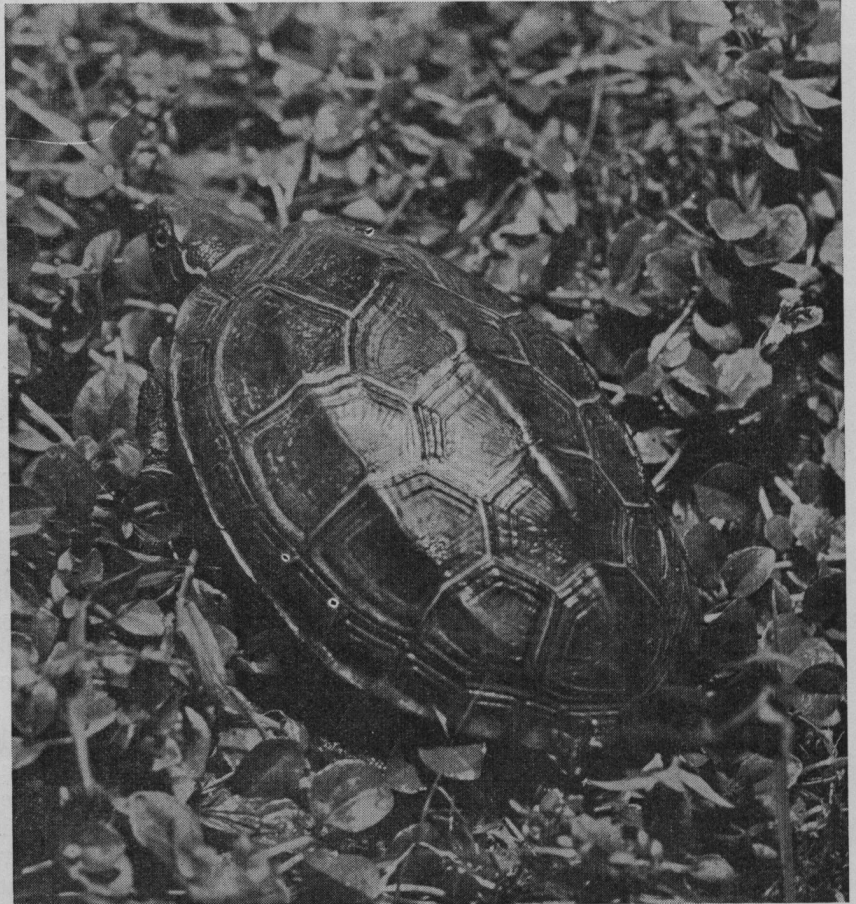
THIS mouthful is only another name for our old friend, Reeves' Terrapin. It was named by Dr. Gray in 1831, in honour of Mr. J. Reeves, who sent the British Museum its first two specimens, these constituting the types for the species. It was formerly included in the genera *Damonia* and *Geoclemys*, but quite recently, because of two osteological characters and the length of its tail, it has been reclassified and now stands alone in the new genus *Chinemys*.

It is a most attractive little animal, compact and neat in form, and, while not brilliantly coloured, has a shell like polished wood and its soft parts prettily marbled with grey and green. Nearly always available in this country, it may be bought for as little as ten shillings a dozen in the East End of London, and elsewhere its price is never higher than eighteenpence or half a crown per individual. Adults are virtually unobtainable, but some very fine ones may be seen at the London Zoo, where they have lived, I am informed, for many years. One of them recently laid eggs. The reason why those reaching our shores are so small is not hard to find. *Chinemys* is a common and popular article of human diet in South China, and may be seen in the food markets of the larger towns in huge piles, to which small boys are kept busy returning stragglers and escapes. There is a size below which it is not considered economical to cook the beasts, and those falling below this standard are bought for extremely low prices by visiting seamen, etc., and it is through the agency of the last (and somewhat clandestinely, I fear) that these little Terrapins are made available to us in this country. Of course, had they to be shipped by the usual means, their price would be a great deal higher than it is.

The species occurs nearly all over China. Extremely common in the south, even in quite populous districts, it becomes progressively less numerous the farther north one goes. It is found in Corea and in South Japan, but whether it has been introduced into or is indigenous to the latter country is not known. At any rate, it is not at all common there. Isolated specimens have been found in the Philippine Islands and in Java, but were no doubt escapes.

In captivity it leaves nothing to be desired. Single specimens may be kept in a living room in quite a small aquarium (with access to land, of course), and flourish and grow indefinitely under such conditions. It is much nicer to keep about a dozen or so in an enclosure in a sunny part of the garden. The pool need not be more than a foot deep, and indeed the larger part of it should

not exceed 4-in. Rough logs of wood in this shallow part will provide basking sites from which the little animals will take advantage of any sun we have. Funnily enough, two or three specimens seem to do not nearly so well as a larger number under such conditions, and take a longer time to overcome their timidity.



At best, although they will soon take food from fingers or forceps, they never really like being handled.

The genus is alleged to be a thoroughly aquatic one, but its members will actually be found to pass a great deal of time on land. They sometimes leave the water for days on end, and lie wideawake but unmoving in whatever shelter is provided for them.

Sexing is easy, as males have a very long and thick tail, while in the opposite sex the corresponding member is small and thin. The courtship—which owing to the immaturity of my females I have never observed—is described as a long, sustained effort by the male to rub his nose against that of the female. From four to six eggs are laid at a time.

The melanistic variety (*Chinemys reevesii unicolor*) is not a distinct species, or even rare. It occurs wherever the typical form does. In the extreme form, every part, both soft and hard, is of the jettest black

imaginable. All intermediate shades of darkness occur between the brown and black specimens, and, needless to say, treatment for all is precisely the same.

A most attractive feature of this little beast is the fact that during the winter it may be taken indoors and kept going there with no ill-effects, such as depression, rickets, or tuberculosis. Alternatively, it may be allowed to hibernate outdoors. I have been unable to find any reference to its hibernation—if any—in a state of nature, but imagine that it buries itself in mud. As mud is so very difficult to provide in pools and enclosures, my practice is to put *Chinemys* from their small enclosure into the larger one tenanted by other and bigger Terrapins, in September. In this enclosure they have a choice between a good depth of water and a warm shelter for hibernation. In actual fact, it is exceptional for them to spend the winter in the water, and I see that those on land are well packed with moss and hay in the shelter. They may be put in a box of moss in an outhouse quite safely, but whatever happens they must not be left in their own shallow pool or they are sure to be killed by the frost.

Having once read that *Chinemys* is an omnivorous genus, mine have always access to greenstuff and fruit of some kind, but they have never been observed to eat any of it. They can dispose of a surprising quantity of chopped meat and if regularly fed will learn when it is mealtime. They normally feed in water, but are able to seize and swallow food on land.

* * *

Club Reports

SHOOTERS HILL AND DISTRICT AQUARIUM AND PONDKEEPERS' SOCIETY.—This Society held its first meeting of the autumn session at Eglinton-road L.C.C. School, on Monday, September 5. The attendance was good. During the evening it was decided that the future programme should include larger and more frequent shows, more lectures, a public show in December, and later on a dinner and prize giving. The first show is to be held on Monday next, September 19, and is open to cold-water and tropical fish, the latter being divided into seven classes. There will be first, second, third, and highly commended prizes in each class; and up to the time of going to press six special prizes have been presented for the "best fish in the show," "best set-up tank," etc. The judges for this first show will be Messrs. C. Ward, Atherton, and Stiff, of the London Aquarists' Society. Altogether the programme is very attractive and warrants the increased membership, which already rewards the efforts of the committee during the past closed season. Application for half-yearly membership should be made as soon as possible to the Secretary, R. J. WOOD, A.I.C., 101, Eglinton Hill, S.E.18.

SUFFOLK AQUARISTS' & PONDKEEPERS' ASSOCIATION.—On Saturday next, September 17, this association will meet at 2.20 p.m. at Tower Ramparts for a car outing to Meadow Farm, Hollesley, by permission of Colonel C. R. Bathurst, who will conduct a tour round his Nutria (Swamp Beaver) Colony. Tea will be provided. —F. P. HUGGINS, Hon. Sec., 98, Bixley-road, Ipswich.

The Life of a Water-Lily Flower

(Continued from page 437)

as much as 7-in. in diameter; the distinctive dark-green leaves are heavily mottled and blotched with red and brown.

The following facts are given for the benefit of readers who are interested in photography, and who may wish to experiment for themselves. Because of the risk of spoiling the camera in the event of bad weather, if it were left in position, it was dismantled after each exposure, but in order to ensure that it was re-erected in exactly the same position for each photograph, the exact length of each leg of the tripod, their position on the ground, and the angle of the tilting table, were carefully marked after the first exposure was made. By examining all twelve photographs, you will see that each one is identical except for the differences in the flowers, and a slight change in the position of some of the leaves.

The exposures for the different photographs varied enormously. When the day was very bright, only two seconds were needed, while on the evenings that were dull the exposure was as long as five minutes. In the early morning (at 6 a.m.) the exposure varied from eight to twenty seconds, according to the strength of the light. It is impossible to lay down hard and fast rules about the length of time required for exposures, because so much depends on the circumstances. With practice, however, it is possible to learn the capabilities of your camera in varying degrees of light. It is very important to make full notes relating to all photographs taken, for only in this way is it possible to benefit by mistakes.

The plates used for this set of photographs were Wellington Anti-screen, owing to the fact that the flowers were yellow. The stop used throughout the series, was f/16. Each negative was developed as soon as possible after the exposures were made, and great care was taken to keep them of a uniform density.

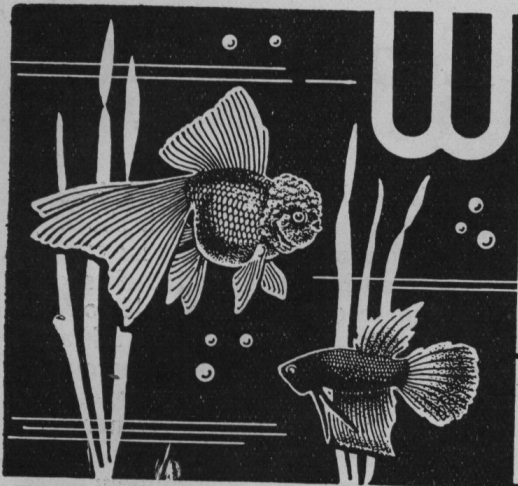
Although many people advocate that Water Lilies should be planted only in the spring, many others have done so in the autumn and winter, with great success. Transplanting outdoor grown Lilies in the autumn and winter, seems to enable the plants to become established early and bloom well the following summer.

* * *

Triton's Jubilee

On September 3 the Berlin Aquarium and Vivarium Club, "Triton," celebrated its golden jubilee. The club began its life in September, 1888, headed by Paul Nitsche, Dr. Karl Russ, and thirty-six members. "Triton" is the oldest aquarium club in the world, and we offer the club and its members hearty congratulations and all prosperity during the next fifty years.

The number of the *Wochenschrift* published on August 30, 1938, is the "Triton" number, and all the articles therein—and excellent ones they are, covering such widely diverse subjects as "Special Sense Organs of Fishes," "Ecology of Water Plants," "Treatment of White Spot," etc.—have all been written by active members of the club. Here is a record that will take a lot of beating.—L.C.M.



WATER LIFE

INCORPORATING AQUARIA NEWS

A weekly paper devoted to the study of every thing which lives in or near the water

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Silver-grey Adders

By PETER MICHAEL

"SILVER-GREY" Adders have a habit of creeping into the news occasionally, and there has been considerable speculation concerning them, especially in so far as sex is concerned. Vipers, as is well known, vary considerably in coloration. Some are light brown or brownish-olive, some dark brown or reddish-brown, etc., and others almost black. In contrast, there is the greyish type—silver-grey, light grey, or almost white. In some specimens, too, the dark zigzag line along the back varies, and not infrequently it tends to merge into the general ground colour; while the colouring of the under, like that of the upper, parts is by no means constant.

According to most authorities, the silver-grey specimens are invariably males, while the darker ones are females; and it has been stated that "silvers number about one in every three." There seems to be more or less general agreement that female Adders outnumber males by about three to one; some naturalists even put the preponderance of females at four to one. One reason advanced for the theory that greyish Vipers are males (apart from the actual proof afforded by captured specimens) is that, when pairs of these reptiles have been seen in spring, "frequently one of the pair has been of the silver type, but never both." Also, it is said that young Vipers of the silver type are never encountered; "they are always of the brown type."

In the main I agree with this, but I venture to suggest there are exceptions. Some years ago, during spring, I watched two large Adders basking in the sun near a chalk pit on the slope of the North Downs, and both snakes were unmistakably of the silver-grey type. Granted, both may have been males, but from my observation—which, however, was necessarily limited by the fact that I, like the reptiles, was on open ground—this seemed doubtful. One is tempted to suggest that Adders, like certain other animals, adapt themselves to the prevailing colour of their surroundings: the pair mentioned above, for example, exhibited colouring not unlike that of the chalky soil of their habitat. But I fancy most herpetologists would regard this more or less as a major heresy: as Leighton (whose interesting and

instructive *Life-History of British Serpents* should be read by all intending students of the much-neglected *Reptilia*) has pointed out, this theory is to all intents and purposes nullified by the fact that in any collection of Vipers taken from any one area, however restricted, the usual remarkable colour variation will be seen. In many districts the Adder varies almost literally from black to white.

In the above-mentioned work, Leighton devotes a valuable chapter to colour variation in Vipers. Some of his remarks, especially as regards sex, are worth quoting. (It would be as well, perhaps, for it to be understood at this juncture that anatomical differences between the sexes do not come within the scope of these notes.) Generally, he says: "... the colours of the males are far more brilliant than those of the females. There are light-coloured males and light-coloured females, but the former are brighter than the latter. Also there are dark males and dark females, but the males are blacker than the females in their markings and on the throat. "More definitely still, a brilliant yellow background, with the zigzag line almost black, occurs in the male, but I have never seen that striking contrast of colour nearly so well marked in a female specimen. The general colouring of the female tends to *dull shades*, that of the male to *sharp colours*. Olive-green body and brown markings are characteristic of the female; while the yellowish body and blacker markings are more significant of the males."

Age, too, is important. In elderly Adders the colours tend to blend or merge, and may become dull; in young specimens the separate hues are sharply pronounced. Most students of our *Ophidia* will agree that "the brightest coloured of all Adders is a young snake seen just after casting his slough."

Incidentally, Leighton considered that white Vipers were examples of "pathological colour variation"—merely freaks. "In these cases the true condition is a non-production of colour rather than a variation."

Nevertheless, it would be of considerable interest to hear if any reader has ever observed or killed a *young* Adder of the silver-grey type.

The Value of Club Membership

IT was a sunny Saturday afternoon, and the driver of the car, feeling rather warm, drew up at the side of the road, got out, removed his jacket, and sat down on the grass verge for a breather. A couple of hours later, and, nearly sixty miles away, he noticed he was driving in his shirt sleeves—he had left his coat by the roadside! No good going back, someone would have picked it up.

The Secretary of the Richmond Aquarists' Society received a letter from a gentleman at Kingston, saying that while motoring along the Kingston-by-pass the previous week-end he had noticed a man's jacket lying abandoned by the roadside. He had stopped and taken it up. In the pocket was a wallet, containing money, and the only means of identification were a rule card of Richmond Aquarists', giving the address of the Secretary, and a receipt made out to a Mr. Watson. Could the Secretary put the finder in touch with the owner?

The Secretary at once sent off to his member, who had only joined the society at its last meeting. The jacket and wallet are now back in their owner's hands. The finder, it is hoped, will come to the club and become an aquarist.—L. C. M.

* * *

Loosestrifes, Groundsels & Lobelias

(Continued from page 447)

of *Lobelia cardinalis* and *L. siphilitica*. I suppose it would not be an exaggeration to say that the scarlet colour to be found in these New World plants is the brightest in cultivation and a group in full bloom makes a picture of dazzling brilliance.

Unfortunately, some of these lovely subjects are only hardy in the warmest parts of the country, but it is usual to lift the offsets which form at the base of the old stems in late summer, and winter them in a frost-proof cold frame, planting out in spring when danger of frost is past. Of these half-hardy kinds, 'Queen Victoria' and 'Huntsman' are two of the best—the former having attractive crimson foliage and intense scarlet flowers, and the latter producing bold spikes of vermilion-scarlet blooms. If the central spike is removed as soon as it has finished flowering, the side shoots will continue the floral display until well into late autumn.

The hardy forms are covered by 'Cardinalis' with light-green leaves and tapering spikes of brilliant scarlet blooms; 'Purple Emperor,' with rich purple flowers, and *Siphilitica*, which grows to 2-ft. and has light-green foliage and spikes of small mauve-blue flowers. All the Lobelias prefer a moist loam in full sun, and to obtain the best effect should be grouped.

* * *

A large pond with a very unusual setting met our eyes while passing through Colchester the other day. In the middle of a display of memorials by the local Co-operative Funeral Furnishing Department it lies, surrounded by tasteful stonework. The plants and water lilies looked very healthy, and with the fountain playing, it cheers an otherwise sombre scene.

Club Reports

AQUARISTS IN SOUTH-WEST ENGLAND.—The Bristol Aquarists' Society is prepared to assist any group of aquarists in South-West England who wish to form a society or club, and advise them about programmes and lecturers. Will any such aquarists please communicate with the Bristol Aquarists, and they will do everything in their power to help.—H. C. B. THOMAS, 46, Wolseley-road, Bishopston, Bristol, 7.

THE LONDON AQUARIST SOCIETY.—At the meeting at Caxton Hall, Westminster, on Thursday, September 8, Mr. Fraser-Brunner gave a lecture on "The Anatomy of Fishes," in which he described the evolution of fish. He said we could all see this for ourselves by watching the growth of a baby fish as soon as it leaves the egg, as they all go through the whole of the process. He explained the skeleton, and also the position and uses of the internal organs. The evening concluded with the usual bombardment of questions, and most of us intending to watch our next batch of youngsters very closely.—K. W. BRANCIK (Hon. Sec.), 10, Spencer-road, W.4.

BRISTOL AQUARISTS' SOCIETY.—The next meeting of this Society will be on Monday next, September 26, at 7.30 p.m., in Prince's Restaurant, High-street. Mr. T. A. Clissold, of the Cardiff and District Aquarists' Society, will talk on his personal observations of the habits and peculiarities of tropical fish, and Mr. H. C. B. Thomas will give his views on "How Water Can Vary." These talks will be followed by general discussion.—H. C. B. THOMAS (Hon. Sec.), 46, Wolseley-road, Bristol 7.

NORTH LONDON AQUARISTS.—The winter season of the above club opens on Wednesday, September 21. Meetings are held every Wednesday at 8 p.m. in the Kentish Town Men's Evening Institute, Holmes-road, N.W.5 (five minutes from Kentish Town Station, Highgate line).—L. B. KATTERNS, Hon. Sec. *pro tem.*, 64, Penton-avenue, Staines, Middlesex.

SUFFOLK AQUARISTS' AND PONDKEEPERS' ASSOCIATION.—On Sunday, September 25, it has been proposed that this society and its friends have a coach outing to Chessington Zoo, Surrey, where, as well as a display of animals, there is a circus and an aquarium. The cost, per member, will be about 10/6, which includes coach fare, light lunch, entrance to the Zoo, circus, and aquarium, games, and tea. The coach will start at 9 a.m., and arrive back at Ipswich about 8.30 p.m. Members are requested to notify the Secretary if they wish to go. Full particulars will then be forwarded if there are sufficient inquiries.—F. P. HUGGINS, Hon. Sec., 98, Bixley-road, Ipswich.

"Chicken" Terrapins

Some "Chicken" Terrapins have been imported from the United States this year, and it is interesting to note that mine will not touch animal food, but spends many hours of the day gulping Duckweed. He will not eat lettuce or banana floated on the surface of his pond, but he soon removed all the *Elodea*. Anyway, Duckweed makes an inexpensive dish on which to feed him.—E. C. LAW.

Season 1938

By "AMPHIBIUS"

SEPTEMBER is a good time to review the happenings of the closing season, which has been interesting for several reasons, and to make one's plans for the winter. First as regards supply. A wealth of species has been imported, among them *Pseudophryne*, *Amphiuma*, *Megalobatrachus*, *Rana agilis*, and, much later, *Hyla septentrionalis* are worthy of special mention among the amphibia. At least two of the Sealing-wax Toads are still thriving at present, although I believe those that went to the Zoo—the bulk of the consignment—are all dead. The attractive appearance of this tiny toad and Mr. Mandeville's article about it created a widespread desire to own the little creature, and no doubt the importer will arrange to get another lot in due course.

The demand for the Gigantic Salamander must surely now be filled. No less than three of our dealers have had these animals during the last year or two, and a fourth told me recently that he is hoping to arrange a consignment at any time now. Considering how commonly these animals are met with in Japan and parts of China, their price remains disappointingly high over here. Since most of the continental zoos and aquaria number their specimens by the half-dozen or more, it is remarkable that the breeding of the species at Amsterdam seventy-odd years ago has never been emulated.

Hyla septentrionalis, the Cuban Tree Frog, is large and handsome. It needs to be kept warm, and has an enormous appetite. It must not be kept with anything less than half its own size, for reasons which will become apparent if it is. It lives well with *Hyla cœrulea* and *Hyla aurea*, but cannot, of course, be allowed to hibernate

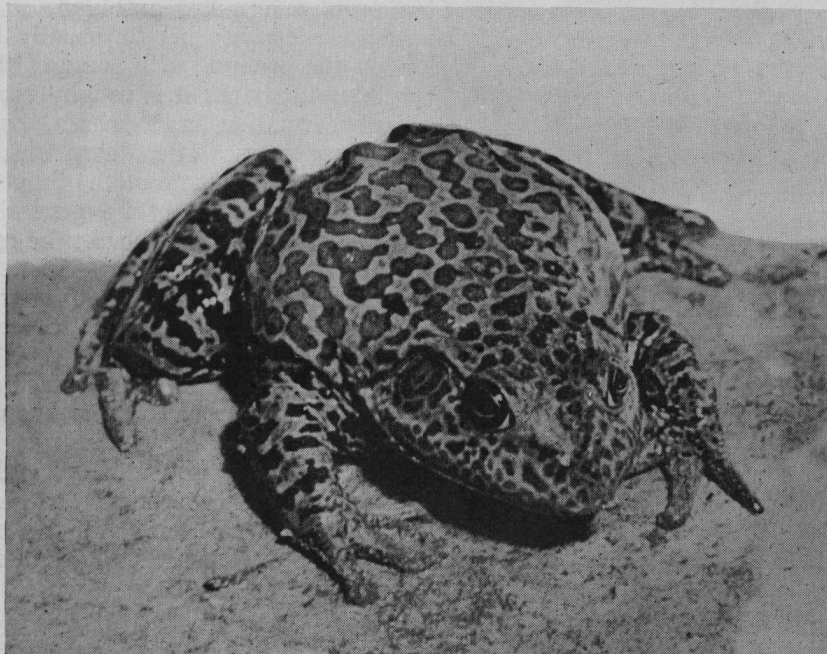
Another interesting arrival has been the Bull Frog, *Rana catesbiana*, an outsize in frogs. It is some time since they were previously here. This year no Bull Frog tadpoles have appeared. There is something rather attractive about their larvæ, which grow to a length of about six inches and have a body as big as a fair-sized egg!

All the well-known continental amphibia have arrived, of course, in their usual large numbers.

Dealers have shown commendable enterprise in the case of reptiles. Although one deplores the enormously excessive quantity of common tortoises imported each year, there has been a noteworthy increase in the number of uncommon species in the market. Blanding's, Painted, Alligator, and Sculptured Terrapins, as well as the now common Troost's, Reeves, and Lesueur's Terrapins were available last winter in London. Previously two dealers had offered the South American Rough Terrapin, *Gecemyda punctularia*, a species which has been available from time to time in Liverpool, but which I believe to be making its first appearance in London.

The year's most interesting arrivals, however, were

from the United States, that paradise of reptiles, and contained, among many interesting species, Gopher and Chicken Tortoises, Carolina and Baur's Box Tortoises, and snakes too numerous to name. In connection with the Baur's Box Tortoises and Mr. Mandeville's article concerning them in a fairly recent number of WATER LIFE, I might place on record that of five specimens put to hibernate outdoors last winter, four came through in fine style, the fifth being found dead in late March. Because of the unpleasant weather of this



Bull Frog

[Specimen supplied by L. Cura & Sons

spring, I took the four indoors until May, and since then they have been outside. I think, given normal weather, that they would live outside all the year quite well. Other examples of the same species which I kept indoors did very well, and showed none of the variable temperament characteristic of most Carolina Box Tortoises under similar conditions. Those left outside hibernated in a small shed, on a pile of bracken and covered with coarse, fibrous peat. Baur's is quite the most beautiful of the Box Tortoises.

Those who like and can accommodate something more spectacular have been well catered for, as, apart from remarkably large Pythons, Monitors, Alligators, and Radiated and Leopard Tortoises, the Great African Tortoise (*Testudo sulcata*) has appeared on the lists after an absence of very many years. This is an Abyssinian species rarely seen in captivity, and it would not sur-

(Continued on page 464)

Biology in a Modern Senior School

By J. BROWN, B.Sc.

AS a science master in a senior school, I would like to describe for the benefit of others who may be interested how, through the medium of aquaria keeping, I have tackled this problem. Biology is only part of the science syllabus, elementary mechanics and magnetism and electricity, are also included. The children are from 11 years of age to 14 or 15, and the school is of the non-selective type. As a result of this the teaching must be essentially practical and capable of being easily understood by all.

The school has a special science room with two benches running lengthwise. One is fitted with a vice, soldering stove, etc., for practical work. The other was free, and I determined to use it for my aquaria. The all-wood frame for the first was made in the handicraft room, with a heavy 12-ply wood bottom covered with a piece of slate; the size was 24" x 12" x 12". As plate glass was rather costly, ordinary glass was tried, with success. I might say that the other three aquaria which have been made were also fitted with ordinary glass. The cement used was 4 parts litharge, 4 parts silver sand, 4 parts plaster of paris, and 1 part resin; this mixture was made into a paste with raw linseed oil. Thus the cost was almost negligible, the chemicals already being in stock.

I then decided to have a further three tanks of the same size to fill the bench. For these, frames of welded steel were bought and fitted with thick window glass. Various water plants were tried, but the best results were obtained from *Sagittaria* and *Elodea*. As the room receives no direct light, artificial light is used during the darker days. Local water plants discovered in a district without any really good pond near have been Milfoil, Arrowhead, Water Mint, and Water Crowfoot. These have provided subjects for several lessons.

We have successfully kept the following fish; Goldfish, Golden Rudd, Golden Orfe, Bitterling, Minnow, and Stickleback; and we have found no difficulty in keeping Minnows in a still-water aquarium, even without an aerator. The despised Sticklebacks have proved by far the most interesting of all the fish kept. We gave them a tank to themselves and were able to watch them breed. It is worth noting here how easily the vexed subject of reproduction can be taught almost incidentally. The fish are fed on a totally live-food diet—no ants' eggs for us! We breed our own *Daphnia*, *Cyclops*, *Infusoria*, etc., in old tin baths sunk in the garden. Fish that grow too big for the aquarium are transferred to a pond we have in the garden. Future plans are the breeding of Bitterling and, if possible, some experiments with tropical fish.

By means of a microprojector, minute animal and plant life can be easily studied. Naturally we have encountered our share of difficulties and disappointments, but these have mostly been overcome by trial and error methods.

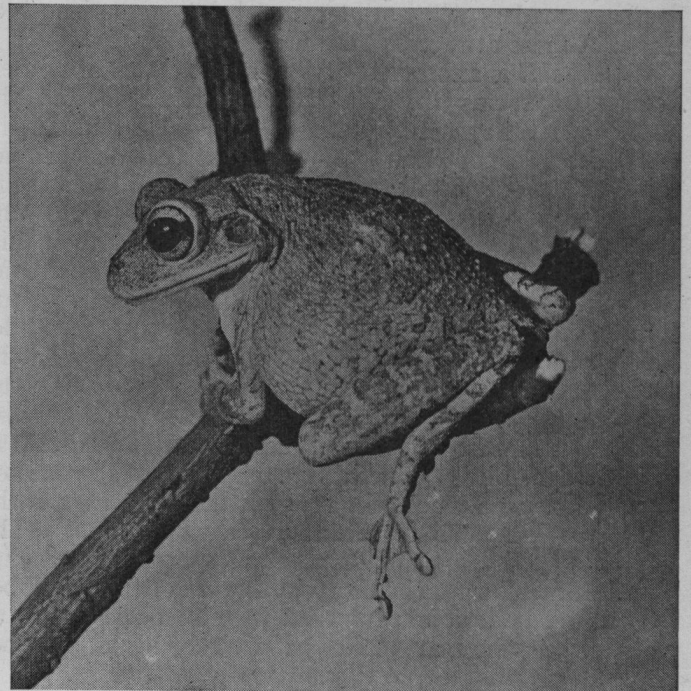
This is a brief summary of what we have done. The cost has been little and the knowledge absorbed great. All the fundamental facts of biology can be taught in an easy, interesting manner, and there is something available for demonstration at any time of the year.

Season 1938

(Continued from page 459)

prise me to learn that until this recent arrival my own were the only specimens in the country. It is not easy to house, but if secure from draughts and given a high temperature and a good and varied diet, it thrives and becomes most delightfully tame. It is the largest land tortoise after the Gigantic Land Tortoises proper.

Chameleons have made a welcome but regrettably late appearance in London. These lizards really do best if bought in the early summer and kept outdoors in, for instance, a wire-netted aviary during the day when the sun shines. They need to be put warmly away at night. Under such conditions, in country and suburban



[Specimen supplied by L. Cura & Sons

The Cuban Tree Frog (*Hyla septentrionalis*) in characteristic attitude

surroundings at any rate, they will catch much of their own food, especially if a piece of "high" meat is put inside a wire gauze net to attract blow flies, etc. The Chameleons available now seem to me to be in remarkably good condition, and the development of the fat bodies of two specimens which were examined *post mortem* by a friend revealed that the animals had excellent reserves to help carry them through the winter. Kept in a light, dry, suitably furnished case, preferably with one or more of their own kind for company, and fed upon meal worms, wood lice, and cockroaches, they will survive the winter. Water must be supplied from a brush or pipette, and a solution of glucose D is often taken with relish and is a good thing.

(To be continued)

* * *

George Tiller was fined 10s. at Bromley, Kent, for delivering a Goldfish to a person under fourteen. . . . The section of the Act came into force recently and was intended to stop such men waiting outside school gates. One is uncertain whether to be more sorry for the Goldfish, for the child who buys it, or for the man who has to make a living by such means.—*Observer*.

Season 1938

By "AMPHIBIUS"

(Continued from page 464)

I HAVE had a letter or two from readers of this paper who have bought reptiles which have died very quickly after purchase, and I think I know a reason why this sometimes occurs. Some dealers—as is quite right and proper—maintain reptile houses at a very high temperature for their stock. If animals are bought from such a hot-house and put straight away outdoors, they get a bad chill, even in the height of summer, and may die at once of it, or its complications. When buying reptiles by post it is best to ask the supplier the temperature at which they have been kept. If this is high, then the beasts should be kept indoors for a few days and gradually brought down to an outside temperature, if they are to live outdoors.

Although cases of the reverse—apart from my own experiences in my early and somewhat exploratory efforts at reptile keeping—have not come to my notice, it might be as well if I mentioned its possibility. Animals just wakened from hibernation must never be put straight into a hot greenhouse, or their metabolism goes rocketing up to heights which the unfortunate animal just hasn't the fuel to sustain, and death rapidly supervenes. If frost or cold weather occurs at the very critical period which follows emergence from hibernacula, tuck the animals snugly up, by all means, in a cool or slightly warmed place, and see that they are feeding and drinking before—if it should unhappily become necessary at all—they are removed to hot quarters.

Many creatures have been worried by the past unnatural winter, and the frosts during what ought to have been days of increasing warmth and sunshine, and the good, hot summer that would have put things right has not been experienced, so that I fear my hibernation arrangements will have to be revised. It is wise for reptile keepers to provide themselves with an accurate balance, which enables them to keep an eye on weight fluctuations, and gives a basis for comparison with data of previous years. A good increase at the end of summer, in the hardy species, is a pretty safe indication that hibernation may be successfully undergone. In this connection, however, one should remember that a smallish tortoise can drink at a sitting a quantity of water nearly equal in weight to a summer's growth and fat deposits, so things must be arranged accordingly. Some continental dealers have realized the potentialities of the tortoises' vast thirsts, especially in the case of large specimens sold by weight!

When the pros and cons of hibernation are being considered, one ought to bear in mind that it is not a difficult matter to keep an eye on animals during controlled hibernation, *i.e.*, hibernation in tanks of water or in boxes of moss, peat, or earth, as the case may be. Restlessness early on is a bad sign, and terrapins hibernating in water nearly always come to the top if all is not well, and on them an opportunity is provided for the owner to exercise his skill. Egg and milk and a drop of brandy given by pipette in increasing quantities can save many reptilian lives. If it is felt that factors during the summer have been such that a

whole winter's hibernation cannot be contemplated with confidence, then two months' rest or even less is better than an attempt to keep an animal going through the whole of the winter. I am well aware that I am, to say the least of it, not entirely supported in some quarters in my whole-hearted advocacy of hibernation for so many species of reptiles, and, although I have not published it, of amphibians as well, but my justification is my experience with a *considerable number*, in many cases a large number, of examples of each species, together with what I hope is a fairly sound knowledge of the biology of this particular part of the animal kingdom. I do not write or offer advice on the basis of an odd example or two plus a good deal of sentimentality about tiny tots of tortoises, or anything like that!

* * *

About Minnows

(Continued from page 470)

rest of the fish in the tank with the supposed eggs. I watched daily for signs of little ones, but none appeared, so I decided it was a failure, until, on March 24, a second spawning took place. Again the mad chase, the males in full colour, continuing all day, till evening, when once more the chase had finished and all seemed to be searching for eggs. I joined in the search, and, with a $\frac{3}{8}$ " diameter tube, I siphoned about in the stones and found approximately twenty eggs all in one spot. They were quite clear, and about $\frac{1}{16}$ " in diameter.

I then removed all the fish back to the top tank, and placed a 60-watt electric immersion heater with the eggs; the water at this time was 55° and the pH 7. I stopped the filter and rigged up an arrangement which still kept up the slight movement of the water. Day by day I watched until at last two eggs, which I had placed on a piece of glass on the stones, showed signs of life, but, by the time I returned home at night, they had disappeared. This was seven days after the second spawning; the temperature had gradually crept up to, and remained at 65° F.

I continued my search for fry each day without avail, and, at last, decided that it was a complete failure. However, a friend came along to whom I told the long, sad story, and off we went to inspect, and he found four fish swimming at the top of the water. They were about $\frac{3}{8}$ " long, and feeding well. *Infusoria* (cultured as advised in WATER LIFE, boiled hay and earth from garden) had been put in when the eggs were definitely located. All the family were, of course, called upon to inspect the new arrivals.

Had I succeeded? Well, perhaps I had. The four are now out in a 15-gall. tank of green water, and, when seen, are about 2" long.

Was it all worth while? With all my care and better judgment, I bought some more Minnows, which I was stupid enough to put with my old stock. In two days, a dreadful attack of White Spot, which, in spite of all treatment, left me with only two fish out of the three dozen. Ah, well, when will I learn?

Rearing Newts

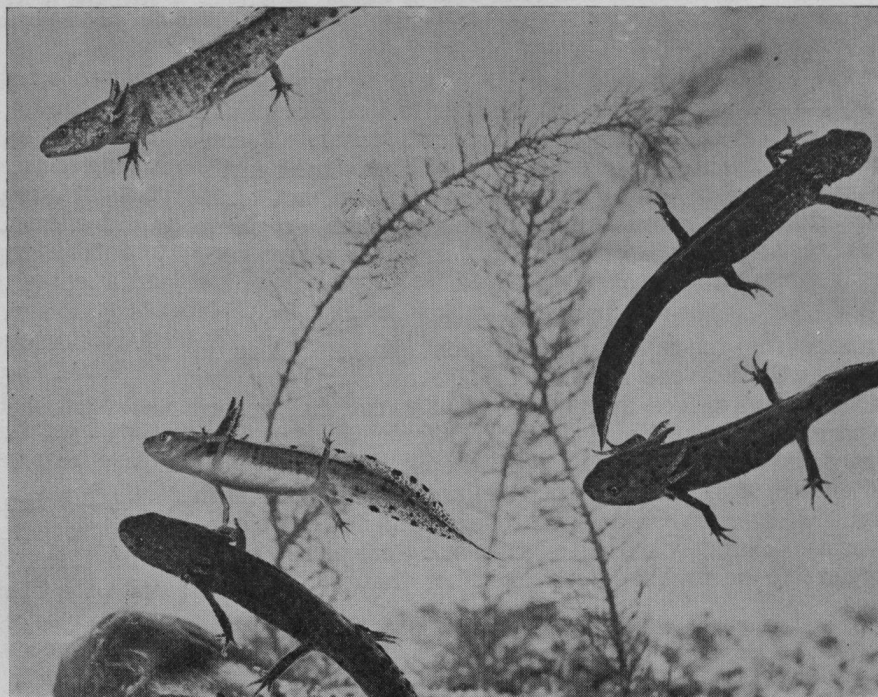
YOUNG incompletely metamorphosed newts still come to the net of the pond hunter, and no doubt many aquarists take them home with the idea of raising them to maturity. There are also those folk who have hatched newt tadpoles from spawn earlier in the year, and are still rearing them. Metamorphosis should normally be complete and the young adults take to the land by the end of the summer. Adverse conditions may, however, delay the advent of maturity.

While the young newts are in the water they will feed on bloodworms, *Enchytræ*, *Tubifex*, and other live foods. The Great Crested Newts, may be nearly 2" long, and they, though still tadpoles, will be capable of eating small earth worms.

As the feathery external gills disappear and the young newts begin to come to the surface to gulp down air, provision must be made in the aquarium for them to reach dry land, as their metamorphosis is completed and they leave the water. A sandy bank with some moss may be built at one end of the tank, but, as soon as all the larvæ are changed into the adult form, the character of their living quarters should be altered. They must then graduate from the aquarium to the moist vivarium.

The vivarium should be layered with damp compost or leaf mould and be provided with moss, pieces of bark, and stones, beneath which the young newts can hide. A suitable bathing place should also be supplied so that the youngsters can enter the water if they so desire.

The feeding of the small newts on land is a rather greater problem. The smallest of them can be fed with *Enchytræ* placed on a clean, smooth surface where they can easily be seen; other minute worms and insects will also be taken. Bigger specimens will soon learn to take the smallest earthworms, and as they grow, they



Young Crested Newts

will graduate to larger wriggling food. When the owner has patience, young newts can be taught to take small shreds of raw meat, held before them by a firm pair of tweezers and gently moved until, the newt snaps at the morsel with interest. Adults do not take kindly to the idea of eating dead food, though sometimes even they can be encouraged to do so.

On the lower left side of the illustration is a young newt which has a long thread-like extension to its broad tail. The unwary will jump to the conclusion that this is a larva of the Palmate Newt. Such a conclusion would be erroneous, for, though the extension of the tail is seen in the Palmate Newt, this character is also seen in the developing larvæ of the Great Crested Newt, though it disappears before metamorphosis is complete. The external gills of the larva will also be noticed giving them an appearance not unlike a small Axolotl.

—L. C. M.

The Live-bearing Half-beak

(Continued from page 487)

of other fish. This may quite possibly be so, and one of the reasons for the cannibalism I have experienced, may be that I have been unable to feed the adults on fish fry, the average newly born live bearer being too big for the Half-beak to deal with easily.

In my experience the fry grew much more rapidly in shallow water, as indicated, than when transferred to tanks of average depth. In shallow water they would frequently come down three or four inches to take their food, whereas in deep tanks, especially where other fish were about, they seemed afraid to leave the surface, and skulked among the plants.

The beak—lower jaw—of the female seems not only to be slightly shorter than that of the male, but also much more liable to injury, and quite often too vigorous netting and handling results in injury to the jaw, which may subsequently prove fatal. During this last week I purchased a new pair, and the lower jaw of the female became severely bruised during carrying, and she died.

Finally, with regard to the use of brackish water. Though I had read that these fish favoured slightly salt water, and I did at first try it out, I subsequently found that the fish did equally well in absolutely fresh water, and perhaps best of all in clean rain water.

Club Reports

Owing to the manner in which Club Reports tend to encroach on the limited space available in this paper, only notices of future meetings and club matters of general interest to all our readers will be published in these columns. We greatly welcome reports giving interesting points from lectures, but are not prepared to devote space to club business, as this is only of local interest.

SCOTTISH AQUARIUM SOCIETY.—The show held recently in the Empire Exhibition Flower Show was a pronounced success. The star attraction was undoubtedly Mr. McNish's Neons. Those aristocrats of the aquarium, the Pompadour Fishes, did not appeal to the public so much. The tanks were arranged in two tiers, tropicals at the front, and cold-water fish behind and higher up. The tropicals included Gouramies, Fighters, Pompadour Fishes (kindly lent by Wilson's), Mollies, Platys, Zebras, Cichlids, Swordtails, Neons, Angels, and Guppies. In the cold-water section there was a fine pair of Orandas, two large Shubunkins, Fan-and Veiltails, Catfish, Tench, Rudd, Orfe, and a shoal of Minnows. Altogether it was a very representative collection, including, as it did, members of the proletariat and aristocracy of both tropical and cold-water aquaria. Great interest was shown in the stand by the public. There was always a crowd round it. The interest was not merely confined to looking, for many questions were asked. Thanks are due to Messrs. Wilson's, of Glasgow, for kindly lending the tanks and heating apparatus. Although the annual show, held at Kelvin Hall, has been cancelled for this year owing to the clashing of dates with the closing date of the Empire Exhibition, a show has been arranged to take place on Friday and Saturday, November 4 and 5, at the Y.M.C.A. Halls, Eglinton Toll. A schedule has been drawn up on the same lines as last year. As the success of this show will be entirely dependent on the members of the society, the President has issued an appeal to everyone to make a special effort to sell tickets beforehand, and to attract visitors to it.—**STRACHAN KERR, 24, Kingsbrae-avenue, Glasgow, S.4.**

SHEFFIELD AND DISTRICT.—It is proposed to form an aquarists' and pondkeepers' society in the above district. Will all readers who are interested in such a project please communicate with **M. BEEVOR, 314, Herries-road, Norwood, Sheffield, 5.**

GUPPY BREEDERS' SOCIETY.—The next meeting is to-night, October 11, promptly at 8 p.m., at "The Crown," Prince of Wales-road, N.W.5 (five minutes from Chalk Farm Tube Station). Cars may be parked outside the buildings.—**L. B. KATTERNS, Hon. Sec., 64, Penton-avenue, Staines, Middlesex.**

NORTH LONDON AQUARISTS.—The headquarters of this club have been turned into an A.R.P. depot, but meetings will be held every Wednesday at 8 p.m., as usual. Visitors are always welcome.—**Hon. Secretary, North London Aquarists, Kentish Town Men's Evening Institute, Holmes-road, N.W.5.**

SOUTH LONDON AQUARISTS.—At the meeting on Thursday, September 29, Mr. A. H. Hoare gave a most comprehensive lecture on "Setting Up and Management of Cold-water Aquaria," which left no doubt, even to a novice, of the methods to follow for successful fish keeping, coupled with artistic settings. A full display of aquarium plants grown on a loam base, proved the usefulness of this medium. Just a thin layer was advised, the variation in the depth of covering sand

giving an artistic finish. Stress was laid on "balance," but Mr. Hoare made perfectly clear that tanks are not "automatic," as some are led to believe, and some effort is required by the aquarist to maintain this condition. Arrangements for a members' show of tropicals, to be held at headquarters, Adult School, Garratt-lane, S.W.17, on October 27, will be made at the next meeting on Thursday, October 13. The useful work of the club is rapidly increasing, members now being enrolled from Surrey districts. All are heartily welcome. Membership is now open to ladies.—**H. G. ROWBOTHAM (Hon. Sec.), 57, Idmiston-road, S.E.27.**

THE ILFORD AQUARISTS' SOCIETY.—A very interesting and entertaining lecture was given by Mr. L. C. Mandeville at our meeting on Monday, October 3, on the subject of keeping fishes, reptiles, and amphibia in the restricted conditions available in a modern flat. Some time after he first set up the tanks and vivariums, Mr. Mandeville came to the conclusion he was not keeping his pets in a really intelligent manner, but merely keeping them alive. Consequently, complete reorganization was necessary, and one large room, facing south and having a good expanse of window space, was devoted exclusively to the hobby. His experiences with heating apparatus and lighting for effective display, and plant growing, also heating with electric lamps, are sufficient to give every club member much food for thought, and, no doubt, new ideas. Mr. Mandeville has not the room for keeping cold-water aquaria at present. He has two 40-gallon community tanks of tropical fishes, one containing Gouramies and other egg-layers, the second Red Platies and Black Mollies—a very effective contrast. As well as other smaller tanks there is a marine aquarium, which is situated in the dullest part of the room. In connection with this tank the value of efficient filtration was emphasized. Thus can the water be kept bright and clear, although there are no plants to help. The range of fishes available in this new sphere is amazing; they do well in the restricted conditions of the aquarium, and are very beautiful. Also in this Pets' Corner are Australian and African Lizards, Yellow-bellied and Fire-bellied Toads, Japanese Newts, the Clawed Frog, Alligator Terrapin and Cunningham's Skink, specimens of all of which were exhibited, together with a water snail, *Milania tuberculata*, not often seen in this country. It is an excellent scavenger which, in bright light, buries itself in the sand, where it breeds prolifically. It is somewhat of a barometer, too, because, if found on the surface of the water, something is certainly wrong with the tank. Once established, these snails are impossible to eradicate without completely emptying the tank. The club recently concluded a public Garden Pond Competition, the results being: First prize, Mr. H. J. Hastings, Hornchurch (member); second prize, Mr. G. W. Warren, Ilford (non-member); third prize, Mr. C. A. Robins, Ilford (member); award of merit, Mr. C. Powell, Barkingside (non-member).—**S. H. CARTER (Hon. Press Sec.), 13, Kenwood-gardens, Ilford.**

A Heated Vivarium

By E. C. LAW

IF one has little facility for keeping reptiles that require warmth in the winter it is advisable to leave them severely alone. That is my rule, but sometimes I am tempted and fall. In the early spring of last year a postcard from a dealer advised me that he had a number of long-necked Australian Terrapins. I went, just to have a look at them, but returned home with two small ones. They had 6-in. or 7-in.



The Vivarium, showing the stove and sleeping box on the right

shells. If you add about four inches of neck and head to the length of shell, you will see that they needed rather a large tank to make them happy. No aquarium of mine was large enough for my new pets, and there was no room in my house where I could accommodate one of suitable size, so I turned to the garden.

I had a small garden frame, size three feet by two feet, and a pile of a hundred or so bricks. With the latter I built a brick box, three feet by two feet, without a top. I left in the longest side a gap of sufficient size to admit an oil lamp (the box was made high enough to accommodate it). I covered the entire top with a piece of sheet iron, and on that I placed the frame. Then a zinc tank, about three inches deep, was put in one end of the frame. This occupied about one-third of the whole area. The remaining two-thirds were filled up with sand except in one corner, where there was a shelter filled with peat. The lighted lamp was placed underneath and adjusted until the water registered a temperature of 65°.

Later on I used two lamps with the wicks turned very low. By this method I found that they only needed to be filled about once a week, as the lamps, of the type used in incubators, had large oil containers. It is advisable to inspect them about a quarter of an hour after lighting, as the flame has a way of creeping up when first lighted, and so raising the temperature too

high. With a little experience one can allow for that, and so avoid the second inspection. During cold weather the frame is covered over at night with mats, and partially so in the daytime if the weather is very severe. This conserves the warmth in the frame, and less adjustment of the lamps is needed to keep the temperature at a proper level.

In this my two terrapins lived and thrived on garden worms and raw beef sprinkled with powdered cuttlefish bone. When summer really arrived they went into the garden enclosure.

During the summer I set about improving their home. I cemented the bricks together properly, added an effective door to the heating chamber, and made an extension to the frame to act as a dormitory. The latter was made out of a large box, which, covered all over with roofing felt and nearly filled with peat, made a snug and roomy place for the long-necked and other terrapins to sleep in. It also gave more room in the frame itself. This extra room had become necessary as some other none-too-hardy terrapins joined the original inhabitants.

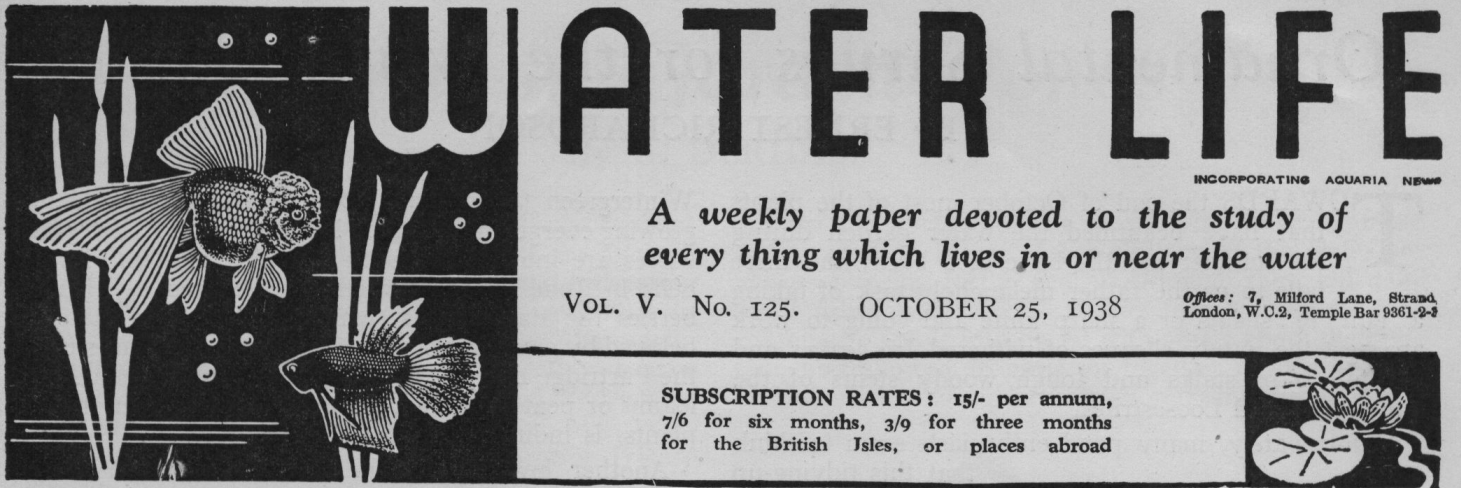
When the winter really set in I packed leaves all round the sleeping-box and held them in place with boards. Its roof also had extra protection. For this winter I contemplate making the dormitory of brick or cement by doubling the length of the brick portion, and covering the extra piece with another three feet by two feet frame. This portion will, of course, be snugly covered in in the winter. The illustration shows the frame at the present moment with the sleeping-box on the right. When the spring sun begins to have some power I replace the glass light with a wire-covered frame to prevent escape, and slide the light half or entirely off during the daytime.

This outdoor heated vivarium has many uses, and is particularly useful when a warm spring wakes up, too early, some species of tortoise or terrapin that is accustomed to hibernation, though not of so long a period as our winters demand. It also offers a simple method of increasing the limited accommodation which most fanciers have for exotic reptiles.

* * *

Gullibility!

Pond hunting always seems to hold an intense interest for onlookers, especially small boys. I was netting for *Daphnia* recently in a large pond which yields enormous quantities of these crustaceans when some boys, hurrying to schools asked me what I was fishing for. They already knew by experience that the pond was not worth trying for Tiddlers. Unwilling to explain the exact nature of my hunt, I told them that the cows and ducks had lost a large cake of soap in the water, and that I was trying to find it for them with my net. Their teacher later retold the yarn to me and asked me if it were true!—D. PARBURY.



The Frog in Winter

By L. G. PAYNE

ARISING out of a reader's query as to the best method of wintering Common Frogs in a conservatory, the Editor has suggested that some notes on the species in winter would be useful and topical.

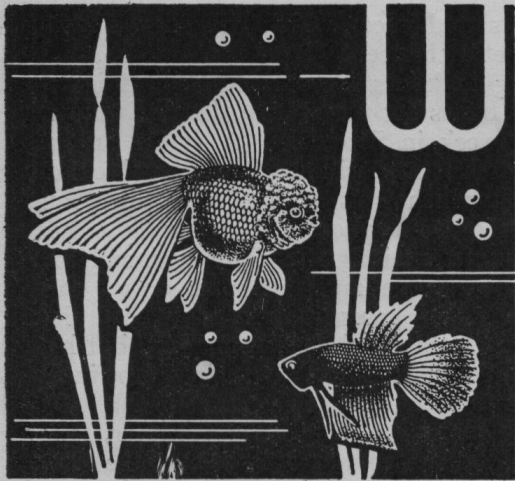
If we are to attempt intelligently the bringing of any wild creature successfully through the winter, it is necessary in the first place to understand its mode of life in the natural state. In early October, occasional chilly days and nights occur, and beetles, spiders, and the smaller insects become scarcer, though earthworms may be in evidence until a ground frost sends them deep. With the disappearance of potential food, the Common Frog seeks out a frost-proof retreat. It may be stated broadly that this freedom from frost is the one essential to the frog's winter abode. The chosen site may be under a wood pile, rock, haystack or in the mud at the pond bottom. It would be wrong to assume from this that the Common Frog is delicate and not hardy. Extreme cold will induce a state of almost complete stasis of the circulation, and the limbs may become frozen and brittle, but, provided the heart remains unaffected, the animal will probably be none the worse. Thus, frogs may be found partially embedded in pond ice, recovery depending largely on duration of frost and subsequent conditions.

It is certain that the normal winter torpor of the frog is discontinuous. I have frequent records of the Common Frog in evidence on mild January nights, when the ground temperature was about 48° F. By late February pairs may be found in embrace, and the new yearly cycle has begun again.

In confinement, Common Frogs will need treatment varying with the conditions under which they are kept. Frogs in a roomy outdoor reptiliary, with stones

under which they can crawl deeply, may be safely left to their own devices. During the warmer winter evenings they may be encouraged to feed by providing a few gentles, though this is possibly a counsel of perfection, unnecessary in any but the smallest enclosures. I have never recommended the keeping of Common Frogs in the small indoor vivarium; their leaping proclivities are, perforce, limited by the size of their cage, and sore noses frequently result. However, any reader who keeps frogs under these conditions should decide at once on one of two alternatives. Either the vivarium should be placed outside, where it will be subject to normal weather conditions, in which case it may be necessary to supply food with some regularity on warm evenings; or it may be kept in a warm living room, where no attempt at hibernation will be made, and where food, which may well include flies and bluebottles, must be provided. In any case, the secret of success is to avoid wide and frequent fluctuations of temperature.

Finally, we have the case of the man who "has a warm conservatory, with a pond in it, and lots of plants." Fortunate indeed are the frogs who live there, for they would appear to have a continuously equable temperature, and almost natural environment. They will find some sustenance in the insect pests attracted by the warm conditions, but will probably have to be given extra food, as before mentioned. Provided the pond is permanently available to the frogs, they should do well in a warm, greenhouse temperature, and, in view of the fact that, in this case, there would be no period of hibernation or suspended animation, it would be interesting to note if any attempt is made at spawning in the spring, or at any other time of the year.



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Hibernating Reptiles and Amphibians

By "AMPHIBIUS"

THE past summer has not been a favourable one from our point of view, if my experience has been general; many animals which would normally have been allowed to pass the coming winter in a state of hibernation, must reluctantly be brought into heated quarters for the winter. There remains, though, a number of well-established examples for whom preparations must now be made.

Whether or not to hibernate is a question to be settled firstly by accurate reference to the animal's mode of life in a state of Nature, and secondly by its physical condition as an individual, this second factor being governed by the season at which it is first bought, and by its subsequent reactions to captivity. As regards the first, it is safe to say that the bulk of the reptiles and amphibia imported into this country are from temperate climates, and that they all undergo some period of hibernation each year. In the case of the second point, I have said often that the earlier in the year one makes one's purchases, the better. Bought in spring, there is not only the hope of a favourable summer to be looked forward to, but the animals have not had time to become debilitated by unsuitable treatment in the limited quarters of the dealers' shops. A late purchase does not necessarily always mean that hibernation must be ruled out: I can feed up such vigorous species as Carolina Box Tortoises and (adult) Alligator, Spanish, and Caspian Terrapins, as well as some less common sorts, so that they can be confidently hibernated out of doors a bare month after purchase; but I must acknowledge that, in these cases, a good deal is due to very selective feeding. As a general rule I like to keep indoors, for their first winter, all specimens bought after July 1, except where individual factors and a fine and warm autumn may render the chances of successful hibernation reasonably sure.

The important thing is that it is the experience of many trained and competent observers that, where it is natural for reptiles and amphibia to hibernate, then they should be allowed to follow their natural inclinations in captivity. Together with this recommenda-

tion, one must bear in mind that natural conditions cannot always be provided for this hibernation, so that a certain amount of artificiality and "management" must enter into the matter. Many snakes (including those North American species available this year) and lizards, for instance, utilize deep, natural cracks and crevices, hollow trees, or the burrows of other animals; Land Tortoises burrow in light soils below the frost line, as do the Box Tortoises, although the latter have been observed, both wild and captive, to hibernate in water. Gopher Tortoises dig their own burrows, into which they retire. Terrapins vary individually, and while many can be left in their pools—if deep enough—all should have access to land in case they prefer it.

Salamanders and newts leave the water and burrow round the boles of trees, or into any fairly light soil, often to only an incredibly shallow depth. Some newts, though, are quite happy to spend the winter in a planted tank of water in stably cool surroundings.

Lizards are creatures with, in many cases, strongly developed territorial instincts, and may spend both summer and winter in the same hole or crevice, coming out in the daytime to hunt or bask, but returning to it each night, and throughout the unfavourable season. Animals behaving in this way are among those most easily catered for when the matter of hibernation is under consideration.

Actual preparation for hibernation consists chiefly in seeing that the beasts are in good condition, and have been feeding well and regularly at least up to the beginning of September. After this time it is natural for there to be found some slackening of the truly remarkable appetite a healthy animal will display through high summer. Shortening days and less sun bring about an increasing degree of somnolence, and lessening period of activity, until the days arrive when the animal doesn't leave his sleeping quarters at all.

In "Hardy Reptiles and Amphibians," Mr. L. G. Payne has described at some length the structure of an enclosure suitable for the all-year-round accommodation of almost any reptile. It includes a heap of

further like to know if the customer used mechanical aeration, whether he were or were not a novice, and the physical state of his aquariums. With full information on all these particulars, and records covering a period of years, we might reasonably expect to be able to come to some conclusions, though, even then, we should be wise not to be dogmatic.

I think, however, that the fish died for want of acclimatization. To transfer fish from the crowded confines and aerated waters of the dealer's tanks to the doubtful conditions which may prevail in the aquarium of the novice might necessarily end in disaster.

Imagine a plainsman being elevated to the top of a high mountain or other place where there is a rarified atmosphere. He would experience great disasters, and might even die. Personally, I think Mr. Paterson could have saved himself and his clients much trouble had he warned them of the possibilities associated with the change of conditions. An explanatory note might have made a great difference. Mr. Paterson next fears for his spawning when the aerator is used. He says the stream of bubbles interferes with the process. But aeration helps spawning. It keeps the water in circulation, and every aquarist knows that certain fish, such as the Angel Fish and various Cichlids, actually fan the water, as it were, to keep it circulating around the eggs, and so prevent fine particles of matter from settling on them.

With regard to the question of filtration, why this subject crops up in an article on aeration I cannot tell. Mr. Paterson is apparently confusing the machine with its primary object, for I take it that the working of the filter is the by-product of the aerator pump?

In conclusion, I would say that aeration is generally beneficial. It can be adjusted to meet the needs of greater or smaller numbers of fish, and it does what plants cannot do—it keeps the water in circulation, thus preventing stagnation, with its incumbent collection of ills.—H. J. D. DUNBAR.

The article by Mr. Paterson, casting doubts on the benefits of aeration by artificial means, has, apart from its interest, given a start again to the old controversy. His opinions in many respects are sound, but the implied condemnation is too broad and too general. I feel that I am in a position to speak fairly authoritatively on this matter, not because of any superior knowledge, but because for many years we have run all the tanks on the farm at King's Langley without aeration, and all the tanks at Watford with aeration.

My experiences are rather conflicting. Fishes that come from perfectly natural tanks at King's Langley, on which there are no traces of disease at the time of despatch, are nearly always the subject of complaints from London dealers, the fishes apparently developing all sorts of trouble soon after being "tanked up," whereas fishes sent from Watford, where all the tanks are aerated, are never any trouble, and seem always to give satisfaction. Actually, however, I think aeration has nothing to do with this.

For what it is worth, the concensus of opinion among experienced aquarists all the world over is favourable to artificial aeration. It would take too long to give all the reasons that have led them to this conclusion, but a few can be briefly stated. Actual experience has shown them that aeration is useful and helpful by its ability

to neutralize the effects of pollution in a tank, allow of very necessary occasional overcrowding, break up the surface film of a tank, and prevent that great difference of temperature in tanks, which often occurs between the upper and lower strata. A difference, harmless where the minimum is high, but very dangerous otherwise. There are other advantages, of course, but these are enough to justify its use where there are many tanks and fishes to care for. Mr. Paterson speaks of its disadvantages in the breeding tank. Here again it must be a matter of opinion, formed from one's experiences. The late Mr. Brandish, of Markyate, raised amazing numbers of Labyrinth fishes and Fancy Goldfishes, yet he used, not a little aeration, but a hard stream that kept the fishes in a continual swirl the whole time. Although he was a comparative novice, I was so impressed by what I saw at his place that I tried the same thing in a 3-ft. tank containing a pair of Fighters, and I also raised more youngsters than I had ever done before, and more broods, too. I have purposely brought in these instances from my own experiences, to prove that we must be careful how we dogmatize, even when we think our experience is backing us.

Despite all this, I cannot really sum up against the opinion of Mr. Paterson for this reason. He is a serious-minded aquarist who has always sought perfection, and I guess that what is in his mind is that if a tank is intelligently cared for, if it is in the right light, if it has the right plants, if it is never overfed or overcrowded, and if one has good luck, then aeration is not necessary and, more, would be harmful. Counsels of perfection, but as aquarists are human and far from omnipotent they must avail themselves of artificial aeration to help them in their failings, cover up their faults, and remedy the errors caused by their lack of perfect knowledge or bad judgment.

So I say that in certain very exceptional cases his theories would apply, but that in the majority of cases artificial aeration is the best friend that the aquarist has.

It, of course, requires no scientific knowledge to realize that fishes coming from well-aerated waters will not immediately be happy when placed in waters somewhat deficient in oxygen, and the other way round, will be happier. Let me put what I think is a fair analogy. A Highlander who has lived always on the breezy heights will be for a while very uncomfortable when forced to live and work in a stuffy room in a large town, and a slum dweller will be immensely invigorated when exposed to mountain and sea air. Are we to say that mountain air is harmful because it stimulates the town dweller, and are we to deny that the vitiated atmosphere in which many people work is poisonous just because it has been natural to them?

Anyhow, all these divergent views are welcome, for only by open and free discussion can we learn what there is to know; most of our knowledge, after all, being the result of experiences and research by other and preceding folk.—ARTHUR DERHAM.

* * *

SNAKE OWNERS' SOCIETY?—There are, in this country, many people who keep snakes as a hobby, and some of these must often feel that they would like to get in touch with fellow enthusiasts. If any readers would care to form the nucleus of a Snake Owners' Society, will they please write to Geoffrey A. Valmore, c/o WATER LIFE?

Hibernating Reptiles and Amphibians

By "AMPHIBIUS" (Continued from page 530)

THE following is a list of those species capable of hibernation which have been available during the past year or two, together with an indication of their approximate requirements. It is only meant to serve as a rough guide and must be modified according to local conditions.

The animals which must have access to both land and water are starred.

- (1) *Wholly hardy animals which may be left in enclosures or outdoor cases to look after themselves.*

Adder, Grass, Dice, Smooth, Æsculapian, Pine, and Garter Snakes, Glass Snake, Slow-worm, Sand, Viviparous, Wall, Northern (i.e., Common) Green and (Spanish) Eyed Lizards.

Mediterranean, Greek, and *Carolina Box Tortoises (where the soil is suitable); *Spanish, *European, Alligator, *Painted, *Blanding's, and Sculptured Terrapins (the last one always hibernates on land).

*Red and Yellow-bellied *Bombina* Toads; *Agile, *Grass, and *Edible Frogs; Midwife, Clawed, Common, Natterjack, Green Toads; *Painted Frog, *American Bullfrog, European Tree Frog.

Spotted and Alpine Salamanders; *Red-bellied, Common, Palmate, Alpine, Marbled, and Crested Newts; Axolotl.

Frogs must not be packed in boxes.

- (2) *Animals which may be hibernated in boxes in a cool building.*

All those under (1) which do not normally hibernate in water, except Frogs.

Four-rayed Snakes, Corn Snakes, King Snakes, Eastern (Dalmatian), Green Lizards.

- (3) *Those which may be hibernated in tanks (set up as recommended in the article I wrote on the Elegant Terrapin).*

All those enumerated under (1) which normally hibernate in water.

Reeve's, Lesueur's, and Elegant Terrapins; young examples of European, Spanish, and Painted Terrapins.

- (4) *Species requiring special treatment.*

Diamond-backed Terrapins. These are very hardy and may be hibernated in their pool of salt water or buried in a cave in their enclosure. They will also be safe in a box of earth, but the other methods are preferable.

Amphiuma. May be left in an unheated room indoors, but takes no harm if kept going all the winter in slightly warmed quarters.

Southern Trionyx. A galvanized bath with at least 6-in. of sand and 4-in. of water in an unheated room.

I have not succeeded in hibernating the Leopard Snake under any conditions.

Gopher and Chicken Tortoises. The former may be hibernated for from two to four months, as described under No. 2, *but only after a very good summer.* The Chicken Tortoise is often a very bad starter. *When* one has found out what it really wants to eat, it should be fed liberally, but kept going during its first winter. It may be hibernated as for the Gopher during its second. Its third and subsequent winters may be spent wholly hibernated. *When* it settles down it becomes a very good doer indeed, and lays beautiful eggs.

Manatee

By F. P. HUGGINS

MANY readers, no doubt, have seen this curious-looking mammal whilst visiting the Aquarium in the London Zoo, and the following notes may be of interest to them.

The Manatee gets its name from the hand-like use of its flippers when nursing its young. Sometimes called the Sea Cow, it inhabits the rivers, bays, and lagoons of Florida, Mexico, Central America, and the West Indies, but never frequents the open sea. It is whale-like in shape, with the similar horizontal expanded tail-fin, and when fully grown measures from 8-ft. to 13-ft. in length. One specimen turned the scales at 590-lb. when it was weighed. The skin is dark greyish and wrinkled and has a covering of fine hairs. There is no sign of ears on the head and the eyes are quite small. The nostrils, situated at the top of the rounded muzzle, are fitted with flaps, to keep water out when the creature is submerged.

The mouth is rather unusual, the fleshy upper lip is cleft in the centre into two lobes, each being separately movable. These have short, stiff bristles on them and

enable the Manatee to pluck aquatic plants, which are then passed into the mouth to be masticated by broad-crowned cheek teeth.

There is no fin on its back and there are no hind limbs. From the shoulders the two flippers can be moved in any direction and, besides being used for paddling and pushing food towards the mouth, are used to hold the young to the breast to suckle, the teats being placed close to the forelimbs. Only one baby is born at a time, but very little is known about the breeding habits.

It is interesting to note that there are three nails on each flipper of the Manatee, excepting those which come from the Amazon, and these are devoid of nails.

The Manatee is supposed to be the origin of legends about mermaids, while the Amazonian species is the object of superstitious reverence by the Indians.

The first of these mammals to be brought to England was sent to the London Zoo in 1875, but soon died. Later a specimen lived in the Brighton Aquarium for sixteen years.

Club Reports

Owing to the manner in which Club Reports tend to encroach on the limited space available in this paper, only notices of future meetings and club matters of general interest to all our readers will be published in these columns. We greatly welcome reports giving interesting points from lectures, but are not prepared to devote space to club business, as this is only of local interest.

THE SCOTTISH AQUARIUM SOCIETY'S tenth annual show.—As a financial venture, of course, it will be a failure, but as a piece of propaganda within the Fancy, and as a means of cementing together the members, we vote it our "best ever" by quite a long way. Members rallied round, and by entering all their healthy stock, ensured a show of very high standard, and wide variety, and by attending all the time made visitors who came in mildly interested, leave enthusiasts, and in many cases, new members. Any actual financial loss we will consider to be money well spent. Our entries numbered about 350 and required about 250 tanks to house them; tropical and cold-water sections being almost equally balanced. The former were housed in tanks ranging from 10-in. x 7-in. x 7-in. for Guppies, to 20-in. x 12-in. x 12-in. for Angel Fish. The heating was done on the oven principle and proved very successful. Overhead lighting was provided and tanks were well planted for decorative effect. The tanks for cold-water fishes were from 12-in. x 8-in. x 8-in., to 36-in. x 12-in. x 12-in., two fish belonging to one owner being housed together. There were thirty-five entries in the Shubunkin class, whilst the various "Bred by Exhibitor in 1938" class, attracted thirty-four entries including Neon Tetras, and White Cloud Mountain Minnows bred by Mr. Peter McNish.—S. KERR (Hon. Sec.), 24, Kingsbrae-avenue, Glasgow, S.4.

LONDON AQUARISTS' SOCIETY.—Owing to the resignation of Mr. K. W. Branczik, Mr. C. S. Stiff, Royston, 32, Gilkes-crescent, Dulwich Village, S.E.21, is now Secretary to the above society.

BRISTOL TROPICAL FISH CLUB.—At the last meeting of the club, held on Monday, October 31, Mr. H. C. B. Thomas, by special request, gave us a paper on "Water," and for over an hour held the whole interest of members. By means of diagrams and carefully explained points he took us through the most intricate parts of his address. The paper was a model of closely reasoned details, and the lecturer was warmly thanked at the close for the pains he had taken, not only in preparing his talk, but

the trouble he took to explain any point not fully grasped at the time. The next meeting will be held on Monday evening, December 5, when a debate is to take place on "Aeration v. Filtration," two members on each side. Anyone interested in this subject will be welcomed at the club room, 58, Newfoundland-street, Bristol, 2, by notifying the Secretary of intention to be present.—F. M. CRABBE (Hon. Sec.), 91, Stoke-lane, Westbury-on-Trym, Bristol.

THE HARROW AND DISTRICT AQUARISTS' CLUB.—At the recent table show, the third to be held at successive meetings, there were too many entries for the number of tanks provided, and the last had to be housed in a biscuit barrel. The next meeting will be held on Wednesday, November 30, at the Half Moon, South Harrow, at 7.30 p.m. Interested aquarists please write to F. J. Boardman (Hon. Sec.), 10, Roxeth-grove, South Harrow.

SOUTH LONDON AQUARISTS.—The visit to the South Kensington Museum on Saturday, November 12, made us realize how small a part we play in the art of fish keeping. As well as seeing all the cases of casts, skins, and mounted specimens, which are on view to the general public, Mr. J. R. Norman, who made the visit possible, showed us some of the quarter of a million or more actual specimens that are preserved and classified in an immense block of store rooms. At the next meeting, on Thursday, December 1, Mr. A. H. Hoare will talk on "Pond Designs." This should be particularly useful to those who are about to prepare new ponds in readiness for the coming spring. Meetings held at Adult School, Garratt-lane, S.W.17 (two-minutes' walk from the Broadway), at 8 p.m.—H. G. ROWBOTHAM (Hon. Sec.), 57, Idmiston-road, West Norwood, S.E.27.

THE PROPOSED SNAKE OWNERS' SOCIETY.—The main objectives of the society would be as follows: (1) A register of snake owners, with particulars of snake or snakes usually kept by such owner. (2) To encourage the scientific study of snakes. (3) To help and advise those who have snakes as a hobby in the best methods of keeping these reptiles in captivity. (4) By means of the register, to place members in contact one with the other for the mutual exchange of ideas. (5) To hold an exhibition once a year. The members of such a society would be scattered, and, at the moment, I cannot say if sufficient members will be forthcoming in or near London to justify even quarterly meetings, yet this should not deter the formation of the society, if we really desire to discuss our subject with fellow-enthusiasts, and perhaps seek their advice. With regard to membership, the only entrance fee or subscription asked of those who enrol in the society is their co-operation with fellow members and myself to make the society really useful to all owners of snakes.—GEOFFREY A. VALMORE, Vagniacis, River Ash Estate, Shepperton, Surrey.

Diary of Coming Events

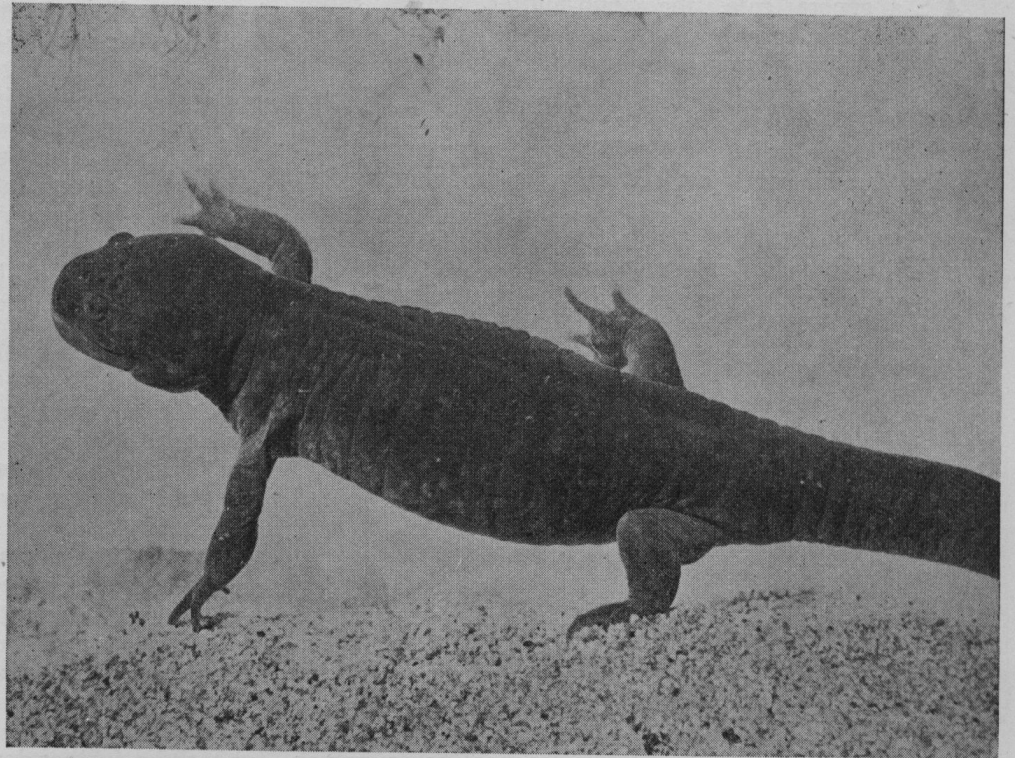
- November 30.—North London Aquarists' Club Show.
- " 30.—Meeting of Harrow and District Aquarists' Club.
- December 1.—Exmouth Fanciers' Show.
- " 1.—Shooters Hill and District Show.
- " 2.—Meeting of Sheffield and District Aquarists' Society.
- " 5.—Meeting of Bristol Tropical Fish Club
- " 9.—Inaugural Meeting of the Central Advisory Club, at 356, Strand.
- " 13.—Meeting of Guppy Breeders' Society.

A Peter Pan in Nature

By MONTAGU A. PHILLIPS, F.L.S.

OF all the amphibians, the life-history of the Axolotl is not only remarkable, but also one of Nature's surprises. This animal, with its tufts of gills on either side of its blunt head, is somewhat like a very large black newt in its larval stage. It often measures up to twelve inches in length, and, strange to say, it is only found, in a wild state, in some of the lakes near the city of Mexico. It never leaves the water, but, unlike newts and salamanders, in their gilled stage, it becomes sexually mature and produces generation after generation of larvæ like itself. Owing to this fact, the Axolotl was, for some time, regarded as forming part of a different group of newts, the Permanently Gilled or Perennibranchiates.

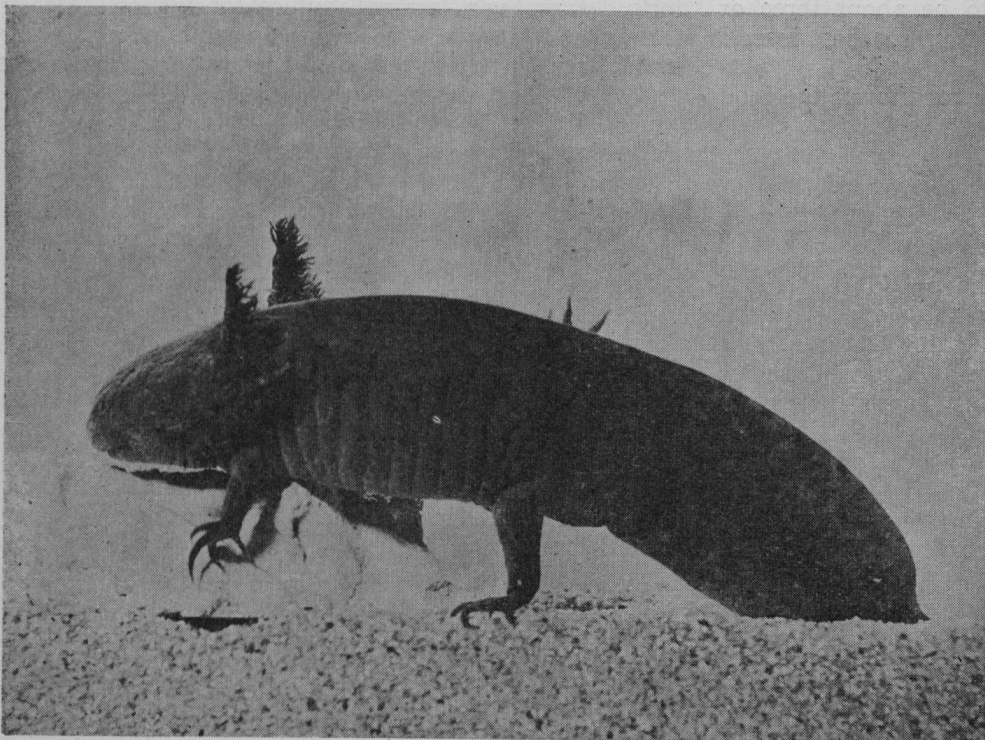
In 1864 some of these amphibians were sent to the Zoological Gardens in Paris. There they thrived and produced many generations of larvæ like themselves. Sud-



AMBLYSTOME (metamorphosed axolotl)

denly, however, it was observed that the young of one brood had lost their gills, and the crest on the tail, and had developed eyelids and changed colour. You can well imagine that these remarkable changes must have created an immense amount of interest to the French zoologists, for it was quite evident that these Axolotls were passing through a stage which would enable them to live on land. To the surprise of all, they ultimately changed to the well-known Tiger Salamander of North America. Thus it became clear that the Axolotls were merely a race of permanent larvæ.

It may interest readers to learn that an injection of secretion of thyroid—even that of a sheep or a fish—is sufficient to transform an Axolotl to a land form. It seems evident, therefore, that the permanently aquatic condition of this animal is due to some irregularity of the thyroid gland.



AXOLOTL (about three years old)

Aquatic Insects

By JOHN CLEGG

No. 20.—The Drone Fly

AS a general rule, the pond-hunter avoids those black, muddy ponds, evil-smelling, and devoid of submerged vegetation, which are sometimes encountered, but if he wishes to find the Rat-tailed Maggot, as the larva of the Drone Fly (*Eristalis tenax*) is called, he will have to overcome his natural repugnance, for it is only by dredging up the blackest and foulest mud near the edge of the pond, where the water is only an inch or two deep, that he will find this remarkable creature.

When the mud is washed off it, the Rat-tailed Maggot is seen to be of a greyish colour, and its body, excluding the tail, about $\frac{3}{4}$ -in. in length. It possesses no true legs, but has seven pairs of circular feet, somewhat similar



Rat-tailed Maggot (Larva of *Eristalis*)

to the pro-legs of caterpillars. The most conspicuous feature of the larva, however, is the "tail," which, in reality, is an organ to enable it to breathe atmospheric air. It consists of two tubes, an outer one, which is a continuation of the skin of the body, and an inner one, in communication with two tracheal tubes, which are in turn connected to the air tubes that run through the body.

Both the inner and outer tubes of the tail can be extended, so that the creature can adjust the length to the depth of water in which it happens to find itself. The maximum extension seems to be about three or four inches, so that it is useless to search for these insects in water deeper than that.

Decaying vegetable matter in the mud forms the food

of the Rat-tailed Maggot, and this is sucked up by the pharynx. The creature creeps about from place to place by means of its retractile feet, which, being provided with little hooks, enable it to grasp the surface on which it is moving. When a good food supply is found, the larva partly buries itself in the mud, the long tail standing up vertically in the water and just touching the surface.

When the larva is ready to pupate, it leaves the water and creeps into a crevice in the soil nearby. Here the skin becomes hard and loose, and, with the particles of earth which have become attached to it, forms a cocoon, in which pupation takes place. In about a fortnight the imago emerges.

KEEP THEM OUTSIDE!

The adult Drone Fly can easily be mistaken for a bee, for not only is its form like that of a hymenopterous insect, but it also hovers round flowers, sipping their nectar. The female flies are said to lay their eggs on objects just above water in which the larvæ are to pass their period of existence.

The requirements of the Rat-tailed Maggot will preclude their ever becoming popular household pets, and to avoid domestic disharmony, it would be as well to keep any specimens, under observation, out of doors. A shallow dish, in which is put a layer of mud, rich in decaying leaves and other vegetable matter, to a depth of about two inches, and this then covered with water to a further depth of two inches, will serve as their aquarium. No further attention will be necessary, until the larvæ are ready for pupation, at which time they will appear restless, and make efforts to leave the water. A quantity of damp earth placed in a box will serve as a puparium, and, in favourable conditions, a fortnight or even less will suffice for the creatures to emerge as imagines. With specimens that pupate late in the year, however, the emergence may not take place until the following spring.

An "Alligator" Terrapin

FOR the past six months I have had two young Alligators living apparently happily and peacefully in company with an Alligator Terrapin. All have been feeding well on meat, live fish, and so forth. The Terrapin, during his more boisterous moments, bit off the extreme tips of the Alligators' tails, but otherwise he has betrayed no vicious tendencies.

The Alligators have grown quite considerably, the larger one doubling his size and being now about 18-in.; the smaller one has fed less ravenously and consequently has grown less rapidly, attaining a length of only a little over a foot. "Terry," too, has grown well during the fifteen months I have possessed him, and the length of his carapace is about 6-in. His capacity for food and his ability to look after himself may be gauged by the fact that recently he completely disposed of a 5-in. live Gudgeon in under ten minutes. Nevertheless,

he is a tame and "gentle" creature, for he never attempts to bite me when feeding him, unlike the Alligators, who, in their excitement, are just as likely to take finger as the titbit offered.

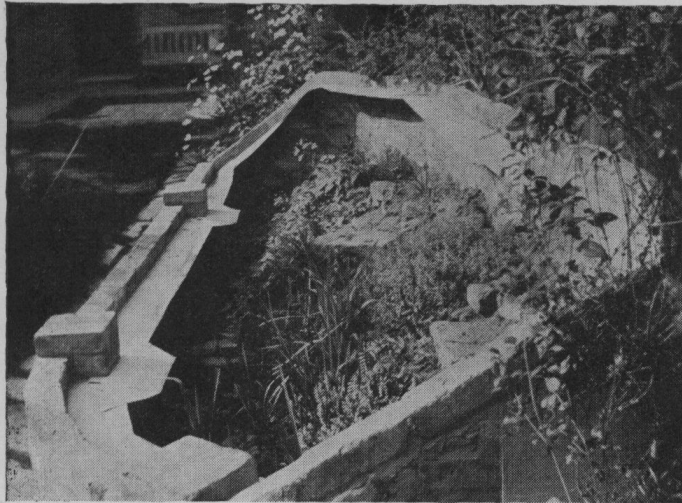
Now, however, in spite of liberal feeding, the Terrapin has apparently decided that a "tough guy" like himself needs some suitably tough food. While I was watching him and the Alligators the other day, he quite suddenly seized the smaller Alligator by the neck as it lazily floated past, and with a vicious snap of the jaws decapitated it. I was so surprised I could hardly believe my eyes.

In the short space of a quarter of an hour the Terrapin consumed the front limbs and all the body of the Alligator, leaving only the head, the hind limbs, and the tail. Now I am prepared to believe any story of the strength and ferocity of Alligator Terrapins.—M.G.E.

An Improved Reptiliary

By L. G. PAYNE

TWO years ago, in the pages of WATER LIFE, I described an open-air enclosure which I had constructed, and which proved satisfactory for certain types of amphibians. The outstanding disadvantage was its unsuitability for any of the hardy lizards. The problem in connection with lizards is to find



a means of rendering the escape of these creatures impossible—one which is effective, but not too obvious. It would be quite simple to construct a square of brick, and cover the inter-space with fine-mesh wire netting, but the latter, if it were to retain Wall Lizards, would have to be of so close a texture as to destroy any sense of naturalness which I maintain a reptiliary should possess. It seemed that an elaboration of the horizontal retaining ledge would provide a satisfactory solution.

It should be stated that my idea was to build an enclosure which would be suitable for as many different types of reptiles and amphibians as might be expected to live together in harmony. This would necessitate sun and shade, sand, and earth, water and rocks, and a frost-proof retreat for winter. These briefly are the essentials for a satisfactory communal reptiliary.

The idea is prevalent that amphibians must have conditions of shade and damp, an idea which, my observations lead me to think should be modified. Hence I decided that the new reptiliary should be in the sunniest part of the garden.

In form, the reptiliary is irregularly oval, sloping downwards from back to front. Maximum length is 18-ft., width 6-ft. There is a definite curve in the foreground, conforming to the line of the path in front. Walls are of weathered brick, with a foundation of single brick well set in cement below ground level. Height of rear wall 3-ft., front wall 2-ft. Consequent angle of slope may be gauged from right foreground of the illustration.

Many of the bricks used were old and damaged, necessitating generous use of mortar in making up the levels, but this is no disadvantage, as on the inside it

gives footholds to lizards on their rapid horizontal runs the length of the wall, and on the outside gives an impression of age and maturity.

The walls are a single brick thick, but three pillars of double thickness are incorporated at intervals along the front. These serve to reinforce the wall, to break the monotony of the more or less straight line, and form convenient seats from which the animals may be observed at ease.

A certain amount of latitude can be exercised in deciding the height of the retaining ledge. Here the spirit-level should be brought into rigorous use, or subsequent trouble will result. For the ledge, sheets of zinc 9-in. wide in 6-ft. lengths were obtained, and these laid flat on the wall top, with an inward projection of 7-in., leaving only 2-in. to be covered by the top row of bricks. Before finally fixing these in position, the zinc was nailed firmly into each underlying mortar joint.

A point to watch carefully is the union of the zinc sheets. These should overlap one another an inch or two and fit closely. Even the tiniest cavity will afford a foothold for certain of the inmates and thus a means of escape. The zinc takes a glossy paint well, and should be painted a pleasing colour.

(To be continued.)

* * *

POOLS OF LONDON

4.—A Roof Pond

This attractive pond, with its beautiful marginal plants, lovely lilies, and fine collection of Goldfish, is actually



ON SELFRIDGE'S ROOF [Photo by B. Davies-Colley]

situated on the roof of one of London's busiest stores. Visitors to Selfridge's may pass a very restful hour wandering round the roof garden and enjoying the peace and quiet afforded by this pleasant little water garden.

An Improved Reptiliary

By L. G. PAYNE (Continued from page 598)

HAVING thus completed the shell of the reptiliary, the next piece of work was the pool. This was constructed in the ordinary way, and was roughly oval, measuring 3ft. by 2-ft., with a maximum depth of 18-in. A narrow gully crosses the crazy path from the garden pool, connecting with the reptiliary pool by the simple method of omitting one brick from the wall at ground level. The resultant gap is blocked with perforated zinc allowing the water to enter, but not the animals to escape. Fresh water is thus run into the reptiliary at will.

Behind the pool the ground rises sharply by means of large porous pieces of sandstone firmly embedded in the soil. These overlap right from the water's edge, and it is a pleasing sight in summer to watch the lizards run lightly down the terraced stones to drink. A few spikes of the tall aquatic grass, *Glyceria aquatica*, are encouraged at the back of the pool, while *Elodea canadensis* is the only other water plant allowed.

I am convinced that a successful open-air reptiliary must have ample underground retreats, providing a frost-proof place for hibernation, shelter from the heat for amphibians, and refuge from an occasional prowling cat. I therefore arranged a continuous tunnel of brick, well below ground level, extending the length of the reptiliary, with entrances at either end, and with a right-angled connection towards the rear wall, thus forming an inverted T when viewed from the front. This tunnel is not so complicated as it may appear in print, as it merely consists of two parallel lines of old bricks laid 4-in. apart on firm soil, with a covering row of bricks laid at right-angles. The whole was then covered with soil, but a large area towards the back was made up of a deep layer of sand, this forming a natural medium for Natterjack Toads and Skinks.

I have said that the surface slopes sharply from back to front. An important point arises here—as the prospective inhabitants may be likely to jump out to freedom, unless proper precautions are taken. From my experience, I can state definitely that there must be a clear 20-in. of space between the rim of the zinc ledge and the nearest earth or stone surface at any given point. For the same reason it is desirable to restrict the planting of the reptiliary, at least near the boundaries, to plants which do not grow to any considerable height, it being hardly necessary to point out what happens if a lizard or Midwife Toad climbs up a stem which reaches to within a few inches of the zinc ledge!

The appearance of a reptiliary can be made or marred by its planting, therefore choose low-growing, tufted, long-flowering plants, if possible. Reptiles and amphibians love close-growing plants; these provide cover, and harbour natural food. A list of suitable plants is unnecessary, but I would mention the common Catmint, and the white form of *Linaria cymbularia*.

Now is a good time to plan the reptiliary with a view to beginning operations early in the New Year, so that all may be ready for the spring importations. In this connection it will be of interest to enumerate some of the creatures such a reptiliary may reasonably be

expected to house. Briefly one may say:—Anything hardy which does not, in a state of nature, prey upon some other potential inhabitant. Thus we may have the Green, Wall, Common, and Sand Lizards, but not the Dalmatian; hardy Skinks and Slow-worms; of Toads and Frogs, all commonly available species, except the Edible and Tree Frogs; Newts of all species; Salamanders, but not Terrapins.

Feeding is simple, but should be attended to at the right times or sparrows will quickly learn to steal both mealworms and gentles. Mealworms for Lizards and Skinks should be given during the warmest part of the day, lizards being easily taught to accept from the finger. Gentles for frogs and toads should be placed in shallow tins at dusk. Earthworms for newts and the purely aquatic amphibia can be given at any time.

An obvious advantage of the open-air reptiliary is that a certain amount of potential food will be available to the inmates by natural means, e.g., earthworms, low flying insects, and small beetles on warm nights; and similarly caterpillars, blue bottles and other flies by day.

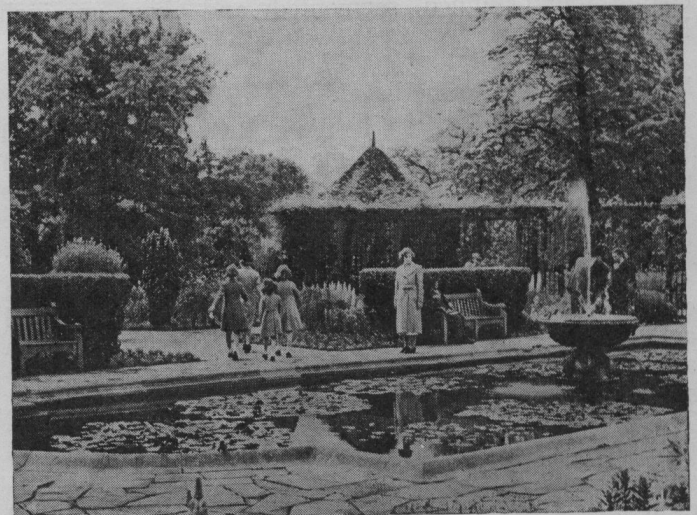
In conclusion I would suggest that a reptiliary constructed on lines similar to the foregoing will be a source of interest to the enthusiast the year round.

* * *

POOLS OF LONDON

5. Old English Garden, Battersea Park

This pool and fountain, set in a lovely garden with pergolas and arbours, is a delightful spot on a warm summer's day. The pool contains some fine Water



The Old English Garden, Battersea Park

Lilies and some large Carp, Orfe, and Goldfish. The basin below the fountain has at most times a twittering family of sparrows standing on its edges bathing in the spray. The boating lake in this park contains enormous shoals of Carp, Dace, and Roach; and to go and feed the fish at the special railed approach to the water is popular with many people who make it a regular outing.