

WATER LIFE

Articles on Herpetology
from Volume 2

VOLUME II

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The Carolina Box Tortoise

By "AMPHIBIUS"

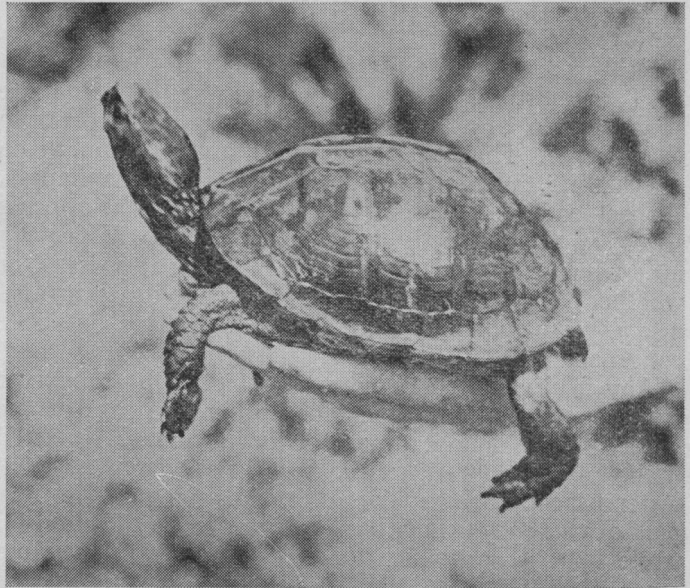
THE subject of this article is nearly always obtainable from dealers, it being one of the extremely few alternatives they offer us to the ubiquitous European Pond Terrapin. I have read somewhere that the latter could be naturalized in this country, and from my experience I would say the same of the Carolina Box Tortoise. It is rigorously hardy, intelligent (for a tortoise), and with the minimum of care will live for a great many years. I have had my present specimen—photograph herewith—for a long time. She is rather bigger than those usually for sale in this country, but is by no means big as these animals go.

They get their name by reason of their possession of a hinge in the plastron, which enables them to shut themselves in when they so desire. Mine, alas, ceased to shut up years ago, and when picked up to be shown off to visitors or friends, sticks out her head and limbs to their fullest extent to see what is going on, instead of retreating with a hiss to demonstrate the efficiency of her hinge mechanism.

This is one of the tortoises which can safely be left outdoors all the year round, an enclosure having a wire fence about 1-ft. high and containing a "tortoise house" and a pond being the most suitable home for them. When keeping terrapins of any kind, it is quite unkind to offer them only the often-advised tub or bowl sunk in the ground. They need a pond of varying depth, being from 2' to 2' 6" at its deepest, and suitably sloped so that they can scramble in and out. By means of "pockets" in the sides, tall growing plants should be set. Having only a very elementary knowledge of the "marginals" and bog-plants about which their vendors write such attractive catalogues and guide books, I stick to *Alyssa*, *Sagittaria*, and various reeds (I do not know their names) round the edge, and a Water Lily or *Nuphar* in the middle. All these plants are strong enough to withstand a good deal of clawing about, and grow up and flower most enchantingly from the smallest of pockets. I steal most of my plants from the Grand Union Canal Company, and haven't been caught yet!

With a good shelter of vegetation and a layer of Frogbit and *Lemna* on the top, your terrapins will soon lose their head-under-the-water-at-every-movement reflex, and gaze undisturbed about them with typical terrapin superiority.

Some readers may think all this is rather irrelevant to the subject, since all the books tell us that *Cistudo carolina* is the least aquatic of the terrapins; but in actual fact I have found that they revel in a thorough, albeit infrequent, bath. Again, the books tell us that this species is nocturnal, but my present specimen and her predecessors could never make up their minds whether to be nocturnal or not. They seem to enjoy basking in the sun much as other terrapins do, as well as a nap during the hottest hours, but all have agreed in favour of the hour about sunset in which to dine off chopped meat, egg, pear, bananas, strawberries, and



[Photo by Brian Stanford]

The Carolina Box Tortoise

any other thing that may be going; pausing selectively between each mouthful to choose what shall come next.

On some mornings, however, evidence of considerable nocturnal activity is manifest in layers and knobs of mud on her limbs, shell, and muzzle, but what she has been digging for I really do not know.

The Box Tortoise is one of the three animals that I know (the hedgehog and the blind worm being the other two) that will readily eat slugs. I am cursed with enormous black and khaki-mottled monsters that assault my flower beds in batteries; but although the tortoise enclosure is large, and offers, in the way of lettuces, etc., a very tempting bait for slugs, I never find one there.

Winter is spent at the bottom of the pool with the other terrapins, and I have never had a moment's anxiety over her in the bitterest and most prolonged frosts. As soon as the sun begins to have even the tiniest bit of warmth in it, her response is to stick her polished ebony head out of the water, to look round with bright eyes as if summing up the prospects of the season before her.

The carapace is marked with reddish or yellow spots and radiated lines. There is a tendency to lose these with age, so that the majority of the adults become coal black, or a uniform extremely dark brown.

Occasionally other box tortoises, such as Baur's and the Spotted Box Terrapin, are in the market, and would, I expect, require the same treatment as their relative, *carolinensis*. Whether they would stand the winter outdoors, of course, is a matter for experiment.

None of the box tortoises, unless *extremely* small, are suitable for confinement in glass cases, or in those iniquitous little round glass bowls often offered for sale complete with unhappy baby terrapins.

The Edible Frog

(A Hardy Species for the Garden Pond) By L. G. PAYNE

THE Edible Frog, *Rana esculenta*, derives its English and specific names from its culinary potentialities, but it is rather on account of its qualities of interest and ornament that it is introduced to the pages of WATER LIFE.

This frog, the largest and most brilliantly coloured of all the European species, is more satisfactory in the garden pond than in the closer confinement of the vivarium, and in this article I shall prefer to treat the amphibian as having the comparative freedom of the garden.

At the outset, let me assure you that the Edible Frog will not interfere with your Goldfish, neither need its mating song disturb the comfort of yourself or neighbours.

The Edible Frog has a wide natural range throughout Europe, and is now established in some parts of England. In one locality within ten miles of Charing Cross it breeds freely every year, and probably owes its survival to its extreme wariness and to the fact that it rarely ventures on land more than a few inches from the water's edge.

Edible Frogs arrive regularly every spring at the dealers' shops, and can be purchased quite cheaply, or, if you prefer to do your own hunting, I can assure you the sport will provide all the thrills of the fisherman with, perhaps, a few more added. Briefly, the method I have found successful is to note a spot perhaps twelve or fifteen feet out on the water, where a frog is floating, then to throw out a worm attached to twine with a match-stick float. The frog will seize this bait, and should then be quickly lifted out to a point behind you, thus giving the chance of netting or otherwise intercepting it, before its powerful leaps permit the frog to regain the water.

The male Edible Frog, in its most attractive form, is bright green in colour, with a few dark brown or black spots, and often with a light yellow vertebral stripe. The male also possesses, during the breeding season, the usual granulated pad on the inner fingers. The most remarkable feature of the male, however, consists of the pair of bluish vocal sacs situated behind the angle of the jaws. These sacs, when distended, are about the size of large green peas, and give the frog a most quaint appearance. Practice will enable one to separate the sexes in these frogs, for the loose fold of the sac may be discovered with a little manipulation of the jaw.

The call notes of the male have been immortalized by the ancient Greek writer, Aristophanes, and I never hear the croak of the Edible Frog without paying silent tribute to the accurate rendering which he gave 400 years before the Christian era, and which it would be impossible to improve upon to-day. Here it is:—Brekekekex Kōax Kōax. The first word should be articulated quickly, and the two following slowly, with the broad "o" accented.

The female frog is relatively larger, a body length of four inches not being unusual. Females are nearly always darker, and even after deposition of spawn appear rounder in body.

Apart from the colouring, obvious points of contrast with the Common Frog consist of the more sharply pointed mouth, and the alert eyes relatively close together, and situated at the top of the head. This latter is a common feature in those species of frogs whose habits are predominantly aquatic. The Edible Frog is a lover of bright sunshine, and then it is that his colours show to best advantage.

In the garden pond these frogs rapidly become tame and will accept worms placed before them by hand. If you would tame your frogs to this extent the important thing to remember is never to make your actions appear jerky. It is not deliberate movement which alarms the frogs; panic is engendered by the hasty and unexpected action.

Food consists of anything small which shows movement. Flies, spiders, wasps, and worms are all readily seized, and one great advantage of the Edible Frog out of doors is that it can always find its own food. It is amusing to watch these Frogs in my garden on a summer's day. There are usually one or two of the globular fly traps set near the pond, and the frogs have seen that numbers of flies are attracted thereto. They cannot get at the flies in the trap, but have learnt that if they knock off the top of the trap with their snouts there is then nothing to stop them devouring all the flies which come to the unprotected bait. This seems a marvellous development of instinct, and I have seen it occur many times.

For a small garden pond up to a capacity of 200 gallons, half a dozen Edible Frogs will be found very satisfactory, and I would advise limiting the number of males to two. If their croak should become too

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Try Barbus Species

By A. K. D.

THESE are many species of Barbs, great and small, available to the Tropical aquarist, but one seldom sees them displayed to advantage, and few attempt to breed them, though one does sometimes see a fine shoal of young *Barbus conchoni*, and a lovely sight they are.

A community tank of Barbs is an idea well worth trying. Of course, the small species must be kept to themselves, while the large ones are heavy, active fish and require plenty of room if artificial aeration is not available. At least 16 sq. in. of water surface should be apportioned to each inch of the larger Barbs when calculating tank capacity. Temperature requirements are moderate, anywhere between 72° and 77° F. being most satisfactory.

Let us consider some of the more desirable little Barbs. First *B. gelius*, which grows to 1½-in. This little fish is much lither bodied than most of its relations. It is coloured a pale golden with large brown-black spots. Though so small and apparently delicate, it is quite hardy.

B. partipentazona, which also falls short of 2-in., is probably the most popular of all Barbs at present. The silver body with the four black bars and red-streaked dorsal, makes a very fine picture.

B. tetrazona, not quite so large as *Partipentazona* and much rarer, is even more beautiful. The body is a lovely pale coppery colour and the fins are a bright copper. The body is crossed by five bluish-black stripes, the hindermost of which is rather indistinct.

The pygmy of the genus is *B. phutunio* which grows to only 1¼-in. Another very beautiful small species and one well known is *B. oligolepis*.

The middle-sized species are not so interesting, but when we get to the really big fellows we find several very attractive species. *B. everetti* grows to 5-in. and is characterized by large bluish-black spots and blobs on a brassy ground, while the fins are of a reddish hue. *B. lateristriga*, about the same size, known sometimes as the Spanner Fish, is marked by two vertical black bars forward and a black stripe behind on a silvery ground. *B. binotatus* is silvery with a large black spot at the root of the dorsal fin and another at the base of the tail. Finally there is our old favourite *B. conchoni*, the Rosy Barb, which, when given room and good food, will grow over 4-in.

The big Barbs are hard on plants, and though a certain amount of green food is desirable, their tank is best left unplanted, with some rocky decoration which also serves as a refuge for any bullied fish. All the Barbs are omnivorous and enjoy a mixed diet, including a large proportion of prepared foods, though the big fellows greatly appreciate small whole earth worms.

* * *

Care should be taken when netting pond fishes, even more care perhaps than when netting aquarium fishes. Roughly netted pond fish will be almost sure to develop fungus in the aquarium. Use a soft muslin net of adequate size. String nets are taboo to the aquarist.

The Edible Frog

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persistent there is a simple remedy. Catch the offender and place him in a tank or box for twenty-four hours. He will immediately become quiet, and when released will probably behave himself for at least another day or two. Remember it is only the males which croak, and it is worth while offsetting a little trouble in this direction against the visual joy of the shimmering lustre of their colouring.

I am sometimes asked if it is necessary to confine the Frogs to the pond by artificial means. The answer is no, for this species will not ordinarily wander away from the vicinity of water. Beware, however, of thunderstorms; then it is that Edible Frogs become strangely restless, often taking prodigious leaps in all directions. It is sometimes worth while to "corral" your frogs in thundery weather. Naturally, if the garden is surrounded by a fence this precaution is unnecessary.

Edible Frogs breed freely in the small pond. Mating takes place in June, and the spawn is laid in irregular flat masses amongst water plants. The actual egg, within its mucilaginous envelope, is brown above and yellow below, thus giving the mass a very different appearance from the spawn of the Common Frog. The tadpoles develop to a large size, usually about two and a half inches, final metamorphosis occurring in the

following spring. A word of caution is advisable here: if the spawn is laid in a garden pool containing large fish or newts the latter will feed on the newly emerging tadpoles, therefore if it is desired to give the new generation a chance to mature the spawn must be removed to a separate tank or pool. Tadpoles should be provided with water weeds, and organic food may be supplied in the form of biscuit or by a meat bone suspended in the water.

In the late autumn Edible Frogs bury themselves in the mud at the bottom of the pond, where the severest frosts of winter will leave them unaffected. With the first warm days of April the Frogs may be expected to reappear, and the cycle of activity to recommence.

In conclusion, however, I would offer one further word of warning. If Common Frogs come to your pond to breed, these will frequently disturb the hibernation of the Edible Frogs. Males of the Common Frog, with the mating instinct strongly developed, then seize upon the semi-torpid Edible Frogs, mistaking them for unresisting females of their own kind. Hybrids of the two species cannot occur in nature, and unless these later-breeding Edible Frogs are released from the clutches of their amorous cousins the death of the former is almost certain to ensue.

The Fire-bellied Toad

(*Bombinator igneus*)

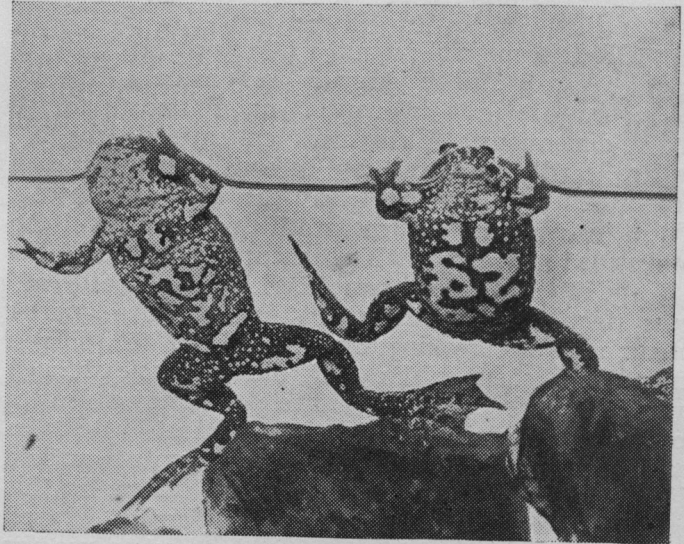
By ALEXANDER LAMBIE

THE natural habitat of the Fire-bellied Toad is South-eastern Europe, and most specimens which are imported come from Italy. They are perfectly hardy in this country, and make excellent subjects for the open-air enclosure, although if a census could be taken it would probably be found that an overwhelming majority are housed in indoor vivariums, some artificially heated during the coldest months. In this last respect it is interesting to know that if a vivarium containing them be kept in a room which has a fire during the winter, the toads will continue active throughout the year.

Fire-bellied Toads are of an olivaceous or blackish colour, with the under side of the body splashed with patches of bright vermillion-orange hue. In most specimens this latter is also present in the under side of both fore and hind legs. The latter are webbed similarly to those of the frog, and the habits of the Fire-bellied Toads do not belie their appearance, for they spend the greater part of their life in the water. When not actively engaged in hunting food on land they rest completely immersed, except for their nostrils and eyes, from which position they survey the surroundings for any sign of possible danger. On the advent of any such indication they dive for a hiding place among the rockwork, but soon return to their contemplative attitude at the surface.

Because of their small size (never exceeding 2") it is possible to house several in a small vivarium, and their many quaint postures in both elements will much amuse their owner. When hopping over the ground a glimpse of the "fire" colouring is seen, and this provides a very good example of Nature's "warning coloration," because, as with most batrachians, *Bombinator* exudes poisonous secretions from the body glands when being preyed upon by other creatures. It is these creatures' only means of self-defence, but nobody need be afraid to handle them on that account, for the poisons are harmless to humans. Incidentally, it will be found that some specimens will turn over and lie on their backs with their limbs in the air if they think that any danger threatens. This act exposes a maximum of the "danger" colour to would-be enemies.

The breeding season is during late May or early June, but severe climatic conditions can delay spawning considerably. This period is the best time to sex these toads with certainty, the male *Bombinator* developing black rugosities on the inner side of the forearm, the "hand," and the two inner fingers. The spawn is deposited while immersed among water plants, and, in common with most eggs deposited under water, it is essential that it adheres to a leaf of some plant in order to have constant circulation of fresh water around it. I have found that any eggs which fall to the bottom invariably fail to develop, so make sure that you have plenty of plants, such as *Myriophyllum*, weighted down in the tank or pool. This will catch the majority of the hundred or so eggs.



Comparison of this number with the 4,000-5,000 eggs deposited by the Common Toad might lead to the conclusion that the latter must exist in countless millions, but this is not so. After hatching, the tadpoles of the Common Toad form much more acceptable food for fish, newts, etc., than those of the Fire-bellied Toad, which, even in this tadpole stage, are fatally poisonous to many creatures. Hence a higher percentage of Fire-bellied Toads complete the metamorphosis and grow to maturity.

Under the influence of warmth and strong light the eggs hatch in six to eight days, but the tadpoles are not free swimming for another three to four days. If in an indoor tank, a can of *Infusoria* introduced at this stage will be the making of them. If you give them as much of the small live foods as they can eat, you will be able to rear them into vigorous adults. Remember, they do not get biscuit meal or porridge in their natural haunts! Feeding with such foods is a sure way of fouling the water, and will cause your brood to diminish in no uncertain manner, while any remaining will never be robust specimens like those reared on live natural foods.

Upon the appearance of the legs a landing-place becomes imperative, but a loose, floating piece of cork will *not* serve. Many amphibians reared in captivity have weak limbs through having nothing firm to brace their legs against upon attempting to leave the water for the first time, so do not fail to provide some rigid rockwork. It is attention to details such as these which makes for 100 per cent. success in breeding. Do not let our continental friends beat us all along the line!

The tadpoles will metamorphose in the autumn, and, for many, this will be the critical time. The young toads, less than $\frac{1}{2}$ " in length, need very small live insects, and, if you have a garden, the greenfly usually

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place was taken by Dr. J. B. O. Sneed, B.Sc., Ph.D., another member of the council.

Dr. Sneed took as his subject "The Objects of an Aquarium Society," and indicated the various channels into which the inquiring aquarist might probe with profit to himself and his society. His idea of a society is of a series of teams or groups each taking a section as its main objective, and all pooling the knowledge so gained. The meetings of the society would then form a central exchange. The society and its members would thus have the advantage of knowledge and information gained under conditions purely local, and which each interested individual could examine. Since one of the main objects of the aquarium society, like all other livestock societies, should be the improvement of stock, it follows that greater attention should be paid to breeding. A study of the effects of line-breeding, and the careful selection of breeding fish would repay the trouble taken. From there to the production of standard types in the Goldfish and other variable varieties is but a step. Speaking of standards, whilst each society must have its own ideals,

the standards already existing could with some modification be taken as a guide.

For the purpose of assessing the points value of fish, Dr. Sneed said that obviously the name characteristic of any variety should carry most points. In a Veiltail, for instance, the tail must take precedence over the other details.

The first whist drive to be held by the S.A.S. took place on January 14 in the Gordon Restaurant, Glasgow. It proved a most enjoyable function.

The society's next meeting will be held on Wednesday, February 3, when we are having Mr. Richard Elmhirst, Director of the Scottish Marine Biological Station, Millport, who will talk on "The Marine Biologist and his Aquarium."—STRACHAN KERR.

AQUARISTS' CLUB FOR WOKING?—Any aquarist who would like to co-operate in forming a club in the Woking district should get in touch with Mr. Leonard Norris, "Lendor," Wych Hill-lane, Woking, Surrey.

The Rock Garden

By A. CORDEROY

THE rock garden, owing to the mild winter, is already beginning to show a small patch of colour here and there among the *Kabschia saxifragas* and Primulas. All dead stems and fallen leaves should have been removed from the rock garden before now; if they have not, I should advise this being done at the first opportunity, as rotting leaves can do a lot of damage among the better Alpines. Mossy Saxifragas and Aubrietias may be divided up and replanted quite safely at this time of year, provided the soil is not too wet. When planting make a hole large enough for the roots to be well spread out, then carefully fill in the soil and plant firmly. Many failures are due to loose planting.

About now a top dressing for established plants will be found beneficial; an all-round good mixture is one part leaf soil, one part sharp sand, and one part good light loam. After carefully forking up the pockets where possible, apply the dressing about a quarter of an inch thick, working it well round the bases of the plants.

Should you be about to make a rock garden in conjunction with your pool, or to enlarge the one you already have, it is a good plan to get on with it now, so that the whole can well settle before it is planted up in the spring. I will not attempt to give any designs, as that depends entirely on the surroundings, but a few tips on general construction.

Having decided on the site, thoroughly dig it and clean from weeds, roots, etc., and, if required, put in a good drainage layer of broken brick or other suitable material at the bottom. A rock garden that is to be a success must have good drainage. If you have a very heavy soil you should put a layer of quite 2" of good loam all over this in the pockets. The question of rock comes next; there are many attractive kinds to be had. Undoubtedly when in conjunction with a pool the best to use is a good water-worn stone. Somerset stone is a very good one and does not split with the weather.

Your local nurseryman probably has several samples in stock from which you may choose.

Do not get your stone in small pieces; it will go further and you will get better effect with a few big lumps than with a lot of small ones. When laying the stones always remember to get them level and leaning slightly inwards, so that all the moisture from the stone runs back into the pockets and to the roots of the plants growing behind it. If using a water-worn stone, make sure that you have the grain running the same way all through or the effect will be anything but pleasing. The soil in the pockets should be level so that the rain can soak in. When it is too high at the back, most of this is lost as the bulk of the rain runs off before it can soak in. Make the pockets sufficiently large to hold several plants.

(To be continued.)

The Fire-bellied Toad

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so prevalent there will be ideal. If you have not a garden, then you must go the rounds of your friends' gardens collecting those plants which are so hopelessly infested (from the gardener's point of view, but not from yours) as to be past (s)praying for. A few days of this feeding and they will be ready for tiny caterpillars and gentles, but do not throw these into the water, because I find they will only swallow food when above water. Mealworms are readily taken a little later, but because they are so fond of them, do not make the mistake of feeding them to the exclusion of everything else. Variety is the spice of life.

When fully adult, *i.e.*, four years old, these toads can be left with no ill effect for three or four weeks without food, but must not be deprived of access to water. With young specimens, however, such an experience, although perhaps not fatal, results in permanent stoppage of growth.

Club Reports

RICHMOND AND DISTRICT AQUARISTS' SOCIETY.—On Friday, January 22, the society was addressed by "Amphibius," of WATER LIFE, on the subject "*Reptilia* and *Amphibia*." The speaker regretted the decline of interest in reptiles, etc., during the post-War period and attributed it to the increasing enthusiasm for exotic fishes and the apathy of the dealers, who fail now to get the varied and interesting shipments they got before 1914.

These creatures, we were told, are easy to keep in health and happiness under captive conditions, and are very long lived—in fact, very few ever die of old age, most meeting violent ends. Most reptiles are in the wild state used to much greater intensities of illumination than that usually provided in captivity, which must seem to the reptile to be about as bright as a moonlight night to a human. The difficulties of encouraging many reptiles to feed were due mainly to lack of light, and the provision of electric lights of ample power in the vivarium goes far to making the animals happy.

Speaking of *Amphibia*, the lecturer reminded us that the frogs are the most successful of the vertebrates, for, in spite of being the prey of birds and fish, used in thousands for scientific purposes, canned and tinned for human consumption, etc., etc., they continue to increase rapidly and new species are now arising in some parts of the world.

Returning to reptiles and speaking of snakes as pets, "Amphibius" told us they were the cleanest animals in the world and have very few diseases. The use of the ever active forked tongue of the serpent was explained. It is primarily a tactile organ used to indicate the position of objects in the line of progress, but it has also an important function associated with the sense of smell, for as the tongue is flicked back into the mouth it is brought into contact with olfactory organs situated in the roof of the mouth. The Indian and West African Pythons, also the Four-rayed Snake, were recommended as pets.

We were then entertained by living specimens of Tortoises and Terrapins, including the Carolina Box Tortoise, the Painted, Elegant, and Alligator Terrapins. The habits and requirements of all these species were given in detail. The importance of regular daily feeding on a mixed and varied diet of live food was stressed.

Finally we were privileged to witness a projection of the actual film taken by Lady Boughton on Lord Moyne's expedition to Sumba in quest of Komodo Dragons for the London Zoo. The sight of 8-ft. Dragons relentlessly tearing meat from a deer used as bait gave one a very different impression of the animal to looking at the somewhat somnolent specimen in the reptile house.

The society is considerably indebted to "Amphibius" for his really most exhilarating and interesting lecture, and it is hoped that he will be able to visit us again.

The Annual General Meeting followed. The financial position proved to be sound. The officers of 1936 were re-elected for 1937 unanimously.—R. V. CHATTERTON, Hon. Sec., 31, Station-crescent, Wembley, Middlesex.

SUFFOLK AQUARISTS' AND PONDKEEPERS' ASSOCIATION.—A monthly meeting of this association took place on January 22, when twenty-two members were present. Election of five new members was approved by the meeting, and then Capt. L. B. Lewis proceeded to give his lecture entitled "Making a Pond." In the course of his address he gave very useful suggestion as to design, methods of construction, and choice of Water Lilies and other plants. Questions were dealt with and then a very lively discussion followed, which proved once again that there are many debatable points and many points of view on the subject of the successful keeping of fish in ponds.

LEYTON AQUARIA SOCIETY.—The second club show held by the Leyton Aquaria Society was a great success, and a very large number of both aquarists and members



General View of Leyton Club Show

of the general public came to see the exhibits. These were arranged in a double row of small glass tanks down the centre of the room; heat was supplied by a number of electric bulbs situated underneath the aquariums and the illumination came partly from these and partly from overhead. The general arrangement can be seen from the photograph. The exhibits were of a high standard and the Leyton Society is to be heartily congratulated on the excellent organization of the show and the progress which they have made during the eight months that they have been in existence.

MERSTHAM, PURLEY, COULSDON AND DISTRICT.—Will any aquarists in the above district interested in forming a club get in touch with Mr. H. M. Hay, Strathclyde, The Ridge, Purley, Surrey.

SCOTTISH AQUARIUM SOCIETY.—The first meeting for 1937 was held on January 5. Due to a combination of influenza and ne-erday the attendance was poor, there being only forty members present. Mr. McNish, President, occupied the chair.

Influenza was also responsible for a change of speaker; Mr. John C. Paterson, A.R.C.M., being a victim, his

Club Reports

THE LEEDS AND DISTRICT AQUARIA SOCIETY. — The first non-competitive fish exhibition of the above society was held on January 20, and proved a great attraction both to members and the general public. Members were kept busy all the evening answering innumerable questions.

Tropical fish of several kinds were shown in electrically heated tanks arranged in a double row. These were successfully lighted by strip lights. A community tank of tropicals (new and old favourites), cold-water fish, Axolotls, etc., showed that the interest in aquaria is not only established, but spreading in this district.—A. SNOW, Sec.

THE HERNE HILL AND DISTRICT AQUARIA SOCIETY.—This society held a very interesting meeting on Wednesday last. The Secretary expressed pleasure at seeing the new visitors who had turned up, and said that they could not have come along at a more opportune night than this, when a lecture on the "Setting up of Your Aquarium" was to be given. The very instructive lecture was followed by a general debate, which became very interesting and lively. The enjoyable evening came to a close all too soon. The visitors expressed their thanks and four new members were elected. Plans have been made for a very interesting programme for the coming season. All wishing to have particulars of this society should apply to the Secretary, Mr. F. T. Salmon, 135, Mayall-road, S.E.24, who will be pleased to forward same by return. The next meeting of the society is March 3, at the Herne Hill Social Club and Institute, 23, Dulwich-road, Herne Hill. 8 p.m. Visitors will be heartily welcomed.

THE BRITISH AQUARISTS' ASSOCIATION. — The adjourned annual general meeting of the association was held on February 9, 1937, at the Y.M.C.A., Tottenham Court-road. Business opened with a short speech by the President, calling members' attention to the need of attending the association meetings. Mr. Mair, as treasurer, then presented the statement of income and expenditure for the past year, which showed a credit balance on the year's working.

The following officers were elected for 1937:—President, Mr. A. Millar; Vice-President, Mr. L. B. Katterns; Chairman, Mr. W. W. Katterns; Vice-Chairman, Mr. G. F. Pengilly; Treasurer, Mr. R. Mair; Secretary, Mr. K. C. White, 14, Palmers Field-road, Banstead, Surrey; Reporting Secretary, Mrs. G. M. White; Show Secretary, Miss V. G. Fleming.

A vote of thanks was passed to Mr. Millar for his attendance, since this involved a special journey from Northampton, and the business then terminated.—G. M. WHITE.

HARROW AND DISTRICT.—Will all who are interested in forming an aquarist club in this district communicate with H. ALLYS, 42, Eastleigh-avenue, South Harrow.

OXFORD AND DISTRICT AQUARIST SOCIETY.—The February meeting of the above society was held at the "Painted Room" (at 8 p.m.), Cornmarket-street. Mr. W. A. West entertained us with some films on fish life, which included some interesting views of under-sea life. It seems a pity there is such a limited supply of films for our hobby. On March 2 Mr. W. W. Welford will speak to us on "Tropicals."—WM. J. BETTAM, 26, Boswell-road, Cowley, Oxford.

The Ideal Pet

VERY few people would think of the lizard as the ideal pet, yet from many points of view he merits this title. As at this time of year lizards are beginning to arrive in the various animal shops, a few remarks may be seasonable.

There are two kinds of lizards which can be bought cheaply; one is the Common or Ground Lizard—the typical English species—and the other is the Green Lizard. The native example is of sombre hue and small size, and is more attractive to the specialist than to the average gardener, but the Green Lizard deserves a corner in every garden. Lizards are inexpensive, and no trouble at all to keep; and since one can possess so much beauty at so little cost it is surely worth while finding out something about them.

Discerning gardeners feel that there is one thing lacking in that delightful haven which it is their joy to create, that is, movement. Many supply this want with an aviary, but for those who feel that an aviary is too rowdy, or who for some reason cannot keep birds, reptiles form a perfect substitute. Green Lizards are dazzlingly brilliant in colour, about one foot long (including a generous supply of tail), and they move about very

swiftly. They should be kept in a large outdoor cage of close-mesh wire netting; for convenience of observation the front may be of glass. The cage need only be of simple construction, but should be arranged so as to prevent escape, for once a lizard is out of his cage he is not easy to catch again. They need all the sunshine they can get, and some shelter from rain; for food they will eat anything "creepy-crawly," small insects, garden pests, worms, and so on. Easily obtainable foods are gentles (maggots) and meal worms. Drinking water must always be available.

Lizards are invaluable in the greenhouse, and if kept there will continue active all the year round. Those exposed to outdoor conditions will hibernate in winter and may be left in their cage quite safely if there is plenty of loose soil and some deep retreats. It might be mentioned in closing that an even more beautiful and larger lizard is sometimes on sale in London. It is called the Ocellated Lizard, is more expensive, and adds a wonderful blue to the green of the smaller species. It has the additional advantage that it eats fruit as well as insects—a point of importance to lady reptile fanciers!

A. E. SPICER.

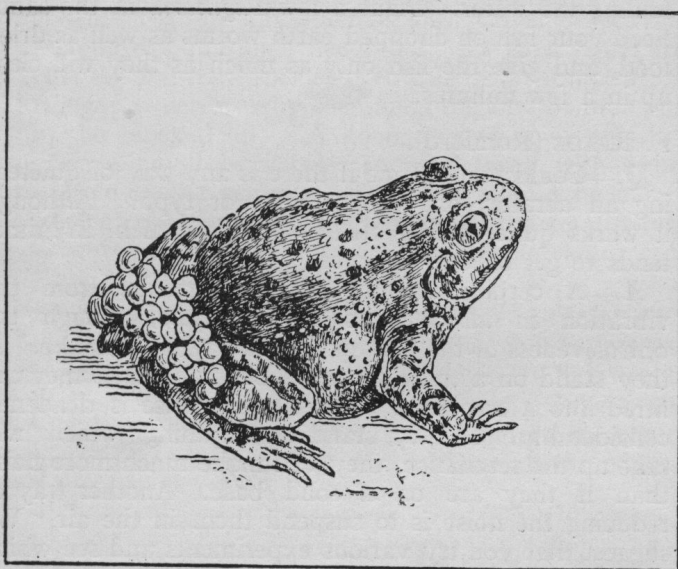
The Midwife Toad

(*Alytes obstetricans*)

By L. G. PAYNE

THIS hardy European Toad possesses two popular names and is referred to equally commonly as the Midwife Toad or Bell Toad.

The inquiring reader will wish first of all to know the reason for these names, so I will proceed to satisfy his natural curiosity. "Midwife" is an exact translation of the French "accoucheur," and in France, where the species is common, the Toad is popularly called by that name. The male Toad becomes responsible for the welfare of the eggs immediately after the act of emission—hence the name.



These eggs, to the number of about forty, and of a colour varying from straw to deep yellow, are actually wound around the thighs and upper joints of the legs of the male, being connected by a continuous elastic ligament. Despite this burden, the Toad suffers no inconvenience, but sallies forth at dusk in search of insects and beetles. Indeed, so little do the eggs impede his movements that he will frequently mate again and add a second chain of eggs to his load.

The instinct of the parent is to keep the eggs moist, but not clammy, and should the nights be very warm during the period of incubation he will descend to the water for a short period of actual immersion.

Very occasionally the egg strings become detached and the incipient brood lost. Should this occur under conditions of captivity the amateur will probably succeed in hatching the eggs if these be placed in a saucer of damp moss away from direct sunlight.

The male carries the eggs for a period of from three to five weeks, at the end of which time he repairs again to the water's edge. Here the perfect tadpole bites its way through the thin membrane of the egg and commences normal larval life in the water.

The alternative name, Bell Toad, is equally descriptive and refers to the clear tinkling monotone of the male's note. In the hilly districts of France and Belgium an occasional Toad will be heard during the daytime,

and the keen amateur may delude himself that it will be easy to run his quarry to earth by locating the sound. The Bell Toad, however, hidden under a tuft of grass or agglomeration of stones, possesses the annoying habit of ceasing to call on human approach—and so the odds are all in favour of the Toad.

It is, however, as dusk falls that the Bell Toad really lives up to its name, and then it is that the lonely hillsides echo with the sound. The call of the Edible Frog and the Tree Frog may be harsh and discordant with repetition, but the melody of the Bell Toad is always soothing.

Both sexes are usually of a dull grey or olive colour, with rough tuberculated skin, and whitish underparts—maximum body length about 1½". A noticeable character is the vertical pupil of the eye.

There is a constant demand for these Toads from the dealers, and especially for the males carrying eggs, and readers who wish to obtain these interesting and unique amphibians will be well advised to make preparation now. Living as they do in conditions of climate similar to our own, they are naturally quite hardy and therefore do better out of doors than in the confinement of a small vivarium. If, however, specimens are obtained with eggs, I would advise keeping the Toads under close observation—and for this purpose, and for the short time necessary—an indoor vivarium may be convenient. This will enable the gradual development of the eggs to be observed, and in the possible event of the latter becoming detached from the parent, will give the owner a reasonable chance of preventing the irretrievable loss of the eggs.

It is interesting to note that the eyes of the embryo tadpole, appearing as two minute black dots, can be seen in the egg tissue almost as soon as these are adopted by the male parent. The persistence of these eye spots can be taken as evidence of normal development.

The tadpoles will feed readily on a mixed diet of *Infusoria*, followed by tiny shreds of meat and soaked biscuit. The latter foods can be placed in a muslin bag suspended in the water. The contents of the bag should be changed on alternate days to avoid fouling of the water. The tadpoles grow rapidly, but, as with most other forms of amphibian larva, flourish best when not overcrowded. It may be of interest to state here that it is quite practicable to keep several species of amphibians together in the larval state provided the tadpoles are of approximately the same size.

If conditions have been favourable, metamorphosis to the perfect Toad takes place in the late summer but, in captivity at least, the larval state is not infrequently continued into the following year. When the young toads leave the water, and for some weeks after, they are almost black in colour and smoothly glossy. Quite the best place to search for them in the wild, in this state, is in the damp hoof slots made by cattle when these come down to the ponds to drink.

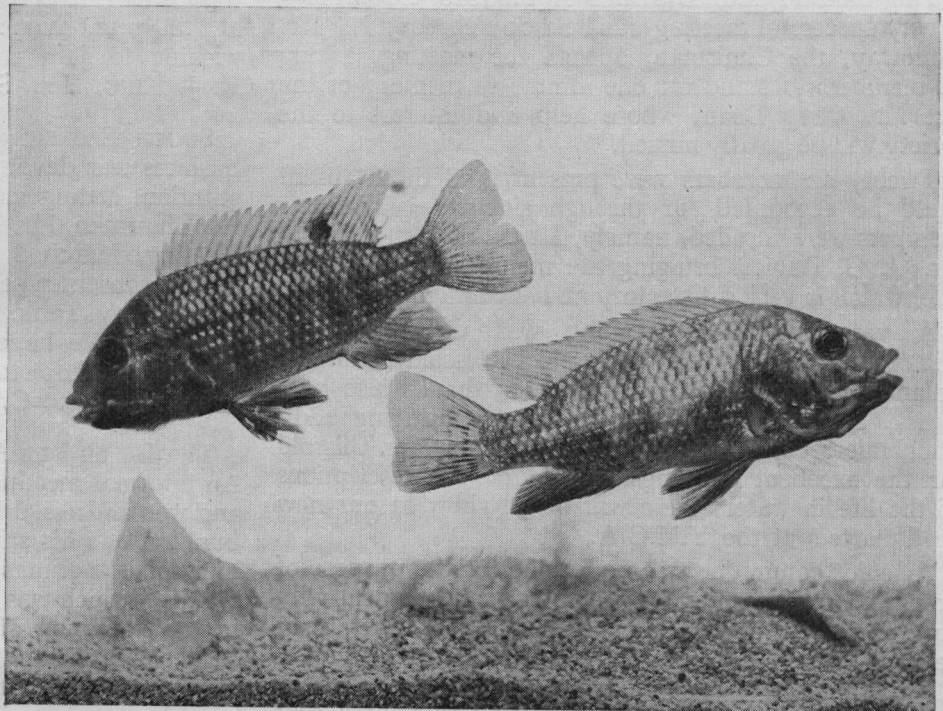
(Continued on page 103.)

The Congo Mouthbreeder (*Tilapia dolloi*)

THE Mouthbreeders are fish which always excite wonder and admiration, and our small species, *Haplochromis multicolor*, the Egyptian Mouthbreeder, is a very lovely species. Now from the Congo comes a much larger and even more beautiful species, *Tilapia dolloi*, which reaches a length of six inches.

The newly arrived fish is a dull grey, with a tendency to horizontal and vertical markings, and here and there a suspicion of green or red colours, but when given room and allowed to settle down, a marvellous change takes place. The grey has disappeared, and the ground colour is now a shining greenish yellow, the lower half of the cheeks, and patches along the belly below the pectoral fins are red, and from the corner of the eye to the base of the pectoral fin is a bright blue line. The chin undergoes a strange change, and becomes completely black, which coloration is continued right back along the belly. The dorsal fin is a similar greenish yellow, and is orange tipped. The female has a peacock-eye marking in the hinder part of the dorsal fin. The anal fin is streaked with red and black, and the tail is generally greenish, with red suffused edges and a very fine black edging.

It will readily be appreciated that these are very fine fish, but, being large, they want a lot of room and deep water. Suitable rocks should be provided for refuge, as they tend to be rather fierce, and the process of mating may end disastrously. It is, of course, easier to pair up young fish than old ones, but if the pair are introduced to one another through a glass partition, and then finally only placed together when the reception may be closely watched to avoid unnecessary harm, success will usually be obtained.



Feeding is simply a matter of lots and lots of earth worms, and the fish seem to get considerable pleasure out of sitting in a corner with a large worm in their mouths—chewing the cud, so to speak. Half-grown Guppies and other fishes are gratefully accepted and caught with extreme rapidity. A fairly high temperature seems to be best, about 79° to 85°. The fish quickly become distressed below 74°.

Breeding is apparently similar to the other mouthbreeders. In this species the female carries the eggs and then the young, which are apparently easy to feed and rapid growers. Now that the big Cichlids are returning to popularity, quite a number of aquarists will no doubt be anxious to acquire this fine species, and a very fine show-piece a pair of fully grown adults will make in a 40 to 50-gallon tank, though the smaller specimens will doubtless do equally well in a tank of much more humble proportions.

The Midwife Toad

(Concluded from page 100)

Ideal outdoor accommodation for the adult Toads consists of a small walled enclosure open to sun and rain. Midwife Toads are good climbers, therefore the retaining wall must have a horizontal ledge directed inwards to prevent escape. If this enclosure is designed for Midwife Toads only, a wall 12" high, with a protruding ledge of 3", will be found satisfactory. Although, apart from the breeding season, the presence of actual water is less necessary to this species than to any other European Toad, yet the enclosure should always be designed to allow of access to damp shade. A few large stones placed at random in a small heap are almost essential. Under these the Toads will spend

the hottest days, deriving ample moisture from the cool shadows.

Insects and small beetles are the staple food in Nature, but in captivity these can be usefully supplemented by gentles. It is also worth while catching live flies in globular fly-traps and inverting the traps at dusk in a bowl of water, or in the pool of the enclosure if one is provided. As the flies crawl out of the water they will be eagerly seized by the expectant Toads.

Towards the end of October, or before if the nights are frosty, the Midwife Toads bury themselves deep under the stones and will not reappear until the following spring.

Necturus

By "AMPHIBIUS"

THE American Mud Puppy, to give *Necturus* its familiar name, is not one of those creatures which immediately commands attention on being seen. Take an Axolotl, flatten and stretch it a bit, and there you have *Necturus* exactly. In common with a great many other amphibians, it has the power of modifying its colour, only—in contrast to many—it becomes dark in a strong light, and pale in a dimly lit tank. Its very graceful, many-branched gills are the only things about it that can be called beautiful, and their occasional movement is, for long periods, often the animal's only sign of life. During the day in an aquarium they really are dull creatures—probably the reason why one so seldom meets with them in captivity.

To anyone wishing to keep them, they are not difficult. They should be given a tank, as large as possible, away from any direct sunlight, to which *Necturus* strongly objects. I recommend that three sides of the aquarium be painted with water paint ("eau-de-nil" is a good shade), as this subdues the light and makes the tank more pleasant to look at. The planting is not such a problem as with some other salamanders, because of *Necturus*' smaller size. Nuphar is a useful plant, and Giant Vallisneria grows well if firmly planted and protected by stones. *Salvinia* or Duckweed (if the light is strong enough for the latter) should cover the top of the water, for *Necturus* is a saturnine beast, happy only in gloomy surroundings.

If a little "cave" is built in the deepest part of the tank, this will become home during the daytime. Care should therefore be taken that this cave is so made that its contents are visible from outside the tank. They get up at dusk, and, never really active creatures, creep slowly about the bottom of the tank looking for food. If disturbed, however, they fold their legs and gills back against their bodies and simply shoot from end to end of the tank, swimming by means of their tails only. They are not capable of sustained movement at this rate.

Someone has said that their optimum temperature is 65° F., but I should put this figure decidedly on the high side, and although it is a very difficult matter during the hot weather, I try not to let their water get above 60° F. On the other hand, no particular measures are necessary during winter, as they seem not to mind how cold their water gets.

There are exceptions, but when they first arrive from the dealer I have usually found them to be in very bad condition, and it may be a matter of some difficulty and patience to persuade them to feed. Once they do start, no further trouble is encountered as a rule, and they prove a heavy strain on the worm supplies. They will take meat, which they will shake vigorously if it is at all a big or long strip, and I do not doubt that they eat *Gammarus* and *Asellus*, a supply of which I keep in their tank. Minnows, when put with them, have settled down nicely, but whether because *Necturus* does not like them, or because it cannot catch them, I

really do not know. They like tadpoles, newts, and small axolotls.

Mine are 13" long, and I believe this to be about as big as they grow. When seen from above, the head is very doglike—hence the name, perhaps—and, as they are used a lot in experimental and teaching work in America, it is presumably lack of demand that makes them so scarce and expensive over here. In a state of nature they are known to eat a large number of fish ova and fry, and are regarded as a major pest by the Commissioners of Fisheries.

With regard to their breeding habits, they lay their eggs one at a time, and stick them to stones, and it still does not seem to be clear whether the mother broods them or not. The larvæ are very like their parents, but the limbs are little stumps. I am not aware of their having been bred in captivity. It may be mentioned in passing that, until the middle of last century, the Axolotl was believed to be a close relative of *Necturus*, and was classed accordingly.

I have never observed any that I have had rise and breathe atmospheric air during the daytime, although that does not mean that they never do, the constant movements of the gills during this time being consonant with a high degree of dependence upon those organs for respiration. No doubt, too, a certain amount of gaseous exchange occurs through the skin. Lungs are present, however, albeit poorly vascularized and without alveoli, and they make good use of them during their crepuscular and nocturnal activities, rising frequently and poking their whole muzzles out of the water when gulping air. A stream of bubbles is given off, either from the gill openings or mouth, as they sink again to the bottom.

I have noticed during the hot weather a curious habit of sometimes lying straight and motionless on the bottom except for lateral movements of the tail. I suspect that if these movements were mechanically analysed, they would be found to drive a respiratory current forwards over the gills.

They will live quite happily with large Axolotls or with any cold-water non-predaceous fish of about their own size, but in mixed company they are not very assertive animals, and care should be taken that they get their share of the food.

There are generally considered to be two species and one sub-species, although lumpers put them all together as one. Over the whole area east as far as the Atlantic Ocean, from a line drawn from Lake Superior to the delta of the Mississippi, *Necturus maculosus maculosus* is found. In North and South Carolina there is a second species, *Necturus punctatus*, which is smaller. The sub-species *Necturus maculosus lewisii* is a tiny little thing, believed to be derived from *Necturus maculosus maculosus* by dwarfism, and it also is found in the Carolinas. I have only kept the common form (i.e., *N. m. maculosus*), though the treatment of the others is probably the same.

Alligators

By "AMPHIBIUS"

THE popularity of these reptiles—especially baby specimens—has undergone a distinct revival during the last two years.

The features which separate Alligators from Crocodiles are very minor ones, and of those often cited exceptions can be provided to nearly all. By comparison with Crocodiles, however, they are much hardier animals, but not so hardy as to afford the slightest justification to the dealer who claims that they can be kept without heat in captivity.

The Alligator now and generally to be had on the market is the American one, which used to be found over an area as large as the British Isles, France, and Spain put together. Over a large part of this area it has now been exterminated: it occurs rarely and in small numbers in other parts, and only in the remotest depths of the immense Florida swamps can it be called at all common to-day. The large scale and indiscriminate slaughter of them began as a result of the demand for their skins, and their scarcity was realized as long ago as in 1902. Legislation was attempted a few years later to make it illegal to kill, molest, or take any Alligator under 5-ft. in length, but—owing to vested interests, I suspect—this came to nothing. A new and graver cause for alarm has now arisen; as a direct result of the absence of one of their chief foes, the Alligator, the rats and muskrats are increasing at such a rate that they constitute a serious menace to agriculture in some of the southern States.

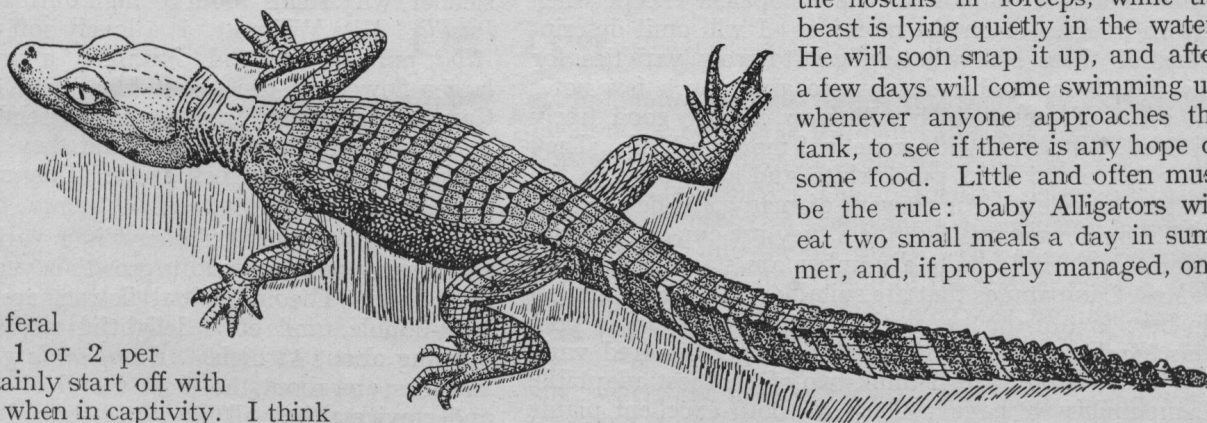
One very interesting result of the shortage has been the establishment of a number of so-called "Alligator Farms" in Florida and elsewhere. At these farms not only are Alligators bred and reared from selected captive parents, but as many eggs as can be found are collected from the wild state, hatched in incubators, and the young reared in enclosures. Since the survival rate among the babies in a feral state is about 1 or 2 per cent., they certainly start off with a better chance when in captivity. I think the farms must be the source of supply to this country, for whereas the babies used to cost at least £1 each, they can now be bought at from a third to a half of this sum, and it would be impossible to retail them at this price if they had to be caught individually.

A steel-framed aquarium makes the best home for them in captivity and, as always—the larger this is, the better. Only one of the reasons in favour of an ordinary aquarium is that while all the "vivaria" that I have ever seen offered for sale would seem to have been

deliberately constructed with a view to the exclusion of as much light and fresh air as possible, an aquarium tank, suitably placed, provides plenty of both for its inmates. When buying a tank it is always as well to have a drainage pipe and plug fitted in a corner. It quarters the time taken to clean out a tank and does away with all that unpleasant mopping out of dirty water. The extra cost to the tank is quite insignificant.

At least a third of the tank is required to be the "dry" part, and the boundary between it and the water can consist of a thick log of wood, with its bark left on and cut to fit exactly across the tank. Sand can be piled up behind the log and the little Alligator will scrape very little of it into the water as he walks in and out. A strip of lead can be nailed to the bottom of the log to stop it floating up. Rocks should have no place in an Alligator's tank as constant chafing against them is likely to result in raw spots on the nose, ventral surface, and extremities. An immersion heater, of a wattage dependent upon the temperature of the building in which the tank stands, will keep the water temperature comfortable and an electric bulb should burn about 6-in. above the dry land part to deceive the little beasts into believing that the sun is shining. The light can be switched off at night, and, if the top of the tank be closely covered by a sheet of glass, the heat from the water will keep up the temperature of the air.

If the necessity to force-feed baby Alligators arises, it is a sure sign of bad management. The importance of light cannot be over-estimated, but satisfied in this respect and kept at a sufficiently high temperature, baby Alligators should feed within twenty-four hours of purchase. Food, consisting of a small worm or pieces of meat, heart, liver or fish, should be held up against the nostrils in forceps, while the beast is lying quietly in the water. He will soon snap it up, and after a few days will come swimming up whenever anyone approaches the tank, to see if there is any hope of some food. Little and often must be the rule: baby Alligators will eat two small meals a day in summer, and, if properly managed, one



G. OURY

a day in winter (minimum water temperatures: 65°, but if no electric light is used as well an extra 5° should be allowed as compensation).

It is necessary here to explode another of those persistent, die-hard, old natural history myths, namely: that an Alligator in a small container will not grow. Absolute rubbish! Under proper conditions of light, temperature, and feeding, an Alligator in a tank only an inch longer than itself will grow just as much and as

quickly as one in a tank of 1,000 gallons or so. I do not say that very adverse treatment, prolonged starvation, or some other cause during youth will not have a deformative effect, but even of this I know only one definite case.

During the summer—if any—a little pool with a sandy bank may be made in the garden for little—or big, of course—Alligators, but babies of the year should not be left out at night. During their second and subsequent summers, they may stay permanently out of doors from early to late summer, and are very ornamental under such circumstances. They must be back indoors again before the first frosts of the autumn arrive. Experiments in hibernating them outdoors in this country have not been successful. Alligators of about 15-in. to 24-in. in length will share a sunny enclosure quite happily with adult Terrapins and land Tortoises, large Lizards, and Snakes. Below the lengths mentioned, they are liable to be molested and bullied by grown-up Terrapins, although quite happy with young ones if there is plenty of room for everybody. Room mates for an Alligator more than 2-ft. long must be chosen with great care. In the garden Alligators often display the most remarkable nocturnal activity, and, as some neighbours are often quite unnecessarily silly about reptiles that walk into their homes and gardens and seem quite unable to appreciate how innocent the little pets are, it is perhaps

wise to make sure that no escape can be made from the enclosure or garden. A 10-in. escapee will have become 15-ft. long by the time the people at the end of the road have heard about it, while if it should be so unfortunate as to get into the local paper it will in all probability be converted into a dangerous, poison-spitting, child-attacking monster.

So much for *Alligator mississippiensis*. I fear that no amount of farming will save his Chinese relative. The latter has not been numerous within living memory, and will probably be extinct before the close of this century. It formerly spread all over the lower basin of the Yangste-Kiang, living in small groups, but only the best organized search seems able to produce even an odd specimen or two now.

They have a hard life of it. The bitter winter, with icy winds sweeping across the plains, seems them burrowing deep into the mud. From March onwards the weather gets rapidly warmer and they wake up and live active lives for a month or two. Midsummer sees the rivers running nearly dry and the unfortunate reptiles have to burrow into the mud again to prevent themselves being dried and baked. The autumn rains, with the ensuing floods, liberate them once again for a month or two's activity before the onset of winter. I imagine that they might even be able to stand an English climate!

The Rock Garden

By A. CORDEROY

THE Campanulas are a very large family of Alpine and herbaceous plants, varying in height from 1" to 4' to 5'. The taller-growing varieties provide excellent material for the herbaceous border, while many of the dwarf growing ones are indispensable on the rock garden. Many of these are very easy to grow and require no special treatment, while others are almost or quite hopeless except when grown in scree or on the moraine. I will omit descriptions of these somewhat-difficult-to-grow varieties for the time being and endeavour to give you a few notes on some of those which will grow in any good freely drained, gritty soil with some leaf mould added. They vary in colour from pure white and pale blue to the deepest purples. The flowers of many are bell-shaped and hang downwards, in others they are cup-shaped and stand erect, while quite a number are star-shaped.

Most Campanulas that are suitable for the rock garden do best in full sun or partial shade. *Campanula portenschlagiana* (*P. muralis*) and the larger-flowered variety, *C. p. major*, are, I think two of the most adaptable Campanulas we have. They are both excellent plants for the dry wall or rock garden, and do equally well in a north aspect. I have seen some lovely patches growing between the rocks among ferns. *Portenschlagiana* has bell-shaped flowers of purplish blue in great profusion, *Portenschlagiana major* is very similar, only having rather coarser growth and considerably larger flowers.

Campanula carpatica, the Carpathian Harebell, grows about 9" high with masses of large, erect, light blue cup-shaped flowers from July to September. There are several varieties of this Campanula, and all are excep-

tionally fine rock plants, thriving in any garden soil with a good drainage. The white forms, *Alba* and 'White Star,' make a pleasing contrast when grown near the blue or purple varieties.

Campanula pusilla is a very charming little Harebell, forming a mass of small, dark green leaves from which rise myriads of pendant blue bell-shaped flowers on slender, wiry stems about 3" high during June and July. *Pusilla* 'Miss Willmott,' is a lovely soft clear blue form; *Alba*, purest white, and 'Miranda,' a variety with rather larger flowers of the palest blue on 2" stems. These Campanulas spread rather quickly, sending out runners below the surface of the soil, and they soon make fine, large patches on the rock garden; they are exceptionally good for crazy paving.

Campanula 'R. B. Loder' is a variety that should be on every rock garden; its growth is very similar to that of *Pusilla*. The individual flowers are rather shorter, semi-double, and of a delightful shade of light blue, growing about 4" high. *Campanula garganica* and its varieties are about the most useful of all for dry walls and crevices; they all have star-shaped flowers and are very beautiful, revelling in full sun. *Garganica* has blue flowers; *Erinus*, pale blue; 'W. H. Paine,' blue with white eye; *Fenestrellata*, small pale blue; and *Hirsuta*, pale blue with heavy foliage. It is advisable to place a pane of glass over the last during the winter months to keep off excessive moisture.

* * *

Herrings go about the sea in shawls.

—Schoolboy howler.

Poisonous Amphibians and Reptiles

By MARGERY G. ELWIN, B.Sc.

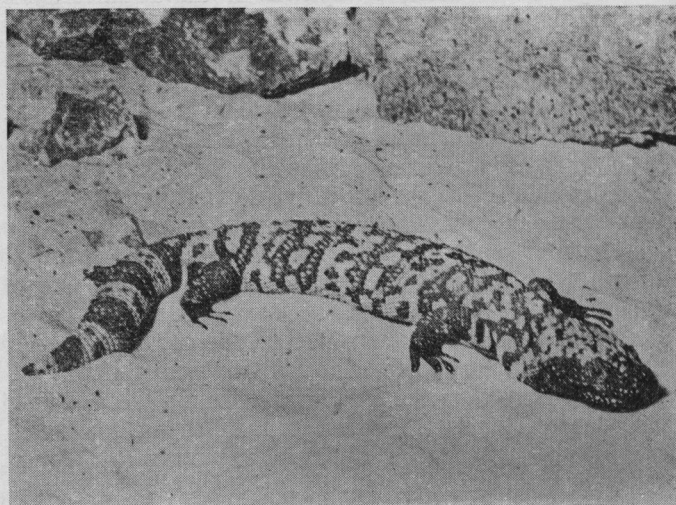
THE poisonous characters of Amphibians and Reptiles, have since time immemorial been the subject of all sorts of strange beliefs and superstitions, and many of these persist even to the present day. How many folk, for instance, still associate the flickering tongue of the serpent with poisonous fangs? The Toad is still regarded with considerable suspicion by country people in remote parts, and according to them should be vigorously and certainly exterminated beneath the heel at sight.

All Amphibians are capable of producing irritant fluids—we will say “irritant,” because in many species there is not the least ground for calling the liquid poisonous—from the glands in the skin and also from the salivary glands which open into the mouth. According to Phisalix these fluids are of two kinds, that produced by the mucous glands of the skin, being alkaloidal and narcotic in effect, while the parotid salivary and the dorsal glands produce an acid secretion of convulsive effect.

Of the Amphibia most familiar to the hobbyist, the European Salamander (*Salamandra maculosa*) and the Fire and Yellow-bellied Toads (*Bombinator igneus* and *B. pachypus*), are good examples of “poisonous” species. To appreciate their “venomous” behaviour to the full we must have newly captured specimens; the pampered, mild tempered pet will not “do his stuff” to order. The captive will emit from his skin glands a fluid which, if brought near to the face, will result in a smarting of the nose and eyes, and sneezing. Boulenger relates that *Bombinator* produces an effect comparable to the early stages of a cold in the head. The effect on humans will be seen to be quite mild, but on other Amphibia it is much more marked, and it is said that collectors have to be careful not to pack several species together in their bags as, if they do, almost invariably a number will die. Specimens of the same species are immune to one another's poison, but numbers of other species may succumb to it.

The American frog, *Dendrobates tinctorius*, is utilized by the Indians of Colombia. The secretions of the dorsal glands are collected by heating the frog before a fire, and the tips of the hunters' arrows are dipped into it. The poison thus introduced into the wound made by the small arrow is capable of killing a small mammal. Incidentally we read of this secretion being used in an altogether different way, to fake the colour of Parrots. The Indians collect the Green Amazon Parrots and, removing the fully grown green and blue feathers, apply the fluid from the frog to the young feathers; these then grow a bright yellow, thus producing a freak which is readily bought by some unsuspecting white man.

Warning coloration is a characteristic of the “poisonous” Amphibia and the Salamander and the *Bombinator* Toads, are good examples of this “keep off the grass idea.” So much for the Amphibia, and no one need expect to receive a fatal bite from their favourite Crested Newt!



Gila Monster

Before considering the Snakes we must not forget the poisonous Heloderm Lizards; from Mexico, *Heloderma horridum*, and from Arizona, *H. suspectum*, the Gila Monster. Again, though these relations of our own humble Slow Worm are definitely venomous, they are not nearly so dangerous as sensational literature would have us believe. Probably most of us have seen these Lizards at the Zoo. They are between 1-ft. 6-in. and 2-ft. long, with a flattened head, plump round body, short tail, and rather small limbs. They are patchily marked in brownish-black and dull yellow. The poison in these animals is produced when they bite and is introduced into the wound by small fangs. All poisonous Reptiles have a cunning modification of the fangs to enable them to introduce the poison deep into the wound. The teeth are grooved, and in some species the groove becomes a tube running right through the teeth. In this Lizard there is a groove along the front and the back surfaces of the fangs, which are teeth in the lower jaw, not the upper as in the Snakes. The salivary glands situated in the floor of the mouth have become adapted to the production of venom, which is conveyed along little ducts to the base of the fangs. The action of biting compresses the glands and forces out the venom along the grooves into the wound. The Lizard seizes his prey and hangs on tightly until the poison has done its work, then he proceeds to eat.

They are chiefly nocturnal in habit and catch small animals of all kinds. Human beings have been bitten, but the symptoms are not nearly as severe as from a Snake bite, and though a death after a bite from *Heloderma* is recorded, it is thought probable that the victim died as a result of supervening infection due to improper treatment, rather than from the effect of the venom. However, the bite is said to be very painful, and the Lizard holds tightly to the victim in spite of vigorous efforts to dislodge it. (To be continued.)

* * *

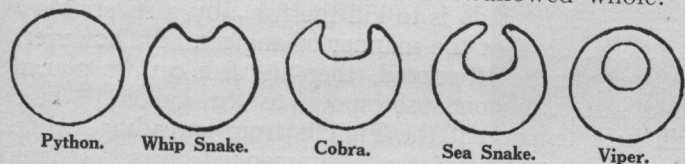
The Kingdom of Fools is peopled by those who never make mistakes.

Poisonous Amphibians and Reptiles

By MARGERY G. ELWIN, B.Sc. (Continued from page 149)

IT is the Snakes which are usually thought of when one considers venomous animals, and when one remembers that approximately 20,000 human beings die annually as the result of Snake bites, the importance of the study of this dangerous character of the poisonous Snakes becomes apparent. The development of the poison apparatus of the Snakes is closely linked up with that of the dentition, and we see through a succession of species the teeth become modified from simple conical structures designed to seize and hold the prey into the complex, tubular "fang" designed to carry the venom into the deepest part of the wound, one of Nature's most terrible weapons.

The Constrictor Snakes, like the Boa and Python, have two rows of small pointed teeth in the upper jaw and a single row in the lower jaw, and they are used solely for holding the prey; they have, of course, no masticatory function as the meal is swallowed whole.



Diagrammatic T.S. of snakes' teeth to show gradual perfection of fang.

Our English Grass Snake and the familiar Egg Eating Snakes of the genus *Dasypeltis* have a similar dentition to the Python and are, as we know, not venomous. Among the *Opistoglypha*, which include the Whip Snakes and the beautiful Green Tree Snakes, we see the first modification towards a venomous dentition. A few teeth are grooved and the venom is moderately poisonous. Among the *Proteroglypha*, which are all poisonous in some degree, we find highly developed poison apparatus. Several of the front teeth in the upper jaw are deeply grooved and the teeth behind are greatly reduced in number. In *Hydrophis*, a Sea Snake, there are about four fangs, while in *Platurus*, a related species, there is a single pair on each side. These are both extremely deadly Snakes, their venom being about ten times as deadly to man as that of the Cobra. They are fish feeders and extraordinarily fine swimmers.

The Cobra has a succession of small fangs and the poison is guided from the opening of the duct to the groove of the fang by a little fold of skin, but when the Snake bites the liquid flows out all over the place, being very profuse. The Cobra, in attacking, bites and hangs on like a dog, so that his poison may have time to penetrate; the reverse is the case with the Vipers, whose elaborate apparatus makes it only necessary for them to strike and stand back, as it were, the poison being introduced into the wound at once.

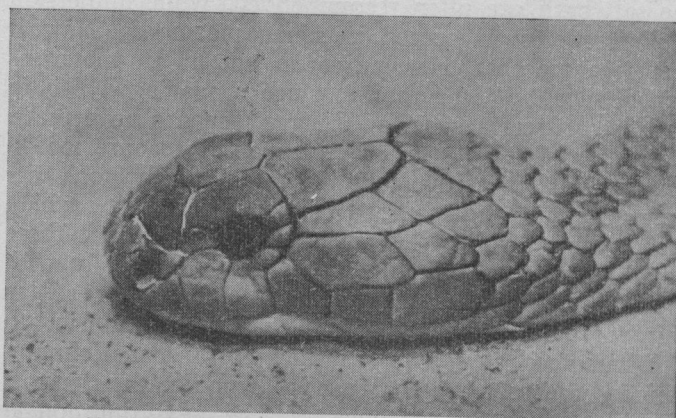
The Vipers, which include the English Adder and the Rattlesnake, have the most specialized apparatus of all the Snakes. The fang is long, sharp, tubular, and slightly recurved. There are a few small teeth in front of it, and in a double row behind are the reserve fangs, which in the Rattlesnake may consist of as many as ten

teeth. A reserve is necessary as the fangs are quite easily broken off. At rest the fang lies flat along the roof of the mouth, covered by a fold of membrane which protects it. When the serpent opens its mouth to attack, the depression of the lower jaw by muscular attachments to the bone supporting the fangs causes the latter to be erected into an upright position. The contraction of the muscles on striking the prey brings pressure to bear on the venom-producing glands and poison passes along the duct and into the tubular fang at its base, and thus into the wound. The fold of skin which protects the fang at rest also helps to direct the venom into the tube in the tooth and to prevent it flowing freely into the mouth. Thus a little venom is utilized to greatest advantage, and there is no waste as in the Cobra.

As already mentioned, the Viper has two rows of reserves behind the fang on each side, and the fang when lost is replaced by the next one of the other series. Thus there is the unique state of affairs of "two distinct chains of developing organs, destined to keep only one organ in a state of efficiency."

The poison is, as has already been stated, produced by the modified salivary gland, known as the parotid (the one which causes Man trouble when suffering from "mumps"). The increased size of this gland and the strong muscles associated with it and the jaws produce wide heads in the venomous Snakes, so that they mostly have broad, flat heads. But many poisonous Snakes—for example, the Cobra—have the narrow head typical of the harmless Grass Snakes, while other harmless species simulate the broad head of the venomous species. The poison duct of the gland passes along the outside of the jaw and doubles back, opening on to the fang on its anterior side at the entrance to the furrow or canal.

The Adder is the only poisonous Snake with which the majority of readers are likely to come in contact, and, provided it is not molested, there is little chance of being bitten. The results of a bite are not usually very severe, particularly if adequate treatment is quickly obtained. The symptoms are local pain, swelling, and discoloration around the bite, vomiting, and a feeling of



Typical blunt head of a poisonous snake. The Hamadryad, a venomous Indian species.

intense chilling. With adequate treatment the acute symptoms pass off in three or four days, but if proper treatment is not promptly acquired the symptoms become more severe and death may follow. In any case of Snake bite, therefore, proper professional attention should be acquired as soon as possible.

Certain animals are immune to attack by Snakes. Notably the Hedgehog, Pig, Mongoose, and among the birds the Stork, Honey Buzzard (*Perisoreus apivorus*) and Secretary Bird (*Serpentarius secretarius*). According to some observers, the birds promptly pluck any feather which becomes tainted by the venom before it can reach the base of the quill and so infect the bird which has really no immunity to the venom once it has entered the blood stream.

More recently, Snake venom has become of use in the treatment of certain diseases, and at the Sao Paulo Serpentarium, Brazil, the processes of detoxicating Snake venom were first investigated. Our own London Zoo, through its reptile curator, worked in conjunction with a large London hospital in perfecting the process of nullifying the venom of the beautiful little Russell's Viper, which has become a valuable agent in the hands of the doctor for controlling obstinate and dangerous hæmorrhages. So have the evil forces of Nature been controlled and utilized for good purposes by the aid of scientific investigators.

[NOTE.—Most of the amphibians and reptiles mentioned in this article are exhibited from time to time in the Reptile House of the London Zoo.]

"Fungus"

By HAROLD J. D. DUNBAR

THE most dreaded disease experienced by all pond keepers is, undoubtedly, Fungus, or "cotton-wool disease." The particular kind of Fungus which attacks fresh-water fish is always white and fluffy, the whiteness, of course, being due to the absence of chlorophyll, and the scientific name of it is *Saprolegnia ferax*. The worst months for contracting this disease appear to be from about December to May or June or, as I have observed, until the average day temperature is above 45 degrees. Another time of the year when fish fall an easy victim to Fungus is after the exhaustion of spawning, which seems quite understandable owing to the weakened condition of the fish, particularly the female.

There are several alternative methods given for the cure of Fungus, but never do we see figures or facts relating to such important matters as the critical temperature at which it thrives, or the salinity, alkalinity, or acidity necessary for its growth. The average pond keeper naturally wants to know a rapid and reliable cure for his affected fish, whatever the nature of the attack.

On consulting his textbook, he may find "*Saprolegnia* only thrives in bright light, hence the fish can be cured by placing it in perpetual darkness until the Fungus dies." Further cures, such as the application of 2 per cent. mercurochrome to the affected parts, and cherry pink coloured baths of potassium permanganate and the salt bath are often recommended, while immersion in kerosene is advocated in some quarters. Now it seems to me that these cures do not fit all the cases experienced by the aquarist, since if placing a fish in darkness effects a cure for Fungus, there is no need to look for a simpler cure. I endeavoured to cure Roach this way, but only found the infection took its normal course and spread all over the fish, which died a slow death. My personal opinion is that these advocated cures can only be used successfully with incipient attacks; that is when the Fungus appears as thin white threads hanging from the sides of the fish.

When a fish is seen to be showing the usual characteristic white tufts, or threads hanging, the aquarist should segregate it at once. The next question is whether the aquarist thinks it is within his power to effect

a cure or not. With pond keepers it usually happens that the disease has gone too far, and then the most humane thing to do is to kill the fish—by a severe blow on the head, after the manner of anglers. If, however, a cure is to be attempted, then the fish can be placed in a salt bath, one tablespoon to the gallon. This will help to prevent the Fungus from spreading, while deciding upon one of the recommended cures. I have had success with 1 per cent. acriflavine, in normal saline solution (normal saline 0.1 per cent.), applying the liquid to the affected areas, and also with a 0.01 per cent. of phenyl mercuric nitrate.

I must emphasize, however, that I only managed to cure incipient attacks which, I think, were caused by sudden changes of temperature. My observations of the disease have led me to draw the following conclusions: First, the increase in alkalinity, due to decaying vegetation, tends to encourage the Fungus spores to break open and attack weakened fish. Secondly, through poor or indifferent feeding during the summer the fish loses its powers of resistance in the winter, and is therefore liable to attacks during these particular months. Good feeding means giving plenty of live food, such as *Daphnia*, earth worms, and gentles, as well as a good dry food. Lastly, I would urge that some attempt should be made to keep the temperature above 40° F. in the winter, although I admit this is rather difficult for aquarists with large ponds and many fish.

To conclude, I will say that prevention is better than cure, and if the simple rules of cleanliness are carried out the mortality can be kept down to a minimum. Sudden changes of temperature should be avoided, as fish can easily catch cold, and this is often followed by an attack of the Fungus. Again, all cuts and abrasions should be treated at once, as they can easily lead to infection. A useful method of dealing with wounds is to paint the spot with a little 2 per cent. mercurochrome, or any other dilute antiseptic. Another way is to smear a little vaseline or friar's balsam over the spot. This will seal it up until it has healed. Finally, it is desirable to round up fish in a small pond, periodically, to see if there are any symptoms of the disease showing.

Newts

By JOHN GRAHAM

AT this time of the year practically every pond and ditch is the home of large numbers of Newts, or Efts as they are called in some districts.

Belonging to the family *Salamandridæ*, they are related quite closely both to the Giant Salamanders of America and Japan, and to the little Spotted Salamander of Europe. Owing to their lizard-like form, people not versed in animal lore often confuse them with those nimble reptiles. I have more than once been told by friends that they had lizards living in their garden, and after investigation found them to be Newts leading the terrestrial life which is natural to them for a large part of the year.

In reality there is a great difference between the two creatures, a difference which is made apparent by a very superficial examination. Newts have a soft, moist skin like that of frogs, but that of lizards is dry and scaly. Again, even when living on land, Newts are always found in moist, shady localities and are seldom far from water; they shelter beneath stones and in banks during the day, coming out to feed under cover of darkness. Lizards inhabit dry heaths and moors, and are most active during the hottest part of the day. Then, too, the tail of a Newt is flattened from side to side, but that of a lizard is rounded. Lastly (although not, of course, apparent by a mere examination of the animals), a most important point of difference between the two is that, like its cousin the Frog, the Newt enters the world as a tadpole and passes through a complicated series of bodily changes before attaining the adult form, whereas lizards from their birth are, except in point of size, exactly like their parents.

There are three British species. The largest and to my mind the most handsome of the trio, is the Great Warty Newt, *Molge cristata*. It attains a length of from 5-in. to 6-in.; the body above is very dark brown or black speckled with minute white tubercles, while the belly is marked with patches of bright orange and black in a manner reminiscent of the Spotted Salamander. During the breeding season the back of the male is ornamented with a large serrated crest, giving him a resemblance to one of those fantastic extinct reptiles such as the *Stegosaurus*. The tail is also much widened and is decorated with a stripe of silver and blue.

I well remember my first introduction to this species. I was a small boy of ten or eleven out fishing for "tiddlers." Another boy much older than myself caught a large *M. cristata* male, and being of generous disposition offered it to me. I was really very scared of it, for the black body and the vivid markings below, together with the great crest and large size, suggested all kinds of evil to my young mind. However, I was assured it was harmless, and, as it was certainly a possession to be proud of, I accepted the proffered gift. Later I caught another myself, but I had to appeal to my benefactor to remove it from my net for me, I could not muster courage to handle it myself!

This species should not be kept with small specimens of the other two species for it is a cannibal. Even if

the others are too large for it to eat they will be uneasy in its presence, so it is better to give *M. cristata* a place to itself. It is well worth it!

Molge vulgaris is the commonest of our Newts. It averages about 4-in. in length and is very variable in its coloration. I have seen specimens of every shade from fawn to dark olive. The under parts are a creamy-yellow, spotted with brown, and the sexes are very similar except during the breeding season—this remark applying to the other two species as well. In March the male assumes a more vivid colouring, the yellow becoming of a more orange shade and the dark spots both above and below deepening in intensity. He wears a fine crest with a wavy edge on his back, running from behind the head to the tip of the tail without a break. The feet too are partially webbed.

The Palmate Newt, *Molge palmata*, is the smallest and most uncommon of our species. It is very local in its distribution and might almost be regarded as a rarity. It is very similar to *M. vulgaris* and was at one time regarded as being a variety of it instead of a separate species. In length it does not exceed 3½-in. During spring the male wears a narrow crest dark in colour and without notches; his tail ends very bluntly, but at its tip is continued as a very slender filament; the feet are fully webbed. The female of this species is also slightly crested, but her tail is not so blunt and the terminal filament is so slight as to be almost non-existent.

Spring and early summer is mating time in pools and ponds. It is then that the Newts leave their winter quarters under roots of old trees bordering the pools. All the year round they live on land, hunting for worms and slugs, but when spring comes they take to the water, and the male Newt soon sports his scalloped comb to make himself attractive. Often they have to go long distances to get to the water to breed.

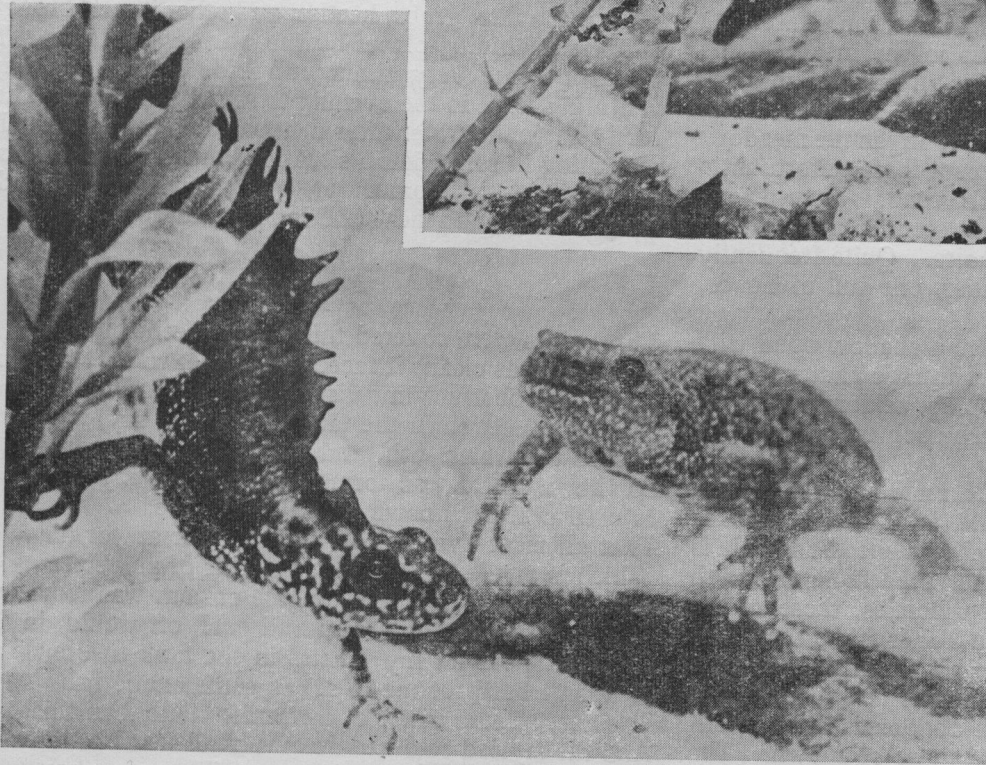
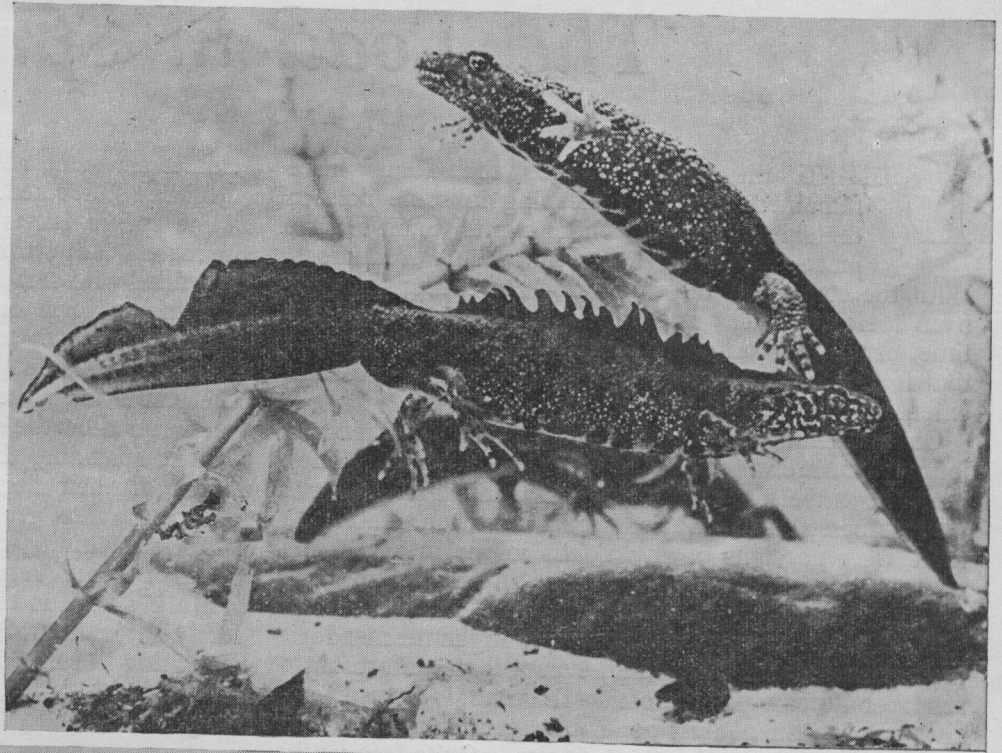
The wooing of the Newts is a relatively quiet affair. The male, having chosen a suitable partner, woos the lady of his choice in Newt fashion. The bridal couple sit in an acute angle to each other, their mouths touching. The male wags his rudder tail striking the side of the female that is turned slightly towards him. This wagging grows livelier and finally he sits down beside his lady love, and after a little he creeps away slowly. The female seems at first to take no notice of it, but finally she creeps after him and settles down on the spot where he sat before. This completes the newts' nuptials. On closer investigation, a little clot of mucus is discovered, the sperm, deposited there by the male, that now adheres to the abdomen of the female. The threads by themselves impregnate the spawn.

(To be continued.)

Poisonous Amphibians and Reptiles

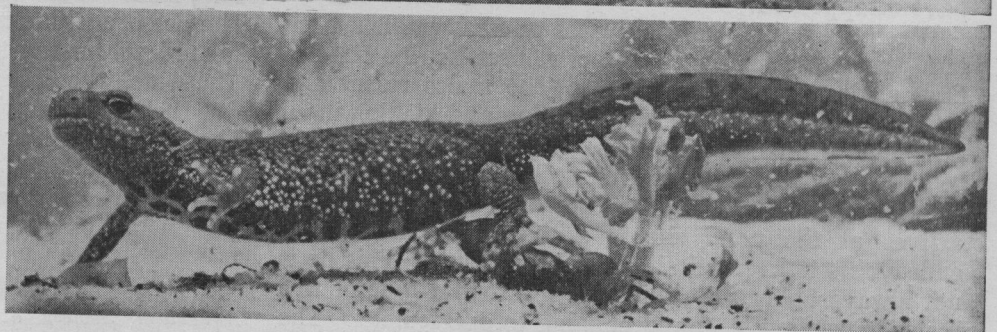
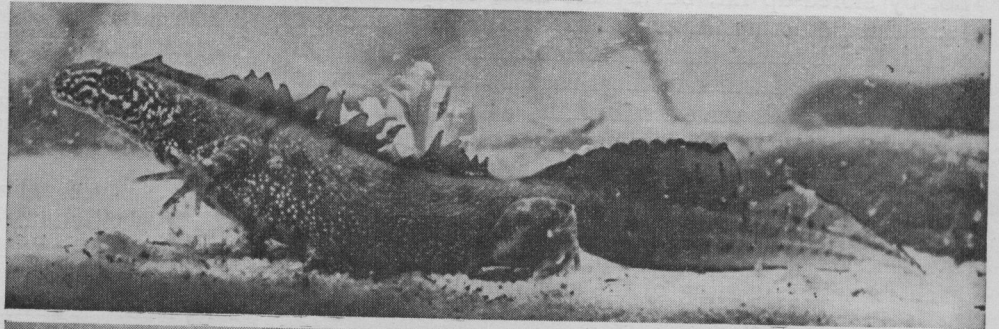
Our attention has been drawn to the fact that the caption to the diagrams illustrating last week's article under the above title is not clear. The words "transverse section" were unfortunately left in the abbreviated form, T.S., instead of being given in full.

Leaving winter quarters and taking to the water, the male newt soon embellishes himself with his scalloped comb.



(Left) The wooing male dances about in front of his bride wafting perfumes to her.

The male secreting sperm (right) When the female (below) crawls after him this adheres to her abdomen.



Indoor Reptile Cases

By "AMPHIBIUS"

OUR aim to-day is to keep pet animals—reptiles and amphibia included—in the open air as much as possible, so that designs for enclosures are apt to become more important topics than designs for indoor cases. The latter are of great importance, however, for the wintering of half-hardy species and the housing of those too delicate even to live outside, and last, but not least, those pets of persons having no garden at all.

Most reptiles are very fond of light and airy quarters with a suitable hiding place if and when they feel in need of one. Amphibia, on the other hand, with some notable exceptions, lurk in gloomier surroundings, and are distressed if exposed to strong light for a prolonged period. All the "vivaria" (horrid word!) which I have examined in shops have thus obviously been designed for amphibia only, and with especial thought for the comfort of nocturnal species. I have never seen ready-made what I consider a suitable reptile case—apart from an ordinary aquarium—so I propose to describe here a type which is eminently successful. It embodies several little features which would automatically occur to any reptile keeper, but otherwise I do not claim that it is strikingly original.

The picture shows its general proportions, and it is made of welded angle iron, and has a slate bottom. The example is 2-ft. long, and houses comfortably and without any overcrowding twelve White's Tree Frogs, a pair of Japanese Newts, a metamorphosed Axolotl, two Dusky Salamanders, and a baby Alligator Terrapin. Of course, so many animals could not live in it were it not for the fact that the Tree Frogs live in the branches, the Terrapin and the Newts in the water (largely), and the three Salamanders on the land. Every part of the case is thus fully utilized.

The back, sides, and bottom of the front are glazed, and the main part of the front is just a sheet of glass, resting on the angle iron ledge, and held in place by a spring clip from the roof. When more than 2-ft. long, a front in one piece is unwieldy to lift on and off, so may either be made in two or more pieces, or else hinged doors, opening outwards, may be fitted. Of the alternatives, I prefer the former as the iron framework of the doors breaks up the front, and detracts from the light appearance of the case. Also the doors add a good deal to the cost of the case, which is something to be considered. I attach great importance to light, and

accordingly each case has a fitting to take an electric bulb, when such is necessary. The roof consists of two sheets of perforated zinc, framed in iron, and two sheets of glass exactly the same size as the zinc. The zinc and glass are thus interchangeable, and it is possible to vary in a moment the ventilation as required: *i.e.*, the case may be entirely closed with the two glass sheets, entirely open with the zinc, half and half, or any one of an infinity of other combinations. Perforated zinc is only used for want of better stuff. It has necessarily to be framed as described, for otherwise it will not lie flat, and is so light that even a Tree Frog could shift it.

Snakes—persevering creatures—will push the roof aside and escape, so that clips or turn buttons are advised to keep the roof sections in place.

As can be seen, the bottom part is watertight, and, by varying the size of the front panel of glass, any maximum depth of water can be obtained. I always find the amount possible in the case under review to be quite adequate—any animal requiring more would be better housed in an aqua-terrarium, a type of case of which I shall say something another time. It is a good thing to have a waste pipe and plug in each front corner. Such enables the back or either side to be arranged as the dry part, and exigencies of water changing, etc., do not confine one to any particular or restricted part of the tank. The best arrangement is to have water in the front half, or third, and the back built up as required for the animals. It looks better and minimizes the risk of escape when active or not-yet-tame animals are housed in the case.

In the case of those lizards, such as Swift's, Anolis, Skinks, etc., Sand-boas and many baby Tortoises, the



case is kept as dry as possible and only a very small container of water is required. Where an active animal also requires an all-dry cage—such as the two first lots of lizards—it becomes essential to have a front made in two halves, so that the beasts can be serviced from the side where they are not. Alternatively when there is considerable risk of escape, the inmates can have their wants supplied through a section of the readily removable roof.

The angle at which the removable front is set, is determined by the height at which the case is set. The higher up it is, the more nearly vertical does the front require to be. The specimen shown has been made to stand in a heated room, but it can be made with an enclosed base and suitably modified floor if it is required to have its own heater. The electric light bulb is sufficient itself for many animals. The case can also be made on legs if required.

Its disadvantages are few, the principal one being its weight, which, especially when the case is set up, is quite considerable and prevents its being easily stood outside when the sun shines. The one shown requires two persons to carry it in and out. When these cases are stood outside in the sun, it must be borne in mind that the temperature inside shoots up at a terrific rate.

On no account must the glass panels of the roof be in use—use the zinc and keep a watchful eye on the inmates to see that they are not distressed.

Any persons with inclinations that way, can paint backgrounds on the outside of the sides and back with oil and water paints, and such add enormously to the appearance of the case. I shall say nothing about the actual furnishing, as this will depend upon the animal to be housed and the owner's taste, but I do urge that efforts may be made to set them up permanently. No art is required to line a tank with sand, and furnish it with a saucer of water, a stone, and two bits of wood, as so many people do. One stands a much greater chance of success with any animal if an effort is made to reproduce in its home a miniature replica of the natural home that it has left.

The case I have described costs a good deal more money than the zinc and glass boxes, which seem to be the only reptile cases generally available, but in itself the terrarium is quite a handsome thing, and if treated properly, will last a lifetime. Taking this into consideration the price is very reasonable and if any readers are interested and will write to me c/o WATER LIFE, I shall be happy to put them in touch with the makers. Alternatively I invite them to copy, or have copied, the design.

Breeding the Ideal Blue Platy

By BILLY NIEBUHR (New York).

NOTICING the change by professional breeders during the later part of 1934 from quality to quantity production, I decided to pick up what really good fish I could of the various kinds I was interested in. There were certain fish, however, that I found impossible to get, one of them being the Ideal Blue Platy. Those that were offered were either off colour or the red of the dorsal fin ran too far down in the body, and the crescent was either indistinct or blotched. Being dismayed at this, I decided to produce what, to my mind, was an ideal Blue Platy.

I began to pick up here and there any fish that had some good points in it, till I had six females and two males. I put one male and three females in a 15-gallon tank and labelled it No. 1; the other four in another 15-gallon tank labelled No. 2. The only plants I used in these tanks were *Sagittaria subulata*. The fish were left alone for three months, and I let them eat their young as they were born. I did this so as to get rid of most of the young resulting from fertilizations taking place before they came into my hands.

After the first three months, as soon as a female looked as if she were going to have young in a week or so, I put her in a 2½-gallon tank by herself. I provided cover in the form of Bladderwort (*Utricularia vulgaris*). If I took the female from 15-gallon tank No. 1, I would label the 2½-gallon tank I put her in No. 1. If she came from No. 2, I would label it No. 2. In this way there would be no risk of muddling the offspring later on.

The young were left in the 2½-gallon tanks till they were two months old, then they were culled, and the selected ones put in rearing tanks, size 36 x 12 x 12-in., also labelled No. 1 and No. 2. As soon as the young

became mature I replaced my originals with them, using a male from tank No. 1 for females from tank No. 2 and vice versa, using two more rearing tanks for their young, and replacing them in their turn as soon as the young became old enough.

Through this method of selective breeding I have in one and a half years' time more than realized my fondest hopes, and have a fish that is azure blue in colour, with a bright red dorsal fin without the red running into the body, and a clear, distinct crescent at the base of the tail. The females are slightly larger than the males, and both have well-rounded bodies.

Most of us fanciers deplore the disappearance of quality fish. It is our own fault, for all of us, myself being no exception, have at one time or another looked for bargain fish. I am glad to say that I have been cured of these so-called bargains. I stick to quality fish every time now, even if they do cost more. If I cannot buy the kind of fish I want, I breed them if possible.

This method can be worked with any fish; if you are interested in good fish try it, and see if you, too, are not more satisfied with quality than quantity.

Fish Swim in Streets

When the Coventry Canal recently burst through a tunnel which was being driven under its banks, Queen's-road, one of Nuneaton's main shopping streets, became a fast-running river.

Fish swam among the traffic.

The road was flooded for half a mile. There was a foot of water in many buildings.—*Daily Express*.

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The European Terrapin

By ALFRED H. SCUNTHORPE

ABOUT Easter-time every year, a tank full of European Terrapins invariably makes an appearance in the windows of most pet stores, in fact, this little water tortoise is quite a "regular line." Large, small and medium sized—they all go into an aquarium with a few inches of water, and are left to struggle and heave about in their characteristic stiff way until purchased.

That the dealers have little difficulty in selling them, I have no doubt, but, I am sorry to say, a surprisingly small percentage of the would-be Terrapin keepers supply their pets with the few needs necessary for their well-being. Instead, after a little while, the poor things are deposited in the garden pond and promptly forgotten. Incidentally, any friend who happens to inquire how they are fed is answered with—"Oh, they find all the food they want in the water"—this being a most mysterious feat often said to be accomplished by many other pet reptiles. Like all animals they need to be properly fed, besides which much of the pleasure of keeping these intriguing little creatures is derived from their amusing antics when being fed.

European Terrapins grow to about 9-in. in length, and are generally black or dark brown in colour, relieved by a number of tiny spots of bright yellow, or orange; the arrangement and profusion of these vary considerably with age, and the locality in which they are captured. Terrapins are shy and nervous at first, and consequently take time to become acquainted with passing humans—here again, this varies enormously, for while some specimens may take a couple of months, others will become tame in a week or so; generally speaking young Terrapins seem to settle down considerably quicker than those who have long tasted the sweets of liberty.

I might mention that whenever I lean over the surface of my own Terrapin pool the inmates rise quickly, like miniature submarines, and begin to scramble about near the surface and between the lily leaves with mouths agape for the worms, flies, strips of meat or fish, fat moths, and gentles, which form the chief items of their diet. They seem to be strictly carnivorous and will refuse all proffered green food.

My own enclosure consists of half a large oak beer cask, about 20-in. deep (wood is far warmer than stone for a pond), sunk in the earth to its rim, and a small shingle and sand beach, facing south for sun basking, with some rock work for climbing purposes; the whole is surrounded with 2-ft. wide, 1-in. mesh wire netting, with 4-in. or 5-in. turned in at the top.

It is also important that provision be made for easy passage in or out of the water in the form of built-up rock work, or a piece of gnarled tree trunk moored stiffly to the margin of the pool—this can make quite a pleasing and informal addition. A clump of ornamental grass or a shrub on the bank then completes the scene, except, perhaps, for a Water Lily in the pool, the leaves of which will be greatly appreciated by the Terrapins on account of the ample shade and cover they afford.

The sight of a few water tortoises stretching out their little heads in the direction of their keeper would, I am sure, please the eye of any reptile lover.

* * *

Crocodiles on Lake Victoria are "sabotaging" the Empire flying-boat service, according to reports reaching Nairobi. Rubber buoys anchored in the lake for mooring the flying boats have vanished. Investigations show that the crocodiles puncture the buoys and sink them.—B.U.P.

Newts

By JOHN GRAHAM (Continued from page 166)

THE female Newt lays her eggs on the leaves of aquatic plants, not in masses or strings as do Frogs and Toads but singly, one here and another there. Anacharis and Starwort seem to be particularly favoured for this purpose, chiefly, I think, because she likes to wrap the leaf round the egg with her hind feet as she lays it, and with larger, coarser-leaved plants this would not be possible. The envelope of the spawn is slightly sticky and, unless the leaf is a particularly stiff one, a little firm pressure is all that is needed to make it assume its protective curl round the egg.

We sometimes find Newts in ponds which are quite devoid of any form of vegetation and we may wonder where the eggs will be laid in these circumstances. Drag to the surface some of the dead sticks and leaves to be found at the bottom and examine them carefully. You will find the eggs sticking to their surfaces quite unprotected. The female cannot do impossibilities, and in this case is apparently content to lay her ova where she can and hope for the best.

The development of the egg is practically identical with that of the Frog. The ovum becomes divided by a circular groove into two halves, then by another at right angles to the first, into quarters. This process of segmentation continues until the yolk assumes a raspberry or mulberry-like appearance. Then on the upper side there appears a deep depression, the edges of which unite to form a tube. This, called the primitive groove, develops into the brain and spinal cord. The embryo now becomes elongated, develops a distinct head and tail and the eggs hatch. Except that their gills are longer and more feathery, the little Newt-tadpoles are at first very like those of the Frog and Toad.

As they continue their growth the body gradually grows longer, then the fore limbs appear, and a little later these are followed by the hind limbs; the tail, instead of now being absorbed, becomes longer still. At this stage they are very like small specimens of the Axolotl. Subsequently the prominent external gills are absorbed, lungs develop, and the little creatures, now genuine Newts, desert their aquatic home for terra firma. As a rule, they do not return to the water again until they attain maturity some three or four years later. Then, together with many of their brethren, they resume an aquatic existence for the breeding season, returning to land at the end of the summer. During late autumn they seek out some hole or corner in which to hibernate until the spring awakens them once more to love and courtship. Usually a number of Newts occupy the same winter quarters, presumably for the sake of warmth.

During the spring and summer Newts will live quite happily in a fair-sized aquarium, so long as they are provided with some means of leaving the water as they often like to do for an hour or two. The Common Newt is particularly fond of doing this, and I have known specimens to remain perched on a piece of projecting rockwork for many hours at a time. The top of the

tank should be securely covered with some form of gauze, well fastened down, as the little fellows are very clever at getting out over-night; they can even scale a vertical sheet of glass because, when partly dry, their skin becomes slightly sticky and they are gradually able to work themselves upwards, using the tacky surface of the abdomen as a brake to prevent them slipping backwards. At the end of the summer this inclination to crawl out of the water will become even more marked, and they should then be transferred to a vivarium, equipped with shallow water at one end, such as is used for housing small Terrapins. The most satisfactory diet seems to be a generous supply of earth worms of suitable proportions.

I would here like to emphasize the statement I made last week, *viz.*, that the two smaller species should not be mixed with specimens of *M. cristata*, for even if they are too large for him to eat and he refrains from attacking them, I have found that the smaller ones are unhappy in his presence and they skulk around with an obviously worried look, trying to keep out of his way.

Like all batrachians, Newts frequently cast their skin, and not uncommonly you will find one floating in the aquarium in so perfect a condition that it is difficult to imagine how its owner ever got out of it without resorting to some strange process of dematerialization. If it is desired to preserve the treasure, a very good method is to place it in a saucer of water and gently float it on to a piece of card. When it is nicely spread out it can be very gently removed from the water on the card and allowed to dry on. It will be found to adhere quite firmly without any fixative whatever. I have some, mounted in this way about fourteen years ago, still as good as when first done. The most difficult part is getting the card out of the saucer without disarranging the skin! As the sloughs are very transparent they do not always show up clearly on the mount, but if first floated in a little dye of a suitable colour before being mounted this shortcoming can be obviated.

* * *

THE HERNE HILL & DISTRICT AQUARIA SOCIETY.—This society met on Wednesday, April 7, and welcomed both Mr. A. H. Boughton and Mr. Bartmann. Mr. Boughton gave a very interesting talk on "The Feeding of Tropical Fish." He described many ways of feeding one's fish, and passed round a German publication showing the anatomy of fish, some of which had been fed on dried food, others on live. Mr. Bartmann spoke on fishing in Bavaria and on the Danube, and stated that one could not catch fish in these parts with earth worms. He had found that by using a block of congealed blood many fish could be caught. Cheese and red cherries, he stated, were also very useful. His talk proved very interesting. Any persons interested in this society should write the Hon. Sec., F. T. Salmon, 135, Mayall-road, Herne Hill, who will be pleased to send full particulars. Better still, they are very welcome to come along to the next meeting on May 5.



(Left) The female selects green water plants on which to deposit her spawn. From time to time she rises to the surface of the water to fill her lungs with fresh air.

(Below) The female deposits the impregnated spawn on leaves of water-plants. She tears them with her hind feet, and folds them carefully over the spawn.

(Bottom left) Spawn enlarged. Soon a small larva, with gills, develops among the water plants, which provide ample quantities of oxygen.



The Komodo Dragons

By "AMPHIBIUS"

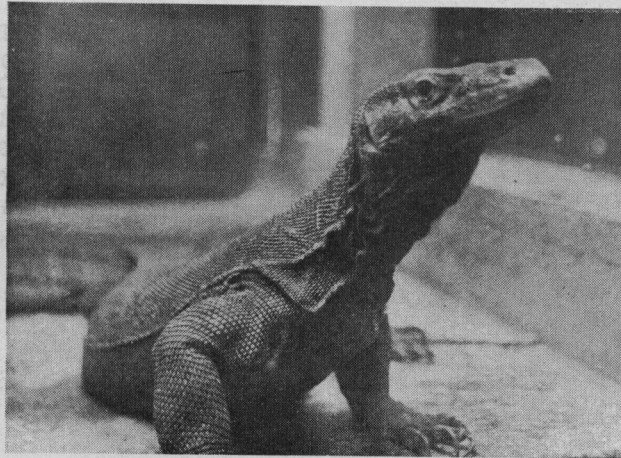
ON a tiny, mountainous island about as big as the Isle of Wight, sandwiched between Sumbawa and Flores in the Dutch East Indies, peopled by criminals, lepers and the insane, these remarkable Monitor Lizards have their home. They were unknown except to natives of the region until 1912 when Dr. Ouwens, head of the Botanical Gardens at Bivtzenzorg, Java, published descriptions of five shot specimens, one of which is the type for the species. The War intervened shortly afterwards—probably the reason why a worldwide trek to Komodo did not immediately occur—but a few odd specimens were secured and made the subject of scientific papers in the years up to 1926.

Komodo Dragons were thus the last large animal made known to science, and in 1926 an American expedition set out, by permission of the Dutch Government to film the animals, get some dead ones for the American Museum of Natural History, and some live specimens.

In spite of the ballyhoo surrounding this typically American expedition, it did not tell us very much about the *habits* of the animals, and the expedition left for home with tangible evidence of the creature's existence in the shape of the corpses of the seventeen best specimens they could trap and one live one sent to a zoo in Europe, where it very soon died.

The next news of the species was from Lord Rothschild who described two of twenty skins before the Zoological Society in 1927, and shortly afterwards Sumba and Sumbawa took London by storm. They arrived on deposit in the London Zoo and the late Miss Procter designed a large cage for them at the end of the reptile house, of which they soon became the most popular residents. Although in bad condition when they came, Miss Procter bestowed such care upon them that they soon became healthy and well. A remarkable feature was the extreme tameness of Sumbawa, who would allow himself to be handled even by small children. Sumba was more typical of monitors in his behaviour, and, although he seemed to tolerate a certain familiarity, he never became as tame and friendly as his cage mate.

Naturally the immense popularity of these spectacular animals stimulated other zoos to have a go at getting some, and among them the Berlin authorities were successful in getting (I think) two. One of these is alive now, and is to my mind the finest specimen in captivity to-day. It is far more active than Sumba, which I attribute to the fact that the former has his cage deeply floored with nice soft sand, whereas Sumba



spends his life on a heap of stones. Perhaps if he had a softer floor the nasty soreness of his feet would heal up again. While on the subject of cages, I hope the Zoo authorities do not intend to keep their new Komodo Dragons permanently in the quite bare, dull and uninteresting concrete cage, in which they are now. I have no doubt that it is only a temporary arrangement while quarters worthy of the inmates are being prepared.

Unfortunately London and Berlin each lost a specimen, and Sumba has grown rather morose since his loss. A cast of Sumba is set up in the South Kensington Museum and another in the museum at Tring. Both the London specimens approached 7-ft. in length, but even so fell 3-ft. short of the record for this species. Prior to their discovery in 1912, local rumour in the Dutch East Indies had hinted at the existence of 20-ft. and 30-ft. monsters, and the realization of their maximum size has come as something like a disappointment. The Two Banded Monitor (*Varanus salvator*) is the next largest member of the genus, but individuals 7-ft. long are unusually large. An Australian species comes next, and, although nearly reaching the length of *Salvator*, does not grow to anything like the same bulk.

Varanus komodoensis is believed to live also in the neighbouring island of Rinja and in the extreme west coast of Flores, but I believe their existence thereon has not been definitely established.

The last contribution to our knowledge of these lizards was made by an expedition a few years ago headed by Lord Moyne. Three young specimens were captured for the London Zoo, one of which escaped from the yacht while in the Red Sea, and was never seen again. The other two are those to which I have previously referred. Lady Broughton, a member of the expedition took a short film of the beasts as well as some quite amazing still-photographs, a selection of which was published in the *Illustrated London News* and *The Times*. These photographs reveal the animals as the very noble and imposing beasts that they really are, holding themselves high on their magnificently muscled fore-limbs, and keen of eye and nostril. I think it quite possible that they hunt and kill their prey which consists of swine and deer. For physiological reasons reptiles are unable to run fast over a long distance, but the Dragons might well silently stalk the unsuspecting animals until a short rush and decisive snap of the huge jaws could quickly provide a dinner for a group. At any rate I do not think enough large animals could die a natural death to provide the Dragons

(Continued on page 199.)

Club Reports

Owing to the manner in which Club Reports are tending to encroach on the limited space available in this paper in future 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.

SUFFOLK AQUARISTS' AND PONDKEEPERS' ASSOCIATION.—Our first show took place on April 14, at the Ipswich Museum, and all the expectations of the committee were outshadowed by the results. The show, which was non-competitive, was a most definite success as well over 500 people attended, and it was a real revelation as to the amount of the latent public interest in fish keeping. The committeemen were kept busy all the evening answering questions after a strenuous day spent in arranging the show. It was repeatedly remarked that a larger show must be staged in the near future. It is surprising how publicity, even of a modest kind, reveals the number of existing and potential aquarists who are eager to establish contact with one another. This is proved by the fact that this association, formed in December last, has now just on fifty members.—T. E. B.

WEST SURREY PONDKEEPERS' AND AQUARISTS' CLUB.—On Wednesday, April 14, "Amphibius," of WATER LIFE, spoke on "The Terrarium." "Amphibius" thought that most people either liked or hated reptiles, which term, of course, was popularly used to include amphibia. He hoped to be able to show how delightful they were as pets, and perhaps arouse interest where it was latent. The hobby was small now to what it was when he was young, but it was certainly on the up grade

again. One must remember that as all these reptiles were cold-blooded and could not produce heat by internal combustion as we did, it was very necessary to apply it from without. The smaller the reptile the greater the necessity for heat, as it cooled very quickly, while the larger and greater-volumed reptiles held the heat longer. Another very important thing was light, and it had been demonstrated that outdoors in the sun this would be, say, 10,000-ft. candles, whilst in a sunny room it would be only 200-ft. candles, or, in other words, a fiftieth of this strength. Therefore you should put your reptiles outdoors and in the sun when possible. After describing methods of keeping and various ways of feeding, etc., "Amphibius" produced six to eight different-sized Terrapins, Lizards, and Tree Frogs, which were handed all round—much to the consternation of some, but the admiration of all.

Descriptions and habits of various Snakes, Salamanders, and Alligators were given, and mention was made that the loss of a limb never seemed to affect any of these creatures—they always grew another one, except in the case of their head being cut off, but even then they would still walk about for some time. It had been found that after the killing off of a great number of Crocodiles (the skins being wanted for ladies' shoes, etc.) the big rivers had not been so clear, and it was now realized that this was part of the natural job of Crocodiles.

After many questions had been answered, Dr. Brown proposed a very hearty vote of thanks to "Amphibius" for one of the most interesting lectures we have had. This was heartily endorsed.—W. L. DEIGHTON, Hon. Sec.

OXFORD AND DISTRICT AQUARIST SOCIETY.—The next meeting of the above Society will be held on May 4, at "The Painted Room," Cornmarket-street, Oxford. This will be a question meeting, and members' problems will be dealt with. Visitors will be very welcome.—W. J. BETTAM, 26, Boswell-road, Cowley, Oxford.

The Komodo Dragons

(Continued from page 193.)

with food, so the matter will have to hang over until somebody can go and keep them under observation for a prolonged period.

With typical Dutch thoroughness the Netherlands Government passed laws rigidly protecting these unique animals, and they appear to be numerous and in no danger of extinction. Fortunately the skin is of no value commercially, otherwise, as has been the case with *Amblyrhynchus* and *Conolophus* (the sea and land iguanas of the Galapagos archipelago), they would soon be poached out of existence.

The cruising liners are very near Komodo when they stop at Bali, and let us hope that when pleasure in the Balinese and their customs has begun to pall, the shipping companies may not make a stop farther east in their search for novelty at almost any cost.



PUBLICITY! An amusing sign at St. Michael's, near Tenterden, Kent. We spent some time looking for the fish ponds, but were unsuccessful. A streamer on the fence exhorted us to buy Goldfish bred in Kent. These should appeal particularly to Men of Kent—or are they Kentish Men? But what about the Yorkshire lads?

A Fantastic Toad at the Zoo

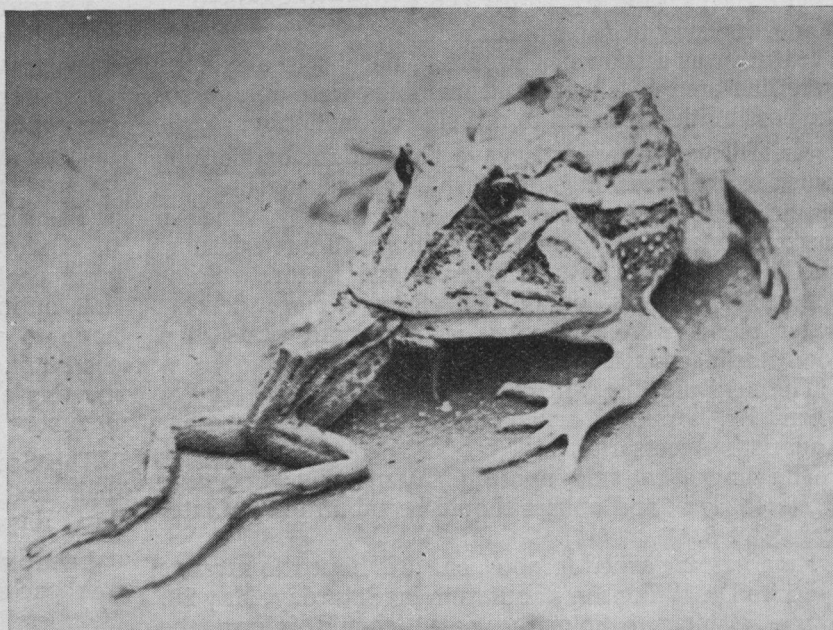
By D. E. SLADDEN, D.I.C., C.M.Z.S

"ESCUERZO," a South American word for a Toad, is applied in particular to the Horned Toad (*Ceratophrys cornuta*). A gigantic specimen of this Toad, the largest the authorities ever remember, has recently been presented to the London Zoo by Mr. J. J. Morris, a frequent donor to the Society. These Toads are remarkable for their large size, brilliant coloration, enormous mouths, and cannibalistic habits. The new inmate of the reptile house is no exception and has a truly fantastic appearance. When viewed from in front with the mouth open it is best described as a large cavity surrounded by a small margin of Toad. The body is 8" in length and nearly as broad, while the animal's actual weight is 850 grams, a colossal weight for a Toad when it is remembered that its European relative (*Bufo vulgaris*) barely turns the scale at 50 grams.

The name "horned" Toad is derived from the curious modification of the upper eyelid which is prolonged into a horn-like projection. Other characteristics include a vertical pupil to the eye, notched tongue, and slightly webbed hind toes. The colours of the dorsal surface of the body are chocolate and green, beautifully blended and forming a marbled pattern, while the under parts are yellowish green inclining to white. At times these Toads utter a kind of barking cry, but if teased they can give vent to a shrill scream.

When at rest the Escuerzos are in the habit of burying themselves in the ground, leaving only the top of the head and part of the back above the surface, thus rendering themselves almost invisible. In this position they lie in wait for their prey, which consists largely of frogs with a possible bird or small mammal occasionally. Their bite, though not poisonous, as the Brazilian natives tell you, is not to be despised, and the tenacity with which they hold on to the victim is almost like that of a bulldog. Any poisonous properties which the species possess are most probably situated in the skin, as in certain other amphibia. During the dry season the Escuerzos aestivate, burying themselves in the ground, where they remain torpid until the rains. Very little is known of their breeding habits.

The cannibalistic greed of the Zoo's specimen has been its downfall. Having swallowed two common frogs in rapid succession it snapped at a third, missed its intended victim and closed its jaws over a branch of wood in the cage. The force with which the jaws snapped was so great that the result was a compound fracture of the lower jaw-bone on one side. First aid was rendered and the broken bone set between an improvised aluminium splint and the corresponding upper jaw-bone. Fortunately the animal had fed when the accident occurred, so that before another meal is required—in two or three



Cannibalism!

Photo by Joan Barnett

weeks' time—the bones will have had a chance to unite. However, even though these Toads are fairly hardy animals, it is feared the chances of its recovery are slight.

* * *

There is no doubt that the hobby of fish keeping is spreading rapidly in this country. Everywhere we go we seem to see aquariums or meet aquarists. Only last week, while doing a little shopping at Harrods, we stopped to have a look at the Pets' Department, and noticed that quite a large corner of this is now given up to fish.

The aquarium section is very pleasingly arranged, and we understand is attracting a good deal of business. The aquariums are of the famous Ryder type, and consequently very well made and finished. The fish all look in excellent condition, and are very lively. Of especial interest is the fine display of *Psettus* of various sizes: rarely have we seen such good specimens of this beautiful species.

Coronation novelties are, of course, all the rage just now, and at Harrods may be seen a most ingenious little novelty in the form of small, beautifully finished, gilded aquariums divided by glass partitions into three sections; in each of these is placed a male Veiltail Fighting Fish, one red, one white, and one blue. Stimulated by the sight of each other, they rage up and down with fins and tails spread, displaying their lovely colouring to full advantage. Any aquarist who is in the neighbourhood of Knightsbridge should not fail to go and have a look at them.

Last of all, gentle reader, do not be too secure! Let seeming success never make you "cocksure"! —INGOLDSBY LEGENDS.

The Bloodfin (*Aphyocharax rubropinnis*)

By WILLIAM GANNET

THE Bloodfin is one of our oldest exotic fishes, and also one of the prettiest, and this, combined with its general hardiness, would lead one to expect them to be in everyone's aquarium, but such is not the case; indeed, one sees relatively few Bloodfins these days. Why this is it is difficult to say, but probably two of the reasons are that this species prefers a lower temperature than that maintained in most community tanks, and secondly, six or eight fish in a shoal are always a much finer sight than a solitary pair.

A black-and-white picture cannot do justice to or, with the exception of shape, in any way depict the elegance of this Characin. The body is long and slender, fully grown adults just exceeding two inches, and is coloured a fine silvery blue. The deep blood-red colour of the fins stands out brilliantly, especially when a number of fish are viewed against a dark ground.

Sexing immature fish by sight is difficult, and as a rule results are not too accurate; but a peculiar feature of the males makes their identification quite simple. When a number of specimens are taken in a soft, fine-meshed net, and then turned out into the tank again, it will be found that some of the fish remain attached to the net, apparently by the anal fins. These are the males, and they hang on to the net by the posterior rays of the anal fins, which project and are recurved, making a little hook. Fishes under an inch long will not demonstrate this character with certainty. The male tends to be more colourful than the female, who herself tends towards a deeper body than the male, but both these signs are unreliable, the colour of the male especially being variable.

Separation of the sexes is desirable if a good spawning is to result, though the fish will mature well in a community tank where the temperature is kept fairly low, somewhere between 68° and 70° F., a tank such as might quite well be housing a community of the hardier live bearers. Feed on all and any aquarium foods, but let the portions be small and frequent. The Bloodfin has not a large appetite, but is also not at all finicky.

The breeding tank should be of a fair size, as the fish are very active when spawning, and need a lot of room. A 24 x 12 x 12-in. tank will suit a pair well. The Bloodfin is a stream fish apparently, and does not like old water that has been standing for a long time, so that the spawning tank should be set up and filled specially. Soft, clear water about six to eight inches deep and thickets of fine-leaved plants, *Myriophyllum*, *Cabomba*, *Nitella*, *Fontinalis*, with a clear space about the centre of the tank, is the order. By the way, plants and tank should be thoroughly cleansed of snails, their spawn, and other pests before the setting-up process. Temperature for the spawning tank should be about 72-74° F.

When the fish are fully prepared, there is no doubt about the sex of the female, who becomes really swollen with eggs, sometimes almost to the degree of our female Stickleback; her red coloration also becomes much more intense. The fish should be put into the spawning tank overnight, and if the following morning is bright and the fish are really in condition, they will go right ahead and spawn. It is strange with Bloodfins that they either

spawn at once or not at all, and always there seems to be a higher degree of success where the pair have been conditioned apart for about a week.

It is a strange fact which, however, seems to be generally observed, that, as spawning approaches, the male loses the red in his fins, which become a sort of pale pink. We always expect colour to become intensified at this stage. The spawning is very interesting, but also very hectic, and lasts for about half to three-quarters of an hour. There is some preliminary fin fluttering and dashing about by the male, and then the fish make for the surface, and, quivering for a moment side by side, they will often jump right clear of the water as the eggs are dropped. After a short interval of less vigorous activity the act is repeated. At first only a few eggs are dropped, but when spawning is really under way a shower of tiny, glass-like eggs descends from the female, falling to the ground or attaching themselves to the plants. Spawning completed, remove the parents who, as previously stated, will eat anything, and strangely enough, their appetite seems to grow where their own eggs are concerned.

About two days after spawning, the tiny transparent fry will be seen hanging to the plants and at the water surface; occasionally they shudder violently and move about, but as yet they cannot swim. The next day the whole brood will be found near the surface, everyone doing his best to swim like a real fish, but it is a poor show as most of them seem to be only capable of moving when supported by the leaf of a nearby plant. An estimate of numbers will probably be somewhere between two and four hundred.

Infusoria will be needed for two or three days and in large quantities, but if normal growth is made in this time, the fish can then be fed on fine dried food and crushed *Enchytrae*. Growth is very rapid indeed, and the demands for food large. With good feeding the best fish will be quite an inch long at five weeks, and the characteristic body coloration will be appearing. In spite of the best of intentions and the greatest care, a brood never seems to grow evenly, and many fish will nowhere approach the size given above. The runts will probably die off or be eaten, but in any case the average "aquary" will not be able to accommodate more than forty or fifty of the growing fish.

Lizards

Large numbers of foreign Lizards arrive in England at this time of year, but many of these will not live to see another English spring or even the end of this summer. If you purchase a Lizard, be sure you have adequate supplies of food available, and also that its quarters are in a sunny situation. A Lizard has a large appetite under the right conditions. Meal worms are usually eaten fairly readily, but flies of suitable size are very eagerly consumed. All specimens will not take earth worms at first, though as the weather gets warmer and they become more used to captivity and being fed, as it were, artificially, they can be gradually taught to take earth worms and enjoy them.

British Adders at the Zoo

By D. E. SLADDEN, D.I.C

THE first warm days of spring see the re-stocking of the Zoo's outdoor reptiliary. Apart from the hardier species of reptiles imported from Southern Europe and obtained from a dealer, the Zoo relies on the efforts of the snake catcher of the New Forest, who annually catches several hundreds of British adders (*Vipera berus*) for the Society. Mr. George Wateridge, successor to the New Forest's former snake catcher, the well-known Brusher Mills, has already this year sent thirty Adders to the Zoo. Brusher Mills, who plied his unusual trade in the New Forest for nearly forty years, also supplied large quantities of live snakes to the Zoological Gardens. He was reported to have become immune to the snake's venom, handling them with his bare hands, and having no regard for their bites.



[Photo by Joan Barnett]

These newly arrived Adders are mostly males, which confirms an interesting fact previously noticed that the first Adders to emerge from hibernation are almost invariably of this sex. They are readily distinguished from the females by their much bolder markings. A little later in the season the Adders to be seen basking in the midday sun in exposed places on heaths and moors are just as invariably females. As the species is ovoviviparous, the females are believed to indulge in this habit of sunning themselves as a natural means of incubating their developing embryos.

The present collection includes not only the typical putty coloured forms with the conspicuous zigzag line

down the back, but several yellow and red varieties. Attempts have been made to form a separate species or subspecies out of these red varieties, but when large numbers are examined there is no definite distinction, as every gradation of colour from red to the typical brownish-grey is displayed.

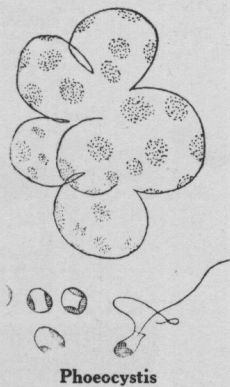
In addition to the red and yellow forms there are two perfectly black specimens. These are by far the rarest of the varieties. There appear to be two recognized types of black Adders, one in which the ground colour is so nearly black that the characteristic zigzag line is hardly perceptible, and another which is an example of true melanism—complete absence of yellow pigment. Both the present specimens are of the latter type. Another instance of melanism in snakes is the black Mamba, which belongs to the same species as the green form. The entire

absence of yellow pigment throughout the body even affects the venom secreted by these snakes. The liquid venom is water-clear instead of straw-coloured as is normally the case.

An amusing incident occurred in the Reptile House recently, when an excited visitor drew the attention of a keeper to an Adder in the act of "swallowing its young." Here, surely, was sufficient evidence to prove this very debatable point. On closer examination, however, the object protruding from the Adder's mouth was found to be the tail of a mouse it had just swallowed, and not the tail of a young Adder:

"Tobacco Juice"

AT certain times of the year those who go down to the sea in small boats find a change in the nature of the sea breezes; instead of that fresh tang, for which Southend-on-Sea is noted, there emanates a "most ancient and fish-like smell," and this is due entirely to the efforts of one of the colonial Flagellates, *Phaeocystis* by name. The individuals of the colony are particularly small—they only condescend to be seen when magnified a thousand diameters—yet each colony manages to form around itself a globular mass of jelly about an eighth of an inch in



Phaeocystis

diameter. The individual colonies link up with each other so that, at times, large uninterrupted patches of this foul-smelling jelly occupy the surface waters, to the intense disgust of pelagic fishes. The fishermen refer to it as "'bacca juice," for some peculiar reason; when the colonies are massed the water is a brownish-green and the smell is that of a fish market on a very hot day.

Phaeocystis usually appears in May, driving before it the shoals of Whitebait which seek the creeks and secluded, brackish reaches; its effect on surface swimming fishes is that of poison gas and so strong is the fish's aversion to it that their greatest urge of all—that of reaching the spawning grounds—cannot overcome their repugnance. On one occasion, some four years ago, the entire herring fleets of Yarmouth and Lowestoft were held up for nearly a fortnight, while a great blanket of this jelly-like matter occupied the greater part of the North Sea, preventing the herrings' migration.—A.L.W.

Tree Frogs

By A. E. SPICER

TREE FROGS are perhaps the most contented pets I have ever kept. They always seem perfectly satisfied and comfortable, and can make themselves perfectly at home in inauspicious surroundings. This adaptability is a great virtue in a domestic pet, but it is only one of the unassuming little batrachian's attractions. He is not only among the most easily pleased of pets; he ranks with the prettiest and also the cheapest, and he is irresistibly comic. Nobody can claim that sixpence is an outrageous price to pay for the humblest of God's creatures, and when it will purchase such a perfectly delightful little creature as a European Green Tree Frog, with his broad artless smile and his placidly folded hands, it is positively an investment. You are bound to fall in love with him at sight.

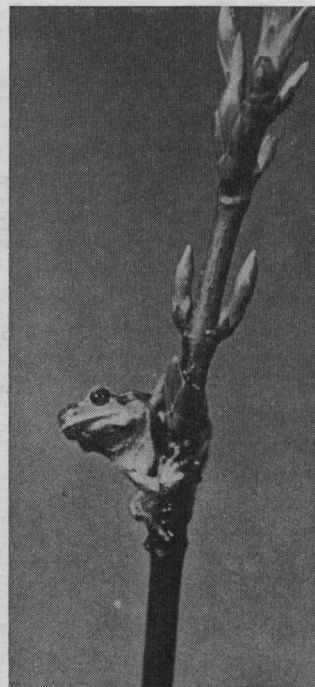
And then he is such a handy, convenient size, never more than 2-in. long; and such an attractive green, like polished wax. That green is not the end of the story by any means, it is merely his Sunday suit. Put him in dark surroundings and he will turn the colour of the earth. As a matter of fact, his powers of changing colour seriously challenge those of the popular Chameleon. I have had Frogs which have rapidly run through every shade of green from cypress to eau de nil; then started on brown, ranging from putty to chocolate, and wound up by switching over to variegated patterns, including a gorgeous representation of Italian marble. Of course, it takes rather longer to do than to tell; they might take a week over such a thorough-going performance as the foregoing, but I have not exaggerated their capacities.

In view of his manifold charms, the Tree Frog may fittingly find a home in the drawing-room, where he and his companions will be the delight of the family and the wonder of visitors. Those who are unacquainted with these curious little fellows are invariably astounded at seeing them walk up the glass sides of their case by

means of the suckers at the extremities of their toes. Speaking of cases, by the way, they offer few difficulties in the matter of housing. The best case would undoubtedly be one of the type described by "Amphibius" in a recent article; but failing this a small aquarium does very well. A sheet of perforated zinc should be cut to fit on the top, and if strips of wooden lath are tacked on to it so as to fit just inside the walls of the case it will be found that they will keep it from slipping off, while their weight holds the zinc down all round. In this cover a small hole should be made to admit food, and plugged with a cork. In one corner of the aquarium place a little vessel of water, and cover the bottom with leaf mould, or potting fibre. In this grass seed should be planted. The most important item of furniture is something for the Frogs to perch on. If the vivarium is deep enough a fern or *Aspidistra* could be planted; if this is not done some twigs should be fixed up for the Frogs to clamber about on. Do not omit something of this nature, for half the fun of these Frogs lies in their acrobatic antics.

Salamanders and small Toads do very well with Tree Frogs, and will eat the same food. This should include small insects of every description, but the staple diet of my Frogs consists of house flies. My method of catching these may be new to some readers. I use a tumbler and a postcard. When I see a fly settle I pop the tumbler over him, slip the card underneath and put the whole thing over the hole in the aquarium cover. A few taps down the tumbler will send the fly buzzing down through the hole, and he is soon caught on the sticky tongue of a Frog, who has leapt right across the tank to secure him. In this way I keep the house entirely free from flies, and the Frogs entirely full of them. In winter, when flies are unobtainable, it is best to put the Frogs away in the loft where they will hibernate.

I ought not to omit the one and only drawback attached to the Tree Frog—his voice. His ear-splitting croak is uproariously funny, but one gets rather tired of it after the first few years. I once conceived the idea of keeping some in my bedroom to act as an alarm clock. They generally used to wake me up at about seven o'clock; but sometimes they got the time wrong, and would fire off a broadside somewhere between three and four, as soon as dawn began to break!



[Photo by A. E. Spicer



[Photo by A. E. Spicer

The Axolotl

By E. M. ATKINS

THIS is the Mexican-Indian name for the larva of *Amblystoma tigrinum* of the order *Urodela*, of the *Amphibia*, and is now in common use for these animals. In appearance the axolotl is very like an enormous newt tadpole. It has three gills on each side of the head, a large dorsal fin merging into a long tail, teeth in the jaws, no eyelids, and four digits on the front and five on the back feet. Full-grown specimens are from seven, to eleven inches long.

Several species of the genus *Amblystoma* are found in North America, and, with the exception of *A. tigrinum*, in certain fresh-water lakes in Mexico; all develop normally in the same way as a newt, and *A. tigrinum* develops normally except in these particular lakes. The larvæ in these lakes are neotenus, *i.e.*, they become sexually mature and reproduce while still retaining their larval appearance and habits. It is stated that no axolotls in these lakes have been known to metamorphose, and that no perfect amblystome has been found near the lakes, but this is doubted by some. The axolotls from this locality may be regarded as a variety of *A. tigrinum*.

The word "axolotl" in this article refers to this variety, and not to those larvæ in other parts of Mexico which develop normally, and which are probably also referred to as "axolotls."

About seventy years ago a number of axolotls were sent to Paris, and some of them, from some unknown cause, metamorphosed. Until then the axolotl had been considered a Perennibranchiate, like *Proteus*, and this unexpected metamorphosis led to experiments. It was found that if the water were gradually decreased until it scarcely covered the axolotls, thus forcing them to breathe atmospheric air, they would sometimes metamorphose and leave the water as mature amblystomes, but death frequently occurred before metamorphosis was complete. Some were stated to have metamorphosed when salt was added to the water, and in this connection it is to be observed that there are no axolotls in the large brackish lakes near Mexico City.

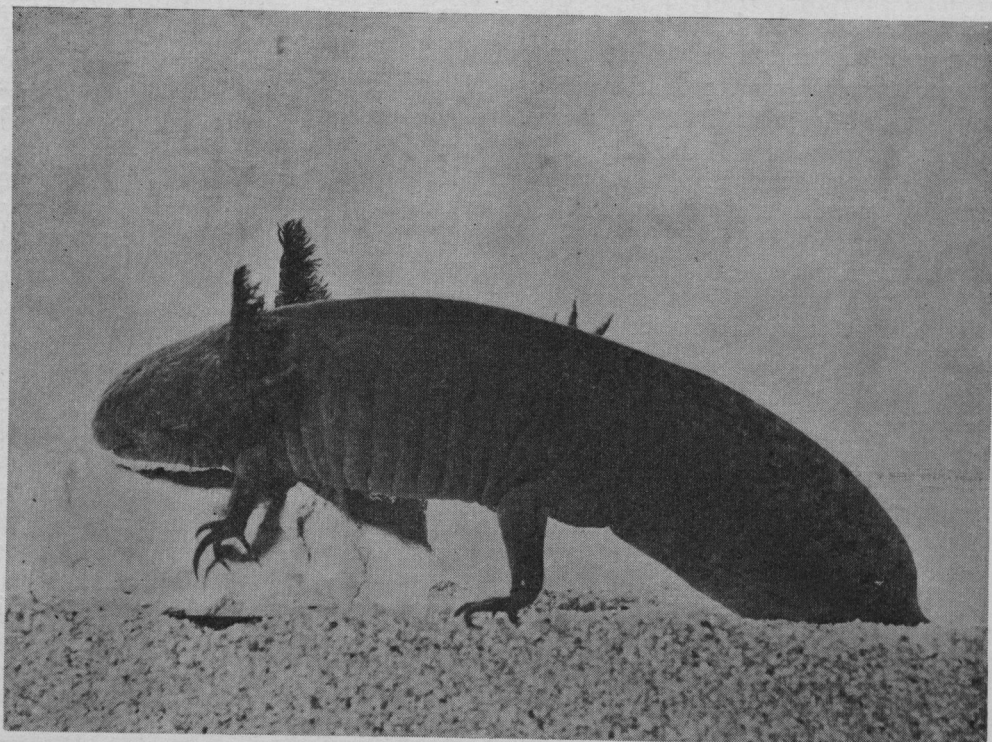
It was afterwards discovered that treatment with an extract of thyroid gland, either by injection or feeding or even by dissolving it in the water in which the axolotls are placed, would cause metamorphosis with little difficulty. More recently it has been found that injections of pituitary gland will produce metamorphosis, and a synthetic thyroid liquid has also been used with success.

The hardiness of axolotls, and the facility with which they breed, have permitted numerous experiments to be made with them as to the process of development generally. The cause of the peculiarity of this variety of *A. tigrinum* is probably connected either with the food supply or with the climate.

If food is plentiful in the water and scarce on land, or if the climate is dry and therefore unsuitable for amphibians, the later a larva leaves the water the better chance of survival and reproduction it will have. As fish breeders well know, there is in many respects a continual variation in individual animals, and some, known as sports, may deviate from type to a very considerable extent. In this particular case any larva that is even a little later than the normal in leaving the water will have a better chance of leaving descendants, and some of these will retain the peculiarity of late development. Under favourable conditions this may gradually be carried further until the larva does not metamorphose at all.

Intermediate stages in such a process can easily be found. The common newt usually metamorphoses and leaves the water in the autumn, but some individuals remain as tadpoles throughout the winter, and metamorphose in the following year. Apparently in this climate this is not a great advantage, or the individuals with this peculiarity would speedily outnumber the others; but in certain very high Alpine country the larvæ of newts become neotenus, and breed while still retaining their larval appearance, like axolotls. The type of country would account for this, food probably being scarce.

(Continued on page 260.)



Axolotl about three years old.

Setting up the Tub Pool

By F. B. HANSFORD

NOT only is the tub pool most economical for water gardening and fish keeping; it also gives us intimate access to the subjects we are studying, and does not take so long to construct as a pool made of cement, while the delay entailed in waiting for the concrete to mature is avoided. A tub measuring about three feet across the top and two feet in height is admirably suited to our purpose, and may be obtained for about ten shillings. It will hold about fifty gallons of water when established, and provides a very satisfactory surface area in proportion to depth. It is sometimes even cheaper to divide barrels, though these usually require the addition of an extra hoop around the top. Barrels which have been used for storing oil are not suitable for our requirements; the best are those which have contained wine or brandy.

Before the tub is prepared care should be taken to see that it is not exposed to the sun or it will shrink. It should be cleaned thoroughly and the inside should be given two coats of Gander Bak to prevent any harmful ingredients coming out of the wood. To accommodate the tub a hole must be dug a little wider and about two inches deeper than the tub, so that the top edge may be hidden by rockery stones. When sinking the tub see that the top is level, and then proceed to press down the soil firmly around the outside.

The next thing to be decided is whether the tub is to be utilized for fish keeping, or primarily for plants with the addition of a fish or two to keep down the mosquito larvæ. If the former is the case, it is not advisable to cover the bottom with soil. The fish will thrive better, and there will be less risk of the formation of fungoid growth on the soil or the proliferation of harmful bacteria if the oxygenating aquatics are planted in pots. If a Water Lily is included it will probably cover the surface of the water with leaves in the summer months, and not much will be seen of the fish.

The bottom of the planting pots should be finely dusted with bone meal, which will increase growth, followed by a layer of good loam and a top covering of shingle or aquarium compost to prevent the fish from disturbing the soil. Clumps of *Elodea densa*, *Callitriche*, and *Myriophyllum* will serve admirably as oxygenators, while shade for the fish may be provided by the introduction of such plants as *Aponogeton distachyon*, *Hydrocharis morsus-ranæ*, *Azolla caroliniana*, *Utricularia vulgaris*, *Riccia fluitans* or *Lemna*. The latter will also provide a welcome addition to the fishes' diet, as will the eggs of a few water snails.

In the second instance, for the culture of the Water Lily the bottom of the tub should be sparsely dusted with bone meal and covered with about six inches of loam. Care should be exercised to ensure that the loam does not contain any harmful matter which is likely to foul the water. It is a good plan to fill the tub with water gradually as the Water Lily settles down and grows.

The best Water Lilies for such a pool are those belonging to the *Laydeckeri* group, of which *Laydeckeri purpurata* is the most popular. This variety does well in about eighteen inches of water, and, when in an open position, flowers freely from June till October. While the pool is settling down it is advisable to introduce a few Water Fleas which will help to keep the water clear and provide a valuable tonic for the Sticklebacks or Minnows to be put in later to keep down the mosquito larvæ, together with a sprig or two of *Elodea* to keep the water fresh.

A tub from which we removed the fish a few weeks ago was observed the other day to be teeming with *Cyclops*, *Water Fleas*, and small animal life, while on the side we saw the spawn of the *Planorbis corneus*.

In conclusion, for those readers who may doubt the permanency of such a pool as we have described, we would mention that, in his book, "Water Lilies and Water Plants," Mr. Niklitschek has written: "It withstands the winter admirably. From personal experience I can confirm that it will bear a sheet of ice fourteen inches thick. . . . The woodwork sunk in the soil and in perpetual contact with water is indestructible. W. Buggele, of Linz, has such containers which have been in use for the cultivation of water plants for more than thirty years, and are as watertight now as on the day they were made. The iron bands must have long ago been eaten away with rust, but the combined pressures from the surrounding soil and the swelling of the staves hold the barrels together as with iron clamps."

The Axolotl

(Continued from page 259.)

From accounts by people who have visited the neighbourhood it does not appear that the land around the axolotl lakes is barren, or so dry as to be unsuitable for amphibian life. This may not always have been the case, however; the variety may have become fixed when conditions on land were very unfavourable, and as at the present time the lakes in which the axolotls live are full of small forms of life, even under present conditions, it is probably an advantage for no metamorphosis to take place.

One explanation of the delayed or arrested development is that the necessary hormone is retained in the gland instead of being released into the system, and it is thought that treatment with an extract of thyroid gland causes the hormone to be released.

In the case of a completely neotenus existence the hormone may be permanently retained in the gland or may be destroyed. The matter is, however, very complicated, as the production of the hormone may be affected by certain conditions, such as variety and quantity of food, temperature, depth of water, etc. Recently it has been thought that in the case of urodeles which never metamorphose the tissues will not react to the hormone.

(To be continued.)

Club Reports

Owing to the manner in which Club Reports are tending to encroach on the limited space available in this paper in future 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.

CROYDON NATURAL HISTORY AND SCIENTIFIC SOCIETY.—A meeting of the aquarists' section was held at the Croydon Public Library, on April 28, 1937. The previous meeting's minutes were read and signed.

Mr. L. G. Payne lectured on the "Fascination of Hardy Reptiles and Amphibians"; at the commencement of his lecture he stressed the fact that all the creatures which he would talk about were sufficiently hardy to be kept out of doors, and said that in his opinion it was very much better to keep reptiles and amphibians naturally out of doors than to keep them active all the winter in a heated house. He then went on to say how very much better and more exciting it was to go out and to catch the different creatures oneself than to purchase them, as with the former method one gets to know their haunts and the type of country which they frequent, and are therefore better able to reproduce these at home.

Mr. Payne then dealt with the various kinds of Frogs and Toads, suitable for keeping out of doors, and told us in a very interesting way the habits of the various live specimens which he had brought with him, which included the Edible Frog, the Firebellied Toad, the Spadefoot Frog (special attention was drawn to the razor-like bone on the hind legs), the Green Tree Frog, the Natterjack Toad, a Dalmatian form of the Common Toad, which measured 12.2 cm. in body length, and an ordinary common male Toad which had mated with the Dalmatian Toad and produced spawn.

Mr. Payne then described his outdoor Frog enclosure which is built up 4-ft. from the ground, and enclosed with glass and a perforated zinc roof, a small pool is situated in the centre of the enclosure. From this Mr. Payne went on to outline the making of the outdoor reptiliary, saying that the surrounding wall should be about 2-ft. high, sloping to 4-ft. high at the back so as to allow the ground to slope upwards. An overlap of zinc should run round the wall.

As regards food, the lecturer recommended the use of one or two fly traps baited with cheap liver, and went on to say that the best method of feeding the flies was to open the trap over the pool in the enclosure, hold the flies under water for a few seconds and then release them; many will crawl on to the edge of the pool and up the growing plants, and over the rocks, making good food for the more agile inhabitants whilst those on and near the pool will feed the Frogs and Toads clustered round.

Mr. Payne talked for a short while on Newts, Terrapins, and Salamanders, and then answered questions on his lecture.

At the close of the meeting the Chairman proposed a very hearty vote of thanks to Mr. Payne for the very fine lecture and for the great trouble and care he had taken in bringing so many live specimens along to illustrate his lecture.—G. B. YEATES (Hon. Secretary, Aquarists' Section), 58, Downton-avenue, Streatham Hill, S.W.2.

SOUTH-EASTERN AQUARISTS' SOCIETY.—On Wednesday, May 5, Mr. Dowsett, of the Dowler Electrical Co., gave us a very interesting lecture on "Heating and Lighting Tropical Tanks." He first discussed various forms of heating: oil, gas, and electric. Oil, he said, was unsafe, unsuitable, and unsavoury. Gas had its merits, but could not be used for lighting; it was certainly the cheapest form of heating, and gave little trouble providing a thermostatic control was fitted, but a gas thermostat would be a very delicate instrument, and to produce one which would be infallible would be costly, therefore not a commercial proposition to dealers or aquarists. He explained how a small Bunsen or geyser jet set with the flame just entering a $\frac{3}{8}$ -in. copper tube which was baffled and set in the centre of the tank by lock-nuts and washers, would conveniently heat a 24 or 30 x 12-in. at small cost. The heat travelling up the baffled tube would not produce heat spots in the sand and cause plant roots to blacken and die off. Passing on to electric heating, he said that cheap heaters and thermostats were unreliable; iron wire was used in their construction in conjunction with asbestos insulation, and when the heaters were switched off or taken out a dampness was produced which in time rusted the iron elements. A 42-gauge nickel-chrome wire wound on porcelain insulated with mica was foolproof, and would last for years. All electric apparatus in use with water must be earthed; Mr. Dowsett quoted many instances of aquarists getting electric shocks from tanks which were not earthed and of fish being poisoned by nickel salts deposited in water as a result of unearthed heaters. First-class data had been obtained from Singapore relating to the rise and fall in the temperature of the water in natural surroundings. Mr. Dowsett had found by experiment that a differential setting of ten degrees was very favourable to the health of fish. He drew diagrams of the construction of thermostats describing the metals used and the delicate snap action which would not interfere with the wireless.

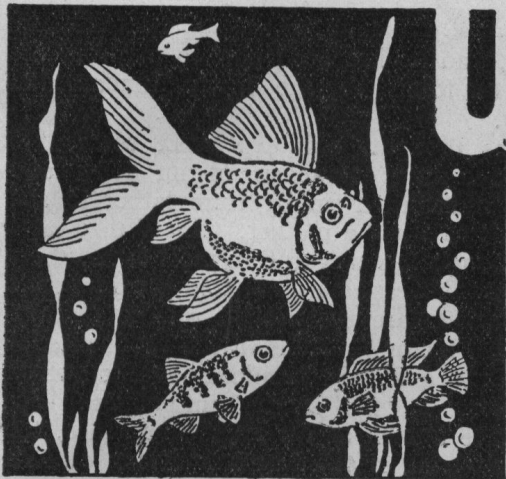
He concluded by giving us a very useful tip which was outside his subject. To test a plant for its oxygenating value, place the plant in question under an inverted glass funnel and place a glass test tube over the funnel (the plant, of course, must be growing in a good natural or artificial light). It was tried out with *Vallisneria*, and it was found that after two days the oxygen from the plant displaced 1½-in. of water in the test tube. That the gas given off was oxygen was proved by putting in the glowing end of a wooden stick; this became very bright, like burning magnesium paper.

This concluded a very interesting and instructive meeting. The next meeting will be held on Wednesday, June 2, at 8 p.m., at the Club Room, Milkwood Tavern, Milkwood-road. The lecturer will be announced later.

C. WARD, Hon. Sec., 188, Herne Hill-road, S.E.24.

* * *

An apt proverb for aquarists is "A Stitch in Time Saves Nine." It is so irritating to lose a good catch because of a hole in the net.



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A "New" Disease in Tortoises

By D. E. SLADDEN, D.I.C.

AMONG the many inquiries from pet keepers which have reached the Zoo's Reptile House recently a large proportion deal with a very infectious disease among Tortoises which leads to blindness. The disease was first noticed in this country in 1935, among some newly imported Greek Tortoises. In that year it reached such proportions that nearly 100 per cent. of some consignments were killed by it. Post-mortem examination showed that the disease was due to a mycelium, or mould, which infested the head of the victim. In the cases examined the mould had encroached on the brain to a great extent before the eyes were affected. It appeared, therefore, that blindness was a late symptom of the disease. By the time the disease is diagnosed there appears to be little hope for the animal.

The disease first appeared in the Zoological Gardens among a barrow-load of Greek Tortoises, which had been purchased from a street vendor by a compassionate passer-by. Within two months of their arrival three-quarters of the consignment were dead and many others blind and obviously dying. It was not until then that the condition was recognized and the remainder removed from the Tortoise House. In spite of the delay none of the other inmates, which include several nearly extinct species, were infected. From this it appears that the disease may be confined to Greek Tortoises. In view of this fact intending purchasers should know how to distinguish between the two species, the Greek Tortoise and Hermann's Tortoise, commonly sold in animal shops in England. There is often some confusion between the species, not only because they are similar in appearance, but because their scientific names have recently been changed. The Greek Tortoise (*Testudo*

græca, formerly *T. iberica*) can be distinguished from Hermann's Tortoise (*Testudo hermanni*, formerly *T. græca*) by the presence of a large horny spur on the posterior surface of each hind limb. Hermann's Tortoise is devoid of spurs, but the tail ends in a claw-like horn.

It appears that the disease is as prevalent in Tortoises imported this year as in the past. As blindness in Tortoises is often a temporary affair following hibernation, the question of diagnosis is important. As a precautionary measure any blind Tortoise should be removed from its companions in case it is a victim of the disease. The eyes should then be bathed to open the lids, and if there appears to be a functioning eye beneath, the lids should be kept smeared with oxide of mercury or yellow ointment. If the eye is obviously affected, however, the animal is better destroyed.

It is a practical point worth remembering, that it is difficult to kill a Tortoise in a lethal chamber or by giving it chloroform to breathe. When euthanasia is decided on, either the head should be drawn from under the shell and the neck quickly severed with garden shears, or a small quantity, about 2-cubic centimetres, of chloroform should be injected by a hypodermic syringe into the loose skin of the "arm-pit" or "groin."

* * *

FISHY STORY.—An angler was fishing in the Vistula at Warsaw when he hooked a woman's handbag containing a lottery ticket. He found it belonged to a servant girl who had dropped the bag in the river by accident. The ticket had won £2,000, and the day the fisherman brought it to her was the last on which she could claim. The fisherman went with her to draw the money and was given £500 for his trouble.—*Exchange.*

The Axolotl

By E. M. ATKINS (Continued from page 260.)

AXOLOTLs are valued as food in Mexico, and there are professional axolotl fishermen.

The normal colour of axolotls is a very dark brown or grey, nearly black, but a white variety, said to have been bred from a single white specimen imported into France, has become very popular with aquarium keepers.

As regards the treatment of axolotls in aquariums, etc.: they are quite hardy and, except for the difficulty of supplying sufficient food for very young ones, give little trouble.

They have lungs as well as gills, and occasionally come to the surface of the water for air. They appear to require less aeration of the water than fish do, but the lungs of amphibia may not be so efficient as oxygenators of the blood as those of other air-breathing animals, and in the immature stage it is doubtful to what extent the lungs are actually used for that purpose. Experiments by E. G. Boulenger showed that axolotls in water definitely deficient in oxygen did not rise to the surface for air more often than those in well-aerated water. In view of these facts, it is advisable to allow nearly as much water and aeration as for fish, though there is no doubt that axolotls will live in water so impure that it would kill fish.

If the above directions are followed and care is taken in feeding, the water need not be completely changed; but axolotls are large animals for the average aquarium, and there is considerable sediment from excrement, so it is advisable, if only for the sake of appearance, to remove the sediment from the bottom of the tank with a siphon about once a month or so, drawing off in the process a little of the water, which should be replaced by fresh.

The water in a tank for axolotls may be very shallow, and they seem to thrive best in water not more than about 12" deep.

Axolotls are nocturnal animals, and in darkness they are quite active; they have a great objection to bright light. The aquarium containing them should, therefore, be placed in a dark part of the room, and if it also has rock-work, forming caves, the axolotls will take full advantage of it. This rock-work can be so placed that the axolotls can be seen in the caves, and they nearly always lie in them with their heads towards the light. The black ones are sometimes rather difficult to see in such a tank, but the white ones always show up well. Fish should not be kept in the same tank, as they bite the gills of the axolotls, thus impairing their health and spoiling their appearance.

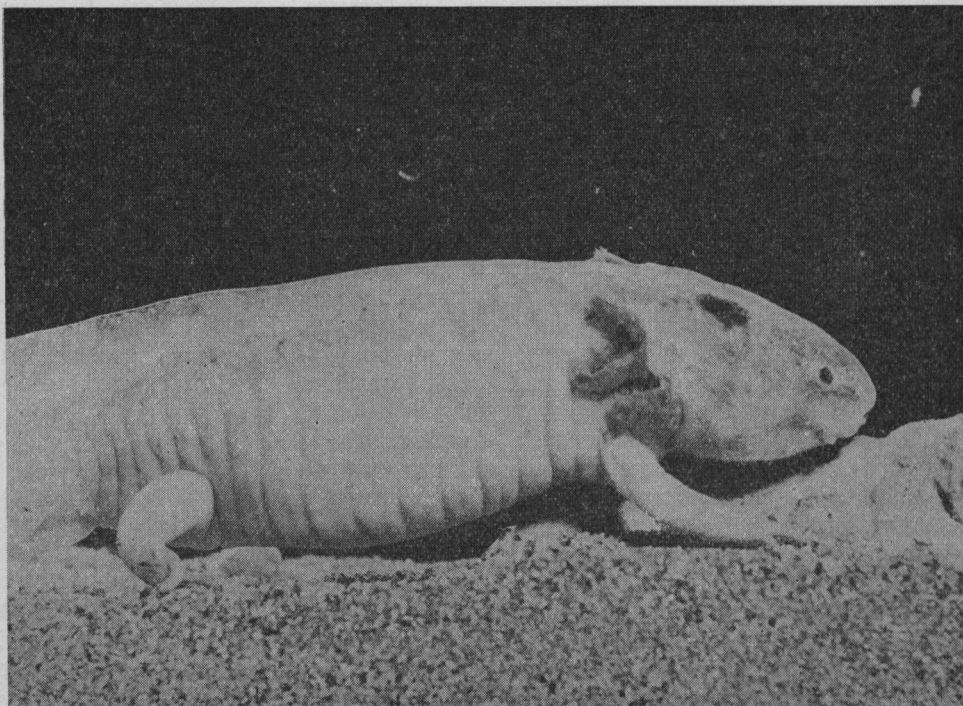
Axolotls can stand very low temperatures. Eggs are sometimes laid at 32° F., and will develop, though the young in such cases appear to be weak. A temperature between 45° and 70° F. seems to suit them best. They should not, of course, be subjected to sudden changes of temperature when water is changed or when transferred from one vessel to another.

The foods most appreciated by axolotls are live tadpoles, fish, shrimps, worms, etc., but they can also be fed on pieces of raw meat or fish of any description, cut to suit their capacities. They are, of course, exclusively carnivorous.

In hot weather full-grown axolotls should be fed about twice a week, and in cold weather about once a week, but they can go without food for a month without injury. When fed they should be given as much as they can eat. Generally the younger the axolotl the more frequently it requires feeding. If axolotls get hungry they will tear the gills and sometimes the limbs off each other; these will grow again, but not always very readily.

Owing to the position of the eyes, full-grown axolotls have great difficulty in seeing anything on the bottom of the tank, and it is fairly obvious that in a state of nature they feed on animals which swim or move above them. Young axolotls, until they are about half grown, seem to have little difficulty in feeding from the bottom of the tank, and if they are never fed by hand full-grown axolotls will manage to pick up dead food from the bottom, though they also scoop up stones, sand, etc. Worms can be easily picked up as the axolotls can see them move.

(To be continued.)



Female axolotl about ten years old, still laying.

Toad Hall: The Outdoor Vivarium

By L. G. PAYNE

IN the days when Toad Hall was built, the "Wind in the Willows" was a favoured book, and it was perhaps inevitable that the new erection for amphibians should be so styled. Toad Hall may be described as an enclosed outdoor vivarium, and, as such, fills a well-defined gap between the ordinary reptiliary and the indoor vivarium.

At this time of the year, when reptiles and amphibians of many species are arriving in the dealers' shops, the question of suitable accommodation for a mixed community will arise, and the glass tank which holds the Crested Newts will hardly accommodate your Tree Frogs and Lizards in addition. It is, of course, true that separate tanks or small vivaria may be purchased for different species, but meanwhile initial expense is increasing, and the outlay necessary could have been, I think, better employed in the provision of a community vivarium.

The illustration shows a close-up of Toad Hall and will serve to amplify the following description, which should be of practical use to the constructor.

Four walls of old bricks were raised from ground level to a height of 4'. The front and back walls were 6' wide, and the side walls 5' back to front. The space thus created was filled with hard core, rammed down; and an oval pool was made in the usual way of one part cement to three of sand. This pool occupies more than half the surface area, and is about 12" deep. At the rear of the pool rough stones were cemented upwards and backwards to form a pleasing background, and amongst these dwarf ferns and free-flowering rock plants were introduced. The side walls are permanently draped with oak bark, and ivy, which latter needs no attention beyond an occasional pruning.

The front of the erection will be seen to consist of two large glass windows, which slide outwards from the centre in the grooves of $\frac{5}{8}$ " match-board. These give immediate access to the whole of the interior. Running water and electric light are refinements which well repay the extra trouble and expense, though these are by no means necessary. The aspect is north, though this is not inherently ideal. At the same time, it should be remembered that though a south aspect would attract the maximum of sun, experience shows that a moderate amount of sunshine meets the requirements of a community vivarium.

Now, a word on the planting of the small pool. I have no hesitation in recommending Hair-grass (*Scirpus acicularis*), and a fine-leaved pond weed whose scientific name is *Potamogeton friesii*. Both of these

are hardy, graceful, and dense-growing, this latter quality being especially valuable where the raising of various amphibians from the egg stage is attempted.

The top of the vivarium consists of an equal area of glass and perforated zinc. This roof is slightly sloping forwards, and the natural rain water runs off the glass and trickles pleasantly through the zinc into the pool below.

An outdoor vivarium of this type can, of course, be made of any size or shape according to the owner's whim, or the area available; but these notes will provide a useful basis on which to work.

Let us suppose that this work is done; we can now feel satisfied that the live creatures we introduce are going to have a good chance of living under satisfactory conditions over a period of years. This is surely the ideal at which every enthusiast aims, but even with a vivarium of this type the beginner must exercise discretion in the selection of his inmates. The pioneer makes his experiments, and is then in a position to warn the newcomer against certain pitfalls; and although several years have elapsed, I can still see the ghastly contortions made by a certain large and normally stolid Common Toad in the community vivarium, which finally reached their climax in the violent disgorging of a Tree Frog, still alive!

When, then, shall we put in our new vivarium? It will probably be helpful if I outline a suitable mixed collection, indicating maximum numbers of individuals for an erection of the dimensions described. Tree Frogs are indispensable; their agility, grace and hardiness are unsurpassed amongst the amphibians, whilst their relative cheapness is a not unimportant factor. A dozen



will be delightful, peeping out of the ivy or basking in the sunshine, when their metallic green shimmers with added lustre.

Of the Fire-bellied and Yellow-bellied Toads half a dozen of each will be satisfactory; and the quiet croaking of the males on a summer evening is in no way unpleasant. In addition, the Yellow-bellied Toads are almost certain to flatter their owner by depositing spawn in the Hair Grass. Half a dozen Natterjack Toads will serve to refute the popular belief that all Toads are heavy in gait and slow in motion. These toads are pleasing to the eye, in their motley of olive and brown and red.

Half a dozen Mud Frogs can be introduced; their popular name would be more apt if the American equivalent, "spade foot," could be made general in this country. These frogs are patterned shades of olive green, with occasional reddish spots, and possess a sharp-edged digging spur under each foot with which they burrow into the soft earth of the vivarium.

Three or four of the Black and Yellow Salamanders should be included, and, when purchasing these, try and get one or two specimens where the yellow predominates, and one or two with the black prevailing, for the sake of contrast. Salamanders may breed in captivity, and cheer the uneventful days of winter by presenting you with babies, as mine did on Christmas Day.

For some unexplained reason newts do not seem to receive the attention they undoubtedly merit, and, although it must be admitted that their colours show to better advantage through the glass of an aquarium, certain of the species are eminently suitable for the community vivarium. Tempting though the field is here, we must at all costs avoid overcrowding, and I would suggest a pair of the Japanese Newts, whose brilliant carmine underparts will be a revelation to the tyro, and a pair of the still more beautiful Marbled Newts. The latter are amazingly patterned in green and brown, while the males possess a conspicuous, serrated crest. These newts will spend a large part of the year in the water, and may spawn.

Finally, there are the lizards. These will provide a note of extraordinary agility and colour in the vivarium, where they will invariably choose the sunniest spots in which to bask during the intervals of their gambols, and, in their predilection for sun, they will have little competition from the other inmates, the majority of which seek the shade. It is amusing and rather wonderful to watch them in the late afternoons, as the shadow line of the sun creeps across the vivarium. Very slowly, but quite definitely, they keep just ahead of the retreating sun line, until the farthest limits of the vivarium impose a final barrier. Three or four each of the Green Lizards and Wall Lizards will be suitable.

Here we have an association of reptiles and amphibians which experience has shown will live together in amity, and in some approximation to their natural surroundings, and it will be obvious that if this number and variety of creatures are kept in small, separate vivaria, there will be an increase in labour and a decrease in practical and æsthetic efficiency out of all proportion to the initial trouble and expense involved.

It is only to be expected, with a mixed collection as described, that, should spawn or young of any of the inmates appear, certain precautions will be advisable. With the exception of the lizards, which are unlikely to breed, the young of all the species detailed are born in the water, and when the eggs are deposited, or at latest when the tadpoles appear, these should be removed to a separate tank if it is desired to raise the young. Newts are gluttons where tadpoles are concerned; and even if no newts are present, maturing, tadpoles and baby Salamanders will prey on smaller larvæ.

Finally, a note on feeding. Ideally, the lizards should be fed in the morning, and the rest of the occupants at dusk. If this is inconvenient, however, it is better to place all the food in the vivarium at dusk. Broadly speaking, the food requirements of all the inmates are small worms, gentles, meal worms, and flies. For the newts, tadpoles of the Common Frog make a welcome and readily procured addition to the diet in early summer.

Answers to Readers' Queries (Continued from page 302)

Vallisneria and *Sagittaria* leaves by eating the surface off them, leaving them thin and transparent. I at once removed the snails and placed the aquarium in a sunny position, thinking this might help the plants to recover. After a week of sunshine, I discovered all the plants were clogged with blanket weed, but in spite of this the *Myriophyllums* were flourishing, so I took them out and cleared out as much blanket weed as possible, cleaned out the aquarium, washed the sand and replanted the *Myriophyllum* and *Ludwigia*, being the only plants that looked worth saving. The aquarium is now standing in my N.E. window again, but I notice the blanket weed is beginning to form over the plants and even one or two coloured pebbles I have on the bottom. I have purposely refrained from introducing any more fish yet, because I want first to learn how to maintain plants in a healthy condition. I have read numerous text-books, which tell me the cure for blanket weed is to shade off the light, but I know from experience that this makes the plants unhealthy. What do you advise?

A.—In your letter you say that your tank is 9" x 9" x 16"; does this mean that it is a tall, narrow one with a small surface area, or is it 16" long? If it is 16" deep, plants will grow well in it, but fish will not do well. If, on the other hand, it is 16" long, both fish and plants should flourish. We would certainly advise you to keep the tank in a light place, in spite of the blanket weed. If you get the plants well established and flourishing, the blanket weed will eventually die out. There is always a competition for food between the two, and if the plants once get going well they will eventually get the upper hand and starve the blanket weed out. One other thing which encourages the growth of blanket weed is hard water; try setting up your tank with rain water to which has been added sea salt in the proportion of one level teaspoonful of sea salt to twenty gallons. We would not advise you to add fish to the tank till the plants are well established. If you feed the snails on fish food, lettuce, or vermicelli, you will find that they will stop attacking the plants.

The Axolotl

By E. M. ATKINS (Concluded from page 273.)

A CONVENIENT and cleanly method of feeding axolotls is to give each animal pieces of meat, etc., to suit its size, on the end of a glass tube or with forceps. This is easily and quickly done, as the axolotls seldom refuse to snap at the food, but if it is practised they will not seek food for themselves. If the axolotls can be accustomed to it they will tear pieces from strips of meat, etc., suspended in the tank.

In all cases of feeding with meat or fish small pieces become detached and fall to the bottom, and to prevent contamination of the water, the tank should be well stocked with snails and *Asellus*. The axolotls eat the *Asellus*, but, provided that there are stones under which they can shelter, some will escape and breed.

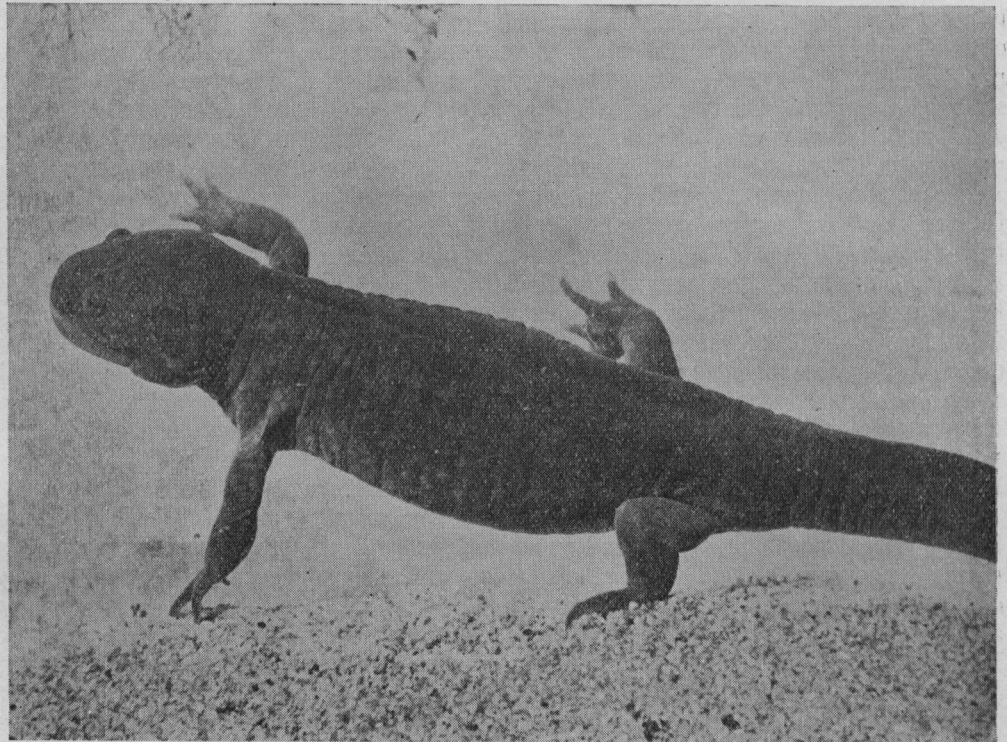
Shrimps are devoured at once, and there is no chance of keeping a stock in the tank. Snails are also frequently eaten.

The breeding of axolotls is a comparatively easy matter, though many keepers of axolotls complain that they never get any eggs. This is probably due, in most cases, to the fact that the axolotls are fed too frequently. Most carnivorous reptiles and amphibians require large quantities of food at long intervals, and any variation from this natural requirement is likely to upset some of the functions.

Axolotls are stated to be sexually mature at six months old, but, in the writer's experience, they do not usually breed until about two years old, and will continue until they are at least ten years old.

In the full-grown axolotls the male can be distinguished from the female by the fact that the cloaca is larger and protrudes. The male usually has a rather smaller head, and has what we are accustomed to consider a more effeminate appearance, but this is not definite enough for sexing. Fertilization occurs before the eggs are laid, the males depositing their spermatophores, which consist of small cones carrying spermatozoa on the top, on stones, etc., and the females picking them up with the lips of the cloaca.

The eggs, which usually number several hundreds and are about the size of frogs' eggs, are deposited on water plants, to which they firmly adhere. It is very necessary to have a large quantity of plants, which may be floating, in the tank at this time, as otherwise some of the eggs will be deposited on stones and on the sides



Amblystome (metamorphosed axolotl). During metamorphosis the gills are lost, the tail becomes rounded, and eyelids are developed.

of the tank, and it is a very difficult matter to remove them without damage.

Spawning seems to take place at any time in the year, and very often in the winter, when it is difficult to find food for the young. It nearly always occurs after fresh water has been put into the tank, or when the water has got colder than usual. To expedite spawning, therefore, some of the water should be removed and fresh cold water added, and to delay it the tank should be left severely alone. Spawning can apparently be caused by semi-starvation and feeding at long intervals, and can be prevented by over-feeding.

The development of the young axolotls can easily be seen, and they usually hatch out in about a month, but the time varies considerably in accordance with temperature. Before the eggs hatch the plants with the eggs adhering should be removed to another vessel, with water about 4" deep. The vessel containing the eggs should be placed in a fairly good light, so that the young axolotls can see their food easily, but it should have some plants in it to afford shelter. The newly born axolotls are about $\frac{1}{4}$ " long, and they begin to feed as soon as they hatch. At first they take minute forms of life, such as *Infusoria* and water flea larvæ, but after a few weeks they will eat ordinary *Daphnia*. They grow rapidly and will soon eat blood worms and *Enchytræ*, but *Daphnia* may form a staple food till they are 2" long, if enough can be procured. If *Daphnia* are scarce, the small axolotls will eat chopped *Enchytræ*.

Young axolotls eat an enormous amount of food, and to be healthy they should be eating nearly all the time.

Generally, it is impracticable to rear more than a few dozen owing to the amount of food required.

When about an inch long, young axolotls sometimes develop what appears to be a sort of rickets. They shrivel up in the hinder quarters and soon die. Exposure to sunlight for an hour or two each day seems to have a very beneficial effect; in any case, very young ones should have a little sunlight occasionally, if practicable. The young axolotls exposed to sunlight should have some plants provided for shelter.

After a few weeks on *Enchytrae*, etc., the young axolotls will begin to take small ordinary earth worms. At about this stage they will begin to vary considerably in size, and the larger ones will devour their smaller brothers and sisters. If it is desired to try and save them all they must be separated into various sizes and kept apart. Their brothers and sisters would, however, in a state of nature, form part of their food, and they appear to thrive on them exceedingly.

Axolotls seem to be very little subject to disease after they reach the worm-eating stage, and, if they are protected from violence, they may be considered to have a good chance of a long life—ten years or more.

Axolotls have been bred out of doors in this country, but very seldom. The writer has had axolotls in outdoor ponds for several years, without observing either eggs or young, although the axolotls have lived quite well, and have survived being under ice for a week or more. Possibly eggs have been laid and the young have been hatched and eaten.

Axolotl eggs and very young axolotls put into small outdoor ponds in spring do very well, except for enemies. About 10 to 20 per cent. survive and develop quite as well as those fed indoors, but the others fall victim to their own kind, beetles, water boatmen, etc. *Asellus* and shrimps will also kill very young axolotls.

Bill Walks a Birmingham Garden

MY suggestion that four-year-old Happy might like a Tortoise was received dubiously. Would he be frightened, would he be interested, and would it live in a Birmingham garden?

The only way to answer these questions was to try, and so Bill was installed in a large depression, boarded round to prevent his escape, and the reactions of Happy were closely observed.

Happy was fascinated. Bill was so unlike a dog or a cat, or a bird, and, best of all, he could be picked up without fear of bites, scratches, or even of uncanny wriggling. True, Happy shouted once, "I see his legs. They is 'orribul,'" but his curiosity overcame him, and now Happy plays in the garden, takes Bill from his enclosure, places him on the lawn, and lies down to watch his head flicker in and out of his shell, and to observe how he eats grass.

The great merit of Bill is that he is no trouble and costs nothing to keep. All he requires is access to water and to grass, lettuce, cabbage, dandelion leaves, or other vegetation. If placed in the garden and left, he shows a skill in making his way into the neighbouring garden, but in his enclosure he cannot escape.

This enclosure is half covered with long grass, and has

Should any reader wish to metamorphose axolotls, the best time to operate is probably the stage at which they would metamorphose if they did not belong to this particular variety of *A. tigrinum*, i.e., when about one-quarter or one-third grown. The desiccated thyroid tablets obtainable from any chemist will effect the change. The axolotls to be operated on should be placed in a vessel with only about 2" or 3" of water and a 2-grain tablet of thyroid dissolved in the water. This will sometimes start the metamorphosis, and occasionally it will continue without further treatment, although the axolotls are placed in water free from thyroid later on, but it is usually necessary to give them about one grain of thyroid in pieces of meat or fish several times to complete the metamorphosis. If the water gets foul it should be changed.

The metamorphosis usually takes several months, by which time the gills have disappeared, eyelids have developed, the flat tail has become more rounded, and the animal has become smaller.

Metamorphosis does not always go on well. Some axolotls metamorphose quickly and regularly and eat well throughout, but frequently they eat very little, and it is difficult to give them the necessary doses of thyroid, but with care they can generally be made to complete the metamorphosis eventually.

Facilities for leaving the water should be provided. Amblystomes vary considerably in their preference for land or water. Some will stay on land for months and then go into the water for months at a time, while others seldom leave the water.

Amblystomes naturally go into the water for breeding. Those metamorphosed by feeding will breed, but the writer can find no record of the breeding of amblystomes produced by the injection of gland extracts into axolotls.

a saucer kept supplied with water. An exit gives Bill a chance to burrow in a large box underneath a heap of shavings, and here, when the cold weather arrives, he will sleep during the whole of the winter, waking up with the warmth of the sun in spring.

Tortoises cannot be tamed as other creatures are, but they have been known to recognize providers of food and even to answer a call, and Professor Romanes recorded several Tortoises which would show their affection for certain people by tapping with their mouths on the persons' boots.

Tortoises do not like rain, and Bill hurries to bury his head beneath a tuft of grass at the first sign of a shower. When he walks as it were on tip-toe and eats much grass, we know we shall have rain before long.

The keeping of Tortoises to devour garden pests is a fallacy, yet fallacies persist. One Birmingham man even kept a Tortoise in a cellar to drive away mice, little realizing that when the Tortoise hibernates mice and rats eat its feet and so kill it.

Bill is rapidly becoming a favourite, and even ladies who approach him with a delicate shudder because he "creeps," stay to admire the quaintness of the slow-moving pet.

CHARLES H. LEA.



HOLIDAYS are in everyone's mind just now, and there must be many readers who will soon be shutting up their homes and going away for a fortnight—or more if they are among the lucky ones—leaving their fish behind them. Those who are pond owners will do so with an easy conscience, for their fish will manage quite well in their absence on the flies and small water creatures which they can catch for themselves, liberally supplemented, in the case of the more vegetarian species, with mouthfuls of algæ and the tender young shoots of water weeds. The only thing the pond keeper need look to before taking a well-earned holiday is the cleanliness of his pond. The fish will not suffer from starvation, but disaster may overtake them if excess dried food, unhealthy plants, or dead fish or mussels are left to decay and foul the water.

The aquarium keeper, on the other hand, is likely to be a little perturbed as to what to do with his fish while he is away, for he knows that they will get no natural food. If he is also a tropical enthusiast there is the added complication of temperature regulation. With a little forethought, however, he can overcome his difficulties and go away with an easy mind.

As with the pond, the first essential is to see that everything is scrupulously clean and there is no risk of the tanks becoming foul during the owner's absence. Care should be taken also to see that the tanks are not overcrowded, and if the fish can possibly be thinned out so that they have more than their usual allowance of space, so much the better. This especially applies to cold-water species, which are likely to suffer from shortage of oxygen if the water gets at all warm.

Temperature regulation is also very important, perhaps more with a view to preventing overheating than chilling. Make quite sure that your tanks will not be left exposed to direct sunshine during the middle of the day, especially if they are situated in a greenhouse, for this will cause the temperature of the water to rise rapidly to a dangerous height. With regard to the lower limit, with Tropicals this may need some attention, especially if the nights are cold, so that if the tanks are not thermostatically controlled it is best to arrange for someone to come in occasionally and keep an eye on the heating

arrangements. If this is not possible, insulate the tanks as much as possible with felt or blankets; the temperature will be sure to rise during the day, and the insulation will help to prevent it falling too low at night.

With regard to food, if the fish are well fed before the holiday they will survive two or three weeks without showing any marked ill-effects—this does not apply to fry, which need continuous feeding. Give the fish as much live food of all kinds as they will take during the week before you go away. Of course, it is better if they can have a few meals during your absence, and frequently the services of a neighbouring aquarist can be enlisted for this purpose. Do not entrust the job to a non-aquarist friend unless you can be quite sure that he will do it properly, for it is far more dangerous to overfeed than to underfeed. This danger can, however, be guarded against to a certain extent by leaving very careful *written* instructions pinned up by the aquariums or putting the requisite portions of dried food in little labelled envelopes. If an aquarist friend is not available, probably your best plan is to entrust the task to some schoolboy whom you know is interested in animals. Boys of, say, 10—15 years of age are usually very keen and quick to learn, and they will often be proud to take on such a responsible job. If you know of such a boy, and can show him beforehand just how you feed the fish, you need not worry about their well-being, especially if you assist his memory by leaving written instructions.

Volume II

This issue of *WATER LIFE* is the last of Volume II, and the Index will be included next week. Back numbers are obtainable from these offices, price 2d. each, plus postage, for those who wish to complete their sets. Those wishing to have their copies bound, in black rexine with gold lettering, should send them, together with a remittance for 5/6, to The Marshall Press Ltd., Milford-lane, Strand, London, W.C.2. Complete bound sets of Volume I and Volume II are available at 10/6 each.

Obituary

It is with great regret that we learn of the death, as a result of a road accident; of one of our contributors, Miss D. E. Sladden, D.I.C., C.M.Z.S. She had been engaged in research work at the London Zoological Gardens, and was particularly interested in tropical fish. Shortly before she died, she finished a paper on breeding Angel Fish, which gives fuller details than any previously written on this subject, and is a valuable contribution to fish-keeping knowledge. We feel sure that our readers will join with us in offering sympathy to Miss Sladden's relations and friends.

* * *

Conceit is more often than not an outward manifestation of an inward sense of inferiority. Stupid people are frequently conceited because they are subconsciously frightened of being found out; scared that some perceptive eye will pierce through their facade and discover the timid confusion behind it. As a general rule the most uppish people I have met have been those who have never achieved anything whatsoever.—By Noel Coward, "Present Indicative."

Encyclopaedia Aquatica

(HINTS AND TIPS FOR BEGINNERS)

"Green Terrapins"

VAST numbers of the pretty little green-shelled American Terrapin, *Chrysemys scripta elegans*, have been imported into England this year, and they have found their way into the smallest pet shops, and always at a reasonable price, so that many folk, attracted by the miniature size and pretty colouring, have purchased the little fellows without being fully aware of their requirements.

Green Terrapin, American Turtle, Pigmy Tortoise—it is all the same little creature, the Elegant Terrapin, christened with what the dealer hopes is a good selling name. Some more patriotic persons bought their "Terries" as Coronation souvenirs, for one bright professional had the idea of decorating the carapace with patriotic symbols in the form of flags and portraits of the King and Queen. Still, whatever the name or decoration, the requirements of the long-suffering little Terrapins are the same.

Firstly they are almost completely aquatic in habit. The home for a single specimen or a couple may be a small glass aquarium about 1' long, or a large bowl, china or enamelled. There should be a layer of washed coarse sand on the bottom, and a depth of water about 4". A few flat stones will enable the Terrapins to get into shallower water, or out of it altogether, while some pieces of moss on the "dry land" will improve the picture. Duckweed, or better still, *Salvinia*, can be floated on the water. This little tank should be placed in a sunny window, or even right out of doors while the weather is warm.

Since they left America, which may now be some months, the majority of these Terrapins have not had a square meal, so that if you want to get them into good condition, and ready to live over the winter, you must feed them well and regularly. Small pieces of raw meat, particularly liver, fish, and small garden worms, are easily obtained. Blood worms, white worms, and large *Daphnia* are greatly appreciated, but the "Terries" are not likely to receive these unless they fall into the hands of aquarists. A "special imported turtle food" is sometimes offered at the same time as the "Terries" are purchased. This, as far as can be told from naked-eye examination, consists of nothing more or less than dried ants' "eggs," or pupæ, the food value of which, even supposing they are eaten, compared with the other things easily obtainable in any house, must be approximately nil. But fresh live-ant pupæ, which may be got in almost any garden by turning over an ant heap, are greatly enjoyed. A few

should be floated on the water surface, when the little fellows soon learn to bob up and take them.

Give the Terrapins as much as ever they will eat, but excess must be cleared away, lest it foul the water, it being, of course, understood that they feed in the water. It will be necessary to change the water at least in part sometimes, and care should be taken to see that the new water is at the same temperature as that removed.

For further details about them, and details as to how to winter these and other Terrapins and Tortoises, readers are advised to purchase No. 3 of the WATER LIFE series of booklets, which is *Land and Water Tortoises, Their Care in Captivity*.

Glass Rocks

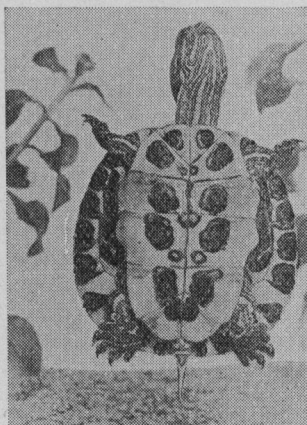
Large, irregular pieces of coloured waste glass and china can be used effectively in the decoration of the aquarium and at the same time are quite cheap. The pieces as bought have no rough or sharp edges, the lumps having been allowed to solidify from the liquid mass run off from the furnaces. Sometimes, however, the original piece is too large, or the wrong shape, and with the aid of a hammer the lump is chipped into a better form. Care should be taken to see that after this has been done no sharp edges are left, as we have come across a few cases where fish have seriously cut themselves by rubbing against the sharp, knife-like edges left after chipping these lumps. It is, no doubt, far better to leave them exactly as they are bought, for then there is little chance of any of the edges being at all sharp.

Sunshine and Fish Houses

The sunshine is now very strong in the middle of the day, and those aquarists with fish houses with glass roofs or sides may quite likely be troubled by green water, or the scorching of their floating plants. White-washing the outside of the glass is a usual remedy, but the use of a preparation known as "Summer Cloud" has much to recommend it, for besides being more durable and easy to apply than whitening, it is not white, but an attractive blue green, with the result that it transmits a pleasing, suffused light of a colour setting off the aquariums to great advantage. It can be obtained in a packet at most nurseries and gardening stores.

Poisonous Fish

A consignment of Weever Fish—the only poisonous fish native to our coasts—has arrived at the Aquarium. Spines carried on the dorsal fin and gill covers connect with poison ducts and inflict wounds analogous to those of venomous snakes. These little fish are abundant in sandy bays and come inshore at this season when they not infrequently puncture the feet of persons bathing and paddling. The sting can be severe enough to incapacitate the victim for several weeks. The name "Weever" is derived from the old English word "wivre" signifying viper.—*Observer*.



Elegant Terrapin