WATER LIFE

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Geckoes

By "AMPHIBIUS"

IT always seems such a pity to me that nearly all the Geckoes are nocturnal. They are most intelligent and sharp little creatures and of great interest to zoologist and hobbyist alike. It must be admitted, however, that their habit of spending the daylight hours in the darkest corner they can find does militate against the popularity which they would otherwise enjoy.

They constitute a widespread, numerous, and successful group of animals, however, and everybody knows that they are the lizards with a "voice." The sounds they produce have been successfully made to fit the imagined words of various hearers, but actually the noise is that which we make when we are annoyed or want our horse to hurry up, and as the Gecko produces it in precisely the same way as we do, *i.e.*, with tongue and palate, this is just what we should expect. From their ability to "chuck" in this manner they are widely known in the New World as "Croaking Lizards." Their other outstanding peculiarity is their ability to run up a smooth, vertical surface and upside down across a horizontal one. They are enabled to do this by means of the little suckers at the ends of their fingers and toes. These suckers are not sticky pads like those on a Tree Frog's fingers and toes, but true suckers whose musculature enables little vacuums to be created below them, thereby affording a strong hold. They move swiftly, but in jerks, and have the unfortunate habit, when one believes them to be sound asleep, of darting with great suddenness out of their cage. If this should happen (and I am afraid it always does) before one has had time to tame them, they must on no account be seized by hand. They are not able to inflict a bite that would hurt even the smallest child, but if touched while in a state of alarm they at once shed their tails. The readiness with which they practise this autotomy is, it is true, nearly equalled by the rapidity with which they reproduce the lost member, but, as with all other lizards, the new tail never looks so nice as did the one it replaces.

There are no species able to pass our winter in a state of hibernation, and they have to be kept warm the whole year round. Almost any kind of case will do for them, the type I have previously described in WATER LIFE being admirable. An ordinary angle-iron aquarium, with a wire gauze and glass lid, is good and gives them the most room for the minimum outlay. Because they are nocturnal, their case must not be put in any old corner, for on sunny days they will emerge from their nests and—apparently—go to sleep in the hottest rays of the sun.

They will live very happily with other lizards of about their own size and with smallish tortoises and

A Gecko, running up a vertical sheet of glass by means of the little suckers at the ends of its fingers and toes. Its tail has apparently been injured at some time, as it has developed a forked tip.

terrapins. Experience has taught me that it is not always wise to keep snakes and lizards together. Unless there is lots of room, not more than a single Gecko should live in a case, as viciously quarrelsome individuals are frequently encountered, but they only quarrel with their own kind. The best type of furnishing consists of a heap of logs (those sold for fires do quite well) nailed together with suitable gaps between them, into which the Geckoes can go to sleep. If these are provided the Gecko will probably not cling permanently to the glass sides of its case. If there are several of these heaps and a few bits of bark on the floor it will be safe to introduce several individuals. Each will find his own sleeping quarters.

Any small dry live food (not slugs, etc.) is eaten readily, bluebottles being a favourite. The last are carefully stalked and then seized (or missed very often) after a quick dart. Appetite varies, as is usual, with temperature, much food being taken in summer, while considerable intervals may occur between feeds during colder weather. There are several standard anecdotes to be found in all natural history books about little Geckoes taking up residence in houses and making accurately timed appearances at mealtimes in order to eat crumbs, etc. Knowing a bit about the feeding habits of these lizards, I have a strong suspicion that " crumbs " is a euphemism to conceal the identity of sundry small creatures which the best people are reluctant to admit share their house with them.

Returning to their little habit of making unexpected dashes for liberty, it is as well to keep handy a small cardboard box with a hole cut in one side, the box being fixed to the end of a stick. When they escape (it will be observed that I regard escapes as inevitable), the box should be cautiously brought up to them, and five times out of ten the escaper will run through the hole into the dark interior of the box, from which he may be returned to his cage still in possession of a tail. On the other five occasions Gecko will make straight for the back of the largest, heaviest, and most difficult to move object in the neighbourhood. One then gets a stool and a long stick.

Geckoes do not drink from pots, and it is a good plan to wet plants (if any) in their cage, or one of the logs near where they will emerge from the heap. They lick up drops of water with their tongues. They are remarkable for lizards in that they have no movable eyelids, and the nocturnal forms, which constitute the great majority of the group, have a vertical pupil, like an alligator. The male Gecko is said to be larger than the female, but as there are no means of determining whether an animal is an adult female or a young male, the statement is not of much use. The presence of pre-anal pores is diagnostic of the male, but the pores are not a constant feature. The female lays one or two eggs only at a time, but perhaps she may lay several times in a season. The first thing a baby Gecko does after hatching is to hide as securely as possible, since the only food a Gecko likes better than bluebottles, grasshoppers, and spiders appears to be baby Geckoes. Fortunately, the baby seems aware of the risks to which his entry into the world exposes him.

Ecdysis occurs once or twice in the summer and is rather a long job, the skin being shed in ragged little bits.

Of the kinds sometimes available those from extra-European habitats seem to be no more difficult to keep in good health than the several species from the Mediterranean shores. Commonest here are the Tarentola (*Tarentola mauretanica*), of which considerable numbers are exported from Italy, and the tiny Leaf-fingered Gecko (*Phyllodactylus europæus*) from Sardinia. The Fan-footed Gecko (*Ptyodactylus hasselquisti*) used to come in some numbers with skinks and chameleons from Algiers, but I have seen none for years now. It is a lovely lizard. The colour of Geckoes seems to be restricted to fawns, greys, and browns, but all possess considerable powers of colour-change. They are, as lizards go, small; from 3-in. to 6-in. seems to be the average size.

Very occasionally an odd specimen or two of the giants of the East comes into the market, but the price is such that such as I get no more than a good view of them from afar.

I have said nothing about the desert forms, since it has not been my good fortune to own any. They lack, of course, the suckers on the feet. I once watched one at the Zoo, but it died shortly afterwards.

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Marine Fish that Aestivates

By PETER MICHAEL

IT is a well-known fact that some fresh-water fish, as well as certain mammals, reptiles, and batrachians, hibernate, either completely or intermittently, during the winter in cold or temperate countries, including our own. In contrast, certain creatures pass into a condition of torpor during the hottest and driest parts of the season in tropical countries, the sluggish condition in this case being known as aestivation. This, naturally, occurs most frequently in countries where severe droughts are of periodical occurrence; and some creatures are so equipped by Nature as to be able to endure long periods of drought buried in mud or sand. Aestivation is practised by several species of tropical fresh-water fish, most of which belong to the family *Siluridæ*; these can exist in moist mud, and may even live for a while where not a trace of water is to be found.

Up to a few years ago, it was thought that all fish that hibernated or aestivated were fresh-water species; at least, all previous examples discovered had been of the fresh-water type. In 1933, however, a discovery of considerable scientific importance was made by Dr. S. L. Hoar, of the Zoological Survey of India. At Uttarbagh, near Calcutta, Dr. Hoar discovered a marine fish which buries itself in mud to a depth of 6-ft. or so and sleeps throughout the summer. This unique fish, an elongated Goby of the genus *Pseudoapocryptes*, burrows into the mud when the creek in which it lives dries up; it then becomes torpid, and presumably remains in its burrow till the creek again fills. A hole at the top of the burrow permits air to reach it. The fish was comatose when removed from the mud, but it commenced to breathe in the normal way on being placed in water.

The Gobies are essentially coastal fishes.

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Whatever is beautiful, is also profitable.—*Willmott.*

Encyclopaedia Aquatica

(HINTS AND TIPS FOR BEGINNERS)

Meal Worms

THE vivarium enthusiast makes meal worms one of the staple articles of diet for his pets, and the aquarist, too, uses them for his large Cichlids, Sunfish, etc. We are often tempted to buy a larger supply of these " worms " than is immediately needed, because they are cheaper to buy in bulk. Sometimes a lot of " worms " in the container will go damp and all die. This can be avoided with a little care. Keep them in a good size tin in a dry place and feed them with bran and brown bread or flour. A banana skin placed inside down on the surface of the bran occasionally will provide food for the meal worms and keeps the mass at the right humidity. The most important thing of all is to clean the culture regularly. About once every fourteen to twenty-one days the whole tin should be emptied into an ordinary household sieve and then well shaken. This cleans the " worms " of all excreta and other dirt. They are then returned to a tin of fresh food. Kept in this way they will live for ages and always be clean and palatable.

Telescope Eyes

The name " Telescope " has stuck to those fancy Goldfish with greatly protruding eyes, presumably because the extended appearance of the orbit gives an impression of an optical telescope. But it should not be assumed that this condition in any way enhances the vision of the fish, or enables it to see distant objects considerably magnified. Quite the reverse; in fact, fish with " telescope " eyes are extremely short sighted; they have difficulty in seeing their food and often habitually bump into the hard sides of the aquarium, injuring their eyes. Not only is the range of vision of the eye reduced by the shape, but the size of the cornea, the part which actually receives the visual impressions, is greatly reduced, so that the fish is only able to see in a relatively dim manner. This should be borne in mind when selecting companions for " Telescopes," for among normal fish they are not likely to get many of the tit-bits, owing to their visual deformity. The Chinese call these fish " Dragon eyes," and perhaps that is a better name.

Egg and Milk

" Amphibius " recently gave us a good tip in relation to feeding exotic reptiles during the winter. We asked advice about a Chameleon who had gone off his food, and it was suggested that the creature be given a fairly thick mixture of egg and milk, or meat extract and milk, with the aid of a fountain pen-filler. The Chameleon certainly enjoyed the mixture, which he quite readily took, allowing the end of the filler to be put right into his mouth. Sad to tell, however, he succumbed, being rather too far gone before this treatment was started. We decided to try out the same idea on some exotic lizards who greatly miss the summer sunshine. Very quickly they have learned to recognize the filler and they hold up their heads and open their mouths in joyous anticipation as soon as it appears. At first we had a little difficulty with an Algerian Skink, who was getting under the weather, for when he did open his mouth he immediately closed it again, clamping down on the thick part of the filler and crushing it. This shows pretty considerable strength in the jaws of a small creature. We got over this trouble by making a new barrel for the filler from a piece of extra-thick-walled glass tubing.

Concrete Edges

The pond goes comparatively neglected at this time of year, and it is difficult, unless a major operation, like the building of an extension is proceeding, to know what to do. Here is a little matter which may give someone a pleasant afternoon. Garden ponds often have very uninteresting concrete edges. Usually what happens is that the pond is built with due regard to size, depth, provision of shallows and bog garden, but the finish of the outside edges remains for fate to decide. Such edges can be very ugly. It is very easy to disguise them successfully with good thick turves laid over, just reaching the water. Even in the hottest weather these will not get scorched, and quite a number of small, moisture-loving plants may be grown there successfully.

Marsh Shield Fern

Of all the pondside ferns, the Marsh Shield Fern (*Lastrea thelypteris*), is at the same time one of the most beautiful and the most hardy and useful. Though it prefers a peaty soil, it will grow quite well in clay right at the water's edge, and it delights in a foot bath. It is a lover of sunshine, but in a more shady position its profusion of verdant delicate green leaves delights the eye.

It is a rapid grower and soon covers the ground with its brown roots. At its best the fern reaches a height of about 2-ft. It begins to come into its glory in May and does not fade and fall until early November.

L. thelypteris is particularly suited to the water gardener's purpose, and should be borne in mind when ordering new plants for the waterside, as many readers will no doubt be doing very soon now.

* * *

New at the London Zoo are some Chameleons from Madagascar. These lizards are well known for their habit of " shooting " insects by darting forth a long, sticky-tipped tongue and collecting the insect prey on its tip. The Madagascar Chameleons do this on the grand scale. The lizard is over a foot in length—an outsize for Chameleons—and it " shoots " not only insects, but also wall lizards.

Anyone who has seen the wall lizard darting about the walls and rocks in the South of France or Italy will appreciate the " slickness " of the tonque that can catch such a prey. This Chameleon takes several such lizards in the course of a meal, and each vanishes into a countenance as inscrutable and emotionless as that of the Sphinx.—*Observer.*

The Mud Frog

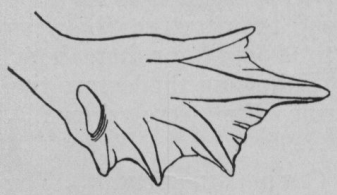
By L. G. PAYNE

I ALWAYS think that the Mud Frog, as it is known by English dealers, deserves a more attactive name. In North America this "frog" (which incidentally is really a toad) is called the Spade Foot, which name provides a practical clue to a characteristic of the genus. In Europe we have two species—*Pelobates fuscus* and *P. cultripes*. Details of the latter, however, by reason of its comparative rarity, I will omit.

The Mud Frog occurs in many of the low-lying parts of Europe ; notably in the flat lands of Holland and Belgium, where, in early spring, numbers congregate in the deep dykes. In this species the call note of both sexes is nearly similar. The sound is rather well represented by the ticking of a grandfather clock.

This frog is definitely of the "squat" type. The limbs are somewhat short and sturdy, but the lover of amphibians who looks for, and finds, beauty in the eyes of all frogs and toads, will not be disappointed. The eye is prominent, with a golden iris, the pupil being dark, vertical, and narrow. Coloration of the frog is variable, and, for the purpose of this article, may be described as being olive grey in contrasting shades, relieved by reddish-brown spots. In one specimen in my possession the marking is so bright as to render it one of the most attractive inhabitants of the community vivarium. The skin is comparatively smooth, and the warts not prominent.

The Mud Frog at maturity will have a body length of about $2\frac{1}{4}$", being somewhat smaller than the common English Frog. In the majority of species it is recognized that there is a distinct disparity in the relative size of the sexes when adult, the females being the larger, and in some cases they are sexed by this character. Males and females of the Mud Frog vary little in size, but, fortunately, sex differentiation is simple and definite. The male is adorned with a long, oval gland, measuring about $\frac{1}{3}$" by $\frac{1}{8}$", and situated on the top, or outside, of the fore limb. It is therefore unnecessary to "man-handle" your Mud Frogs to discover if you have a potential breeding pair! It is curious that this is the only European frog in which the pads of horny granules on the fore legs are absent at breeding time. Is it one of those exceptions which always go to prove a rule, the rule in this case being that the pads assist the embrace of the pair?



The female Mud Frog does not enter the water until ready to spawn; the embrace is consequently of short duration—again in contrast to our native frog. The eggs are deposited in a band, which may be $\frac{3}{4}$" thick, this being wound between, and supported by, water weeds. The tadpole commonly develops to the amazing length of 4", with tail, the body exceeding 1", and is therefore the largest of European tadpoles. It should be noted that length of tadpole bears no relation to the size of the mature adult.

We now come to the razor-like, horny shovel which is arranged obliquely to the axis of the hind foot. When the hind legs are drawn up, *i.e.*, when the animal is at rest, this spade lies in a plane with the foot; but when the latter is fully extended, and the frog is engaged in burrowing into the soil, the effect is to set the spade at an angle of about 60°, and this naturally assists considerably in shifting the soil. The frog by this means is enabled to burrow rapidly. In the wild state, except at the breeding season, most of the hours of daylight are spent underground, but at dusk it comes above ground to search for beetles, worms, etc.

This frog is reputed, on the best authority, to scream like an infant if teased or angered, but although I have occasionally subjected mine to a few slight pokes, I must confess that I have not yet had the doubtful pleasure of corroborating this statement.

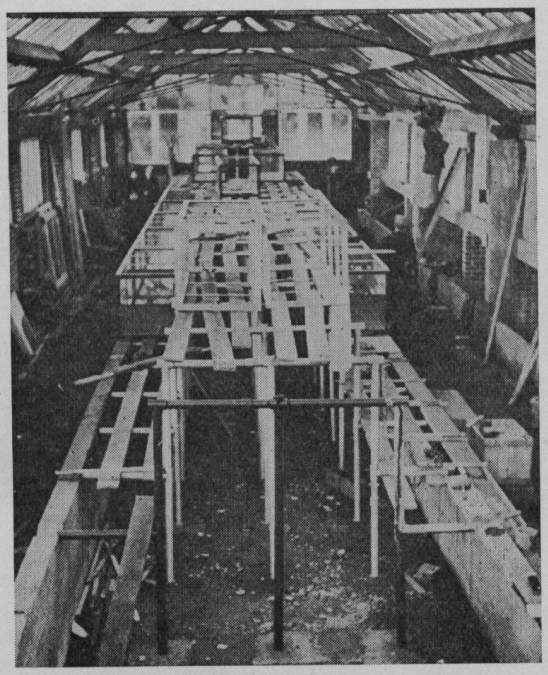
The Mud Frog, under conditions of confinement, presents no difficulties. It is a hardy, friendly, easy-to-feed creature, and these qualities alone should endear it to the fancier. In my outdoor vivarium, where the winter temperature descends below freezing point, the Mud Frogs retire under the soil about the end of November, and will frequently reappear in late February; subsequent frost may send them underground again for a few days. The longer one has these frogs in captivity, the more diurnal they seem to become, and I have frequently seen them feeding in the early afternoons. They will take the usual food of batrachians; flies of all kinds, beetles, worms, and gentles. They must, of course, be provided with water sufficient to immerse themselves, and they should also have about 6" of earth in which to burrow out of reach of frost. The usual vivarium complement of bark and moss is desirable for temporary shade and shelter, and long periods of bright sunshine should be avoided in the summer.

If the vivarium be kept indoors throughout the winter, in a warm room, the Mud Frogs will remain active, and will naturally require feeding. One final point in favour of this frog is that its medium size

(*Continued on page* 35.)

News by the Way

LAST Sunday found us near Hemel Hempstead, and we called in at Messrs. Cura's establishment at Water End. The new fish house is progressing apace, and a number of the aquariums are actually in position, and filled with water for their preliminary soak out. The house promises to be the biggest and finest in the country. Over 130′ long, it will contain sixty 8′ aquariums, apart from side pools. Each tank is being equipped with individual heating apparatus with separate control, so that the temperature of every tank may be adjusted to suit the occupants. In the old house we saw some very nice Black Paradise Fish, and a number of American Terrapins about 4″ long. At this size the latter prove much more hardy, and likely to have longer lives than the tiny creatures which each year in early summer make their appearance in such large numbers in almost every pet shop. In one tropical aquarium we noticed an electric heater of a type which we do not remember seeing before. The actual heating element was, as usual, enclosed in a metal casing, but attached to the outside of the aquarium by a clip was a small switch box with three levers. By operating these according to a code given on the side of the box, six different heating powers can be obtained, 15, 30, 45, 60, 75, and 90 watts. We understand heaters with a higher maximum are available, and, according to Mr. Cura, this type of heater, which has much to recommend it, has proved very reliable.



The new Fish House at Messrs. Cura's establishment, Hemel Hempstead

We took this opportunity to go over to Markyate to see Mr. Brandish and his fish house. This fish house is essentially a breeders' establishment, there being no pretence of a collection of fishes. More particularly Mr. Brandish has specialized, with the result that not only has he mastered the breeding and rearing of several species, but he is producing large numbers of very good quality fish, Veiltail Goldfish, Fighters (*Betta splendens*), Dwarf and Blue Gouramies, and a special line of what appear to be improved Czechoslovakian Gold Guppies. These are a very pure gold colour in both male and female, the mature males showing little extra colour other than bars or stripes of pale red. We find these attractive fish, particularly as they are of a real gold coloration, which shows well in the female. Strangely enough, earlier in the week we had received several fish of exactly similar type from Mr. Wiggall, of Cheltenham, who has apparently been working on similar lines for some time past.

A description of the fish house will be of particular interest to many of us, for it is built on very sound principles, which have been borne out in practice. The house is 13′ long by 7′ wide inside. The walls are brick built, double, and air spaced. The roof is ridged and all glass, and is again double, with an air space between. Entrance to the fish house is through a double door with a small chamber between. This prevents sudden blasts of cold air in the winter months. The house contains twelve 48″ x 18″ x 15″ deep aquariums arranged at two levels, six on each side of the house. Again we came across a double heating system designed to eliminate, as far as possible, the risk of a violent fall in temperature, should one source of heat fail. The main heat is derived from 4″ heating pipes fed from an anthracite-fuelled water boiler. Large electric thermostat-controlled heaters along the walls automatically switch on if the temperature falls below 72° F.

It was very delightful to see young fish in such large numbers. An accurate estimate of the several shoals is impossible. But in one tank there were about 150 1½″ Dwarf Gouramies, in another 200 young Veiltails. As far as possible Mr. Brandish feeds live food, but the staple diet at this time of the year is a special mixture of his own, and one which quite apparently the fish relish, large and small falling to with a will. A cup of fine oatmeal has two eggs thoroughly stirred into it, a small quantity of water and a pinch of salt are also added, and the mixture is cooked until it thickens.

Mon Aquarium

Editor: O. GUARANI.

The enthusiastic aquarist is for ever seeking for more information concerning his hobby, and he is always glad to hear of new books, new periodicals, etc. For those who read French we heartily recommend the Belgian monthly, "Mon Aquarium." The present issue (December) is a special number, and includes articles on: Raising Fighting Fish; *Scatophagus argus;* Diseases of Aquarium Fishes; The Marine Aquarium at Monaco; *Tubifex;* Feeding Aquarium Fishes; and Breeding and Rearing Veiltails. It is well illustrated, and contains a colour plate supplement of Fighting Fish. Price 6d. Obtainable from Mon Aquarium, 103b, Rue Royale, Brussels.

The Mud Frog (*Continued from page* 33.)

renders it eminently suitable for the community vivarium. It will not interfere with a smaller inmate, neither will it b attacked by a larger.

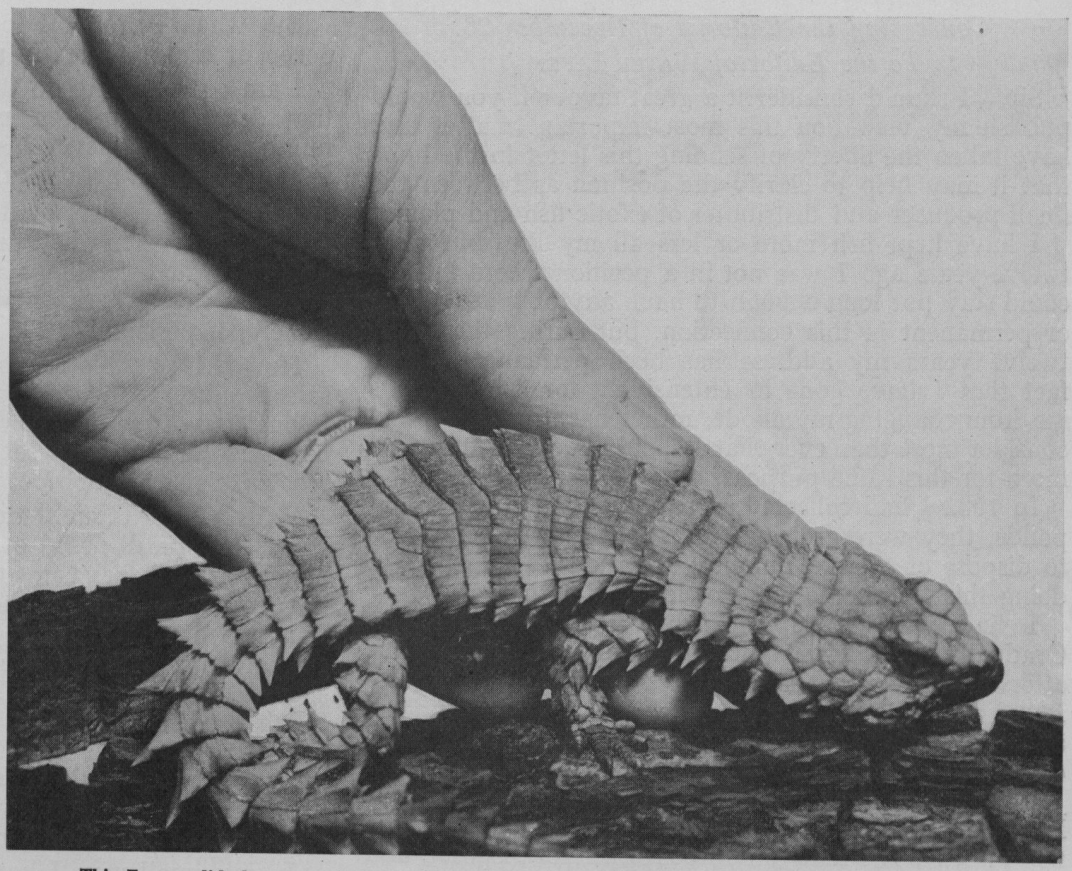
There seems to be no reason why the Mud Frog should not breed successfully in captivity, and the amateur whose frogs present him with a rope of fertile spawn may well feel that he has been able to keep this species under conditions as nearly perfect as possible.

Zonures

By "AMPHIBIUS"

ZONURES form a group of highly specialized desert livers and several members of the family find their way into the animal market from time to time. Whenever one sees a sandy-coloured, spiny, rather flat lizard, one can be sure that it comes from a desert, since these are the characters which have been separately evolved in connection with the habitat. Apart from the Zonures, these same characters are shown by the Horned Toads of North America, and the Mastigures of Africa and parts of Asia.

A feature of the desert as an environment is the extremely high temperature during the daytime, rising to a maximum of perhaps 110 deg. F. at noon. Less well known is the fact that it falls almost equally steeply during the night, the difference between maximum and minimum temperatures being sometimes as great as 65 degrees per day. Taking this into consideration it is not surprising that Zonures are extremely tolerant of wide temperature ranges in captivity.



This Zonure did show a tendency to dart away just when he was particularly required to keep still and so he had to be "assisted" to "hold it."

They live extremely well, requiring only a glass case, floored with about 6-in. of powder dry, rather coarse sand, and a few rocks behind which they can hide. Aloes and Cacti—in pots—may be set in the sand and add greatly to the appearance of the case, but are not necessary from the animal's point of view. A small vessel of water must always be present as they drink quite a lot, but they never bathe. It will be noticed that their requirements are precisely those of many Skinks and small Tortoises, and all of these will live in complete harmony together. On the whole, though, Zonures will thrive if required to do so at a temperature considerably less than that required by Skinks, but both families agree in appreciating the maximum light available. During winter this may well come from an electric bulb slung over the case in a manner which I have previously described.

As they require such very dry conditions they cannot be confined in a totally enclosed case (totally closed except for ventilation, of course), since condensation will quickly wet everything. This is unfortunate since it means that an isolated case cannot be so economically heated. As regards food, Zonures favour us in that they thrive indefinitely on a diet of meal worms. The more such a diet is varied, the better, and in this respect nothing in the insect line comes amiss. In spite of their formidable appearance they may be handled with impunity from the time of purchase, and can be relied upon not to bite. In temperament they are solemn and deliberate little things, much of the day being spent gracefully posed upon a rock or log in whatever sunshine there is. They sleep at night either buried in the sand or behind the stones. Needless to say it is a good thing to put them outdoors during the summer, either in their case, or else in a suitable enclosure. In the latter case I have made a practice of returning them to their case at night, although I do not think it would prove absolutely necessary to do so.

They do not dart away just as one is explaining how gentle and tame they are, and neither have they the irritating habit of skipping about shedding tails if anything unforeseen happens to upset their equilibrium. I think they may properly be described as the most suitable lizard for beginners to start with.

Of the sorts available the Common Zonure, from dry regions of South Africa, is cheap and plentiful, some idea of the numbers in which it occurs being given by the fact that I was once informed from Durban that I could have 100 as often as I liked during the season. Lord Derby's, or the Giant Zonure, is the other species to be had here. It is an enlarged edition of the first species mentioned, and in no way differs in its requirements.

Troost's Terrapin

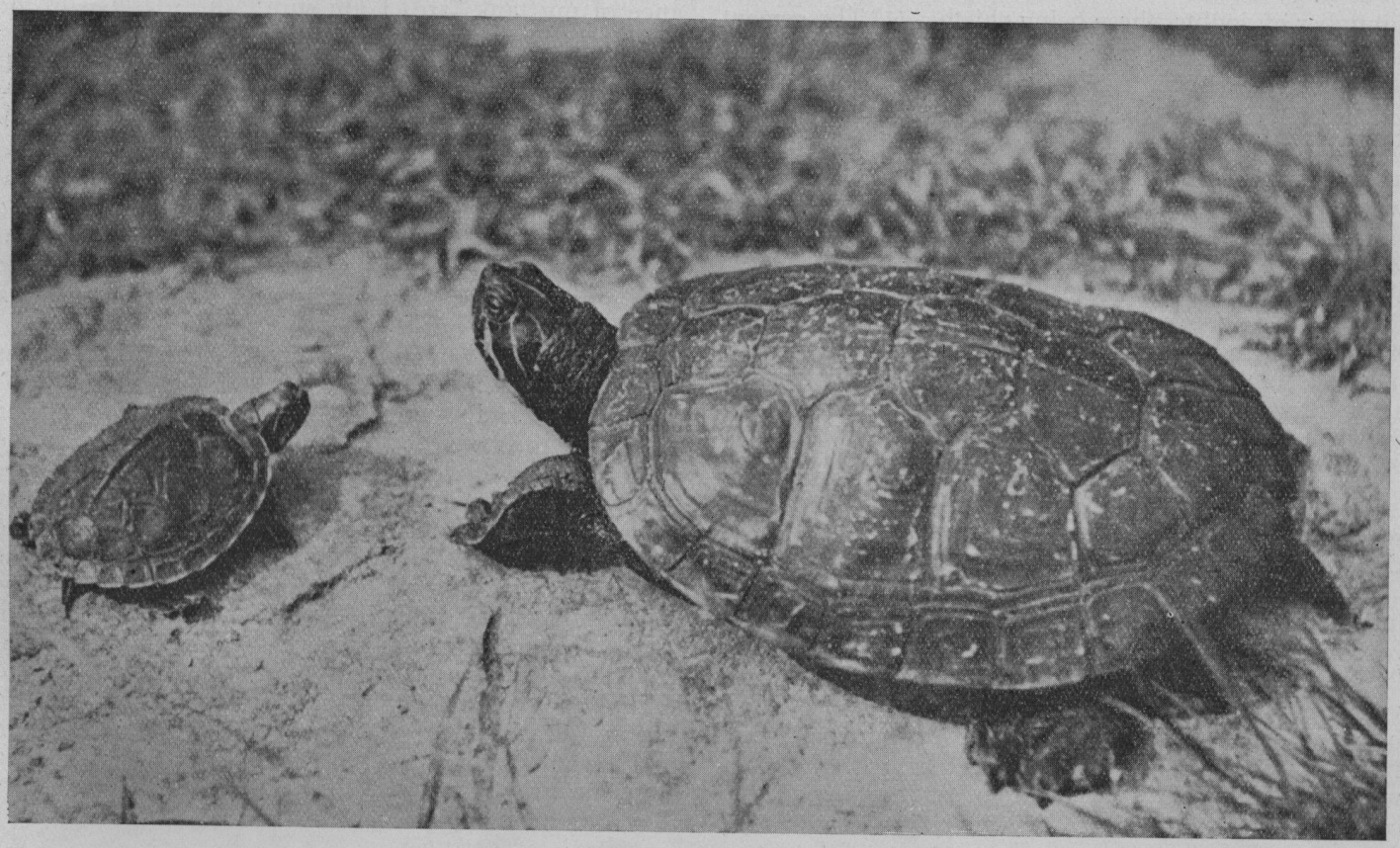
Pseudemys (Chrysemys, Boulenger) troosti

A NOTE or two about this Terrapin may be opportune, as " Troost's " is the proper name of the little yellow-lined, blackish Terrapins, of which a small number can usually be seen in the consignments of Elegant and Lettered Terrapins which the dealers now have. Professor Troost sent some specimens from the Cumberland River in 1836 to Professor Holbrook, who was then writing his famous " North American Herpetology," and the discoverer's name has been associated with the species therein and ever since.

Adult specimens find their way to Europe from the food markets of certain towns in the south-eastern States of the U.S.A., as this species is one of those eaten, both fresh and canned, as a substitute for the Diamond-backed Terrapin. Its shell in youth is decidedly higher than that of the Lettered Terrapin, and there is a slight median keel which persists throughout life. Its colour is such a dark green as to appear almost black and is patterned with orange or yellow lines. The pattern on the back becomes obscure with age. The plastron is clear yellow in youth, and dark, patchy areas appear as the beast grows up. Head, limbs, and tail are black with yellow lines, and the eyes are green. The maximum size is 10-in. (shell only) and it is found over a very wide area of the south-eastern States. Being a river tortoise, it likes clean water and plenty of vegetation. In captivity the former requirement is easily fulfilled, but for reasons which will become clear later the vegetation must be restricted to handfuls of *Elodea*, Duckweed, and Frogbit.

The little babies are somewhat hardier than their elegant relatives, and if kept warm and well lit during their first winter they come through it in fine style and nearly double their autumn weight. When all risk of frost is over they should be transferred to outdoor quarters.

Troost's is a surface-swimming Terrapin, which makes it an attractive animal for the garden pool. It will spend as much time out of as in the water during spring, summer, and early autumn, but rarely ventures more than a foot from the water's edge. It is most gentle in mixed company and requires as a rule no more than five or six days in which to become thoroughly tame. It is—especially when young—largely vegetarian, and Duckweed is one of its favourite foods. Lettuce and thin slices of melon are eaten if floated on the water. It is useless to set marginal plants, such as *Sagittaria, Alysma,* Water Dock, etc., as this Terrapin will deliberately bite through the stems close to their origin. The leaves, having as a result fallen into the water, are consumed at leisure and entirely, and, since this occurs however well one feeds the beasts, I have abandoned all efforts to plant their pond. This is the only factor in a most delightful Terrapin's disfavour. In addition to the vegetarian food Troost's requires a daily meal of meat of some sort, worms, and occasionally a few meal worms. As this species is one of the small-headed *Pseudemys* Terrapins, its meat requires to be chopped extremely small. To give a big bit and allow it to be torn up in the water makes the latter very dirty and bloody



Club Reports

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

THE SHOOTERS' HILL AND DISTRICT AQUARIUM AND PONDKEEPERS' SOCIETY.—The first annual general meeting of the society was held at the regular meeting place at Eglinton-road School on January 10, with a full attendance of members, when officers—chairman, secretary, treasurer, and reporting secretary—were elected for 1938. A lecture on aeration and aerators, with details of their home construction, was given by Mr. R. Wynne. The next of the society's fortnightly meetings will take place on January 24, when a lecture on the treatment of diseases of fish will be given by Mr. R. J. Wood, A.I.C.—W. G. Key, Hon. Reporting Secretary, 8, Cleanthus-road, Shooters' Hill.

CARDIFF AND DISTRICT AQUARISTS' SOCIETY.—The monthly meeting was held on December 7. Mr. Holloway opened by discussing the show and its results and complimented all who took active part in making the show the great success it was. The President, Dr. G. F. Petty, then addressed the meeting. He paid high tribute to all persons responsible for the success of the club and said that the progress of this society, only twelve months old, was very gratifying. He then distributed the prizes and cards won at the show.

At the first show held last year, after the society had only been established about a month, sixteen tanks were put up, and a very creditable display was made; this year, the entries were more than doubled, showing increased membership and greater enthusiasm all round. Those who visited the show were very proud of its attractive appearance and general layout.

The officers for 1938 were then elected: President, Dr. G. F. Petty; Vice-President, J. Clissold, Senr.; Chairman, E. Holloway; Treasurer, B. Parkhurst; Secretary, R. J. King; Librarian, E. Angwin; Committee: T. A. Clissold, R. T. Leylande, A. J. Trimnell, W. P. H. Templar, L. J. Jones. These are the same officers as last year, with two additions, namely, Vice-President and Librarian.

It was decided to inaugurate a junior section of the society, membership 1/6 per annum, this section to start from the next monthly meeting. The annual subscription remains the same—3/6 per annum.—R. J. KING, Hon. Sec.

SUFFOLK AQUARISTS AND PONDKEEPERS' ASSOCIATION.—A meeting was held at the County Hall on Friday, January 21. There was an attendance of twenty-four members, including our President, Mr. L. H. Vulliamy, to hear Mr. L. G. Payne give a talk on "Reptiles and Amphibians." Several specimens were brought along by Mr. Payne to illustrate his remarks, and these, of course, aroused considerable interest. Among them were European and Spanish Terrapins, Japanese, Marbled, and Italian Crested Newts, Green and Wall Lizards, and Tree, Mud, and Edible Frogs. A contrast was observed when Big Bertha, a Dalmatian Toad with a body length of 12-cm., and the Australian Sealing-Wax Toad, only ¾" long, were shown.

Mr. Payne explained the habits and sexing of the specimens, and recounted various experiences, particularly with keepers who did not seem to believe that a grown man should be looking for frogs and toads. An experience that proved profitable was when Mr. Payne was on holiday on the Continent last year, and found a breeding ground of Midwife Toads (these carry their eggs on their backs). He caught the night boat back to England, with a collection, made a round of the dealers next day, and sold them for £15. With the aid of photographs members were then introduced to "Toad Hall," a glass and brick structure in Mr. Payne's garden, and also the lizard house. This concluded the talk, and time was allowed for questions and answers. Mr. H. Spencer, of the Museum, accorded Mr. Payne a hearty vote of thanks for his instructive remarks, and also for coming so far from London to oblige our members.—F. P. Huggins, Hon. Sec.

THE LEEDS AND DISTRICT AQUARIST SOCIETY.—The members of the above society held their second competitive show on January 19. Entries were limited to two species—Guppies and Zebras. These being common species, which are to be found in almost every community tank, it was thought that beginners would be encouraged to show. The competition was judged by ballot and a discussion on the merits of each fish took place after the voting. In expressing opinions as to each fish's good points, and by showing members the points to look for in show fish, it was thought that members would be induced to consider more seriously the quality of their fishes. Absence of data on the show points of tropical fish was deplored.

Mr. Snow, the President, gave a short talk on three different species of fish: Climbing Perch, Orange Chromides, and Catfish. These fish were also exhibited by the speaker.

The next meeting, to be held on February 16 at the Church Institute, Albion-place, Leeds, will consist of talks by four different members, each member being allowed fifteen minutes. Visitors welcomed.—SPENCER ANTHONY, 55, Upland-grove, Leeds.

* * *

The World in a Drop of Water

(*Continued from page* 59.)

which, by waving energetically about, are responsible for the whole creature rolling along through the water.

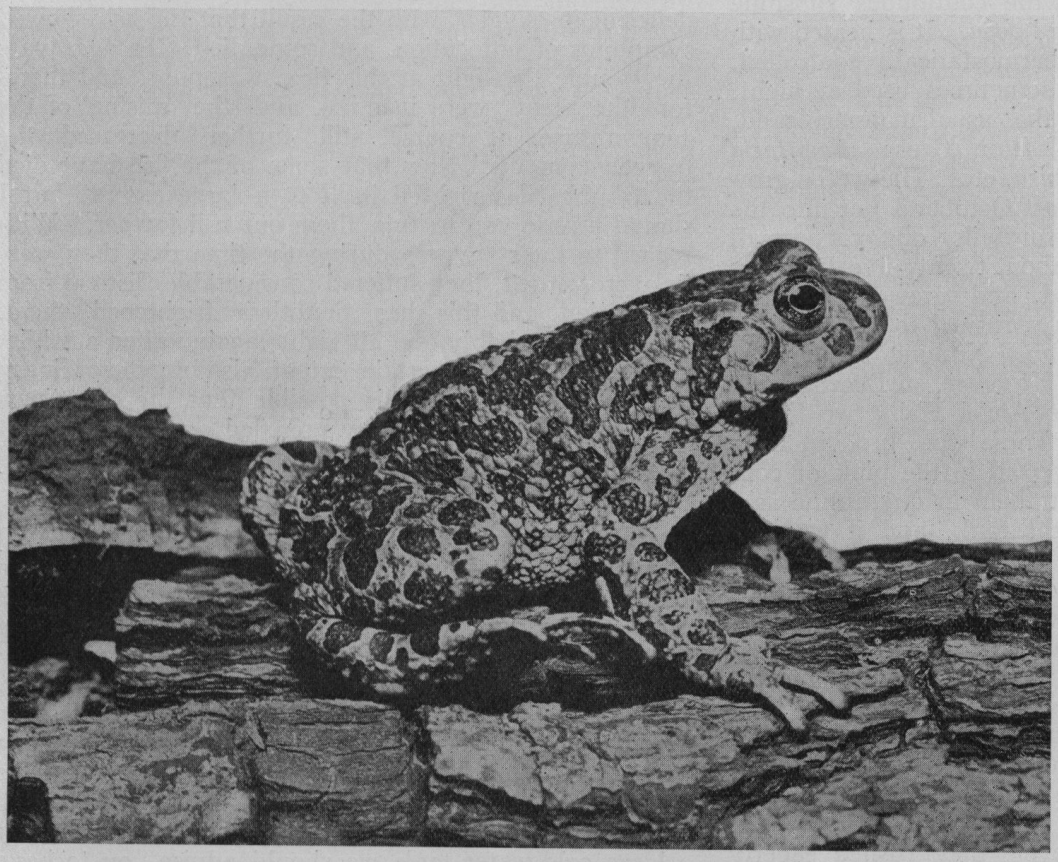
Within this parent globe smaller but similar spheres may be seen revolving, and when eventually the old Volvox breaks up, the young ones escape from their temporary prison, and float away on their own account. The interesting point in connection with these creatures is that, although by watching them rotating and swimming through the water one might conclude that they were animals, they are actually classed as plants! Yet for some time there was much controversy amongst botanists and zoologists, as to whether they should be placed in the animal or plant kingdom—however, the botanists won.

Reproduced by courtesy of "The Microscope."

The Changeable Toad (*Bufo viridis*)

By L. G. PAYNE

THE subject of this article has two generally accepted English names—Green Toad and Changeable Toad. The former is a literal translation of the Latin, and in the early days of scientific nomenclature would have been sufficiently descriptive for a short title. The term " Changeable " may possibly be a dealer's designation, but is sufficiently alluring to catch the public eye and possesses the additional advantage of being " founded on fact."



This toad has a peculiar distribution in Europe, being found in all countries except France and Spain, and it would be an interesting ecological problem to determine the factors which appear to prevent its crossing these purely artificial boundaries.

In describing the males and females of this species, one almost feels that two entirely different kinds of toads are under review. The colouring varies within somewhat wide limits, and to be dogmatic would be misleading. It has been my fortune to see many hundreds of males, but the number of females could be counted on the fingers of one hand. Adult females of the Green Toad give pride of place to no other occupant of the reptiliary in their striking contrast of colour. Large, irregular, olive-green patches are blotched on a groundwork of creamy white. Underparts are whitish and frequently spotted with black. Females commonly attain a length of 3-in. The males are smaller and usually of a more uniformly yellowish green. Nuptial pads on the inner fingers are very distinct. In both sexes the eyes are large, with green-veined iris and dark, oval pupils. The transparent nictitating membranes are frequently brought into use. A series of reddish spots on the flanks and brown tips to the toes give a " finished " appearance to the toad.

The breeding season extends throughout spring and early summer. As many as 10,000 eggs may be deposited by one female. These, as in the other European species of *Bufo*, are emitted in long, gelatinous strings and are wound round the submerged stems of water plants. The tadpole is small and does not exceed 1¾-in.

Green Toads become very active with the approach of dusk. They seem to combine the hopping and crawling movements of the Common Toad with the running of the Natterjack.

In captivity the Green Toad does much better if it is not confined. By this apparent paradox I mean that the animal will not really thrive in a small vivarium. The lover of amphibians will recognize at once the difference between "existing" and "thriving," and no true fancier can be content with the former. It is not easy to persuade the Green Toad to feed when surrounded by glass and iron, but the same toad in the comparative freedom of the reptiliary becomes a different creature. He is at once alert and awake to the movement of any beetle or caterpillar which may be put before him. Gentles will be accepted, but winged insects which come within reach are an especial titbit.

In common with other amphibia, the Green Toad likes to get well out of reach of frost before the approach of winter. Spells of mild weather may, however, induce a temporary reappearance, and, as I write these notes in mid-January, I have a lady Green Toad on the desk in front of me. This was taken from the open reptiliary with a ground temperature of 46 degrees. Two other factors would appear essential to the winter appearance of amphibians; these factors, which are present to-night, are the absence of strong wind and a tendency to rain. Worms are abundant and a few wood-lice are in evidence.

For those amateurs who are not in a position to give their Green Toads the run of a reptiliary, I would suggest that the best chance of success will be obtained by giving attention to the following points. Aim at

(*Continued on page 72*)

Club Reports

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CROYDON NATURAL HISTORY AND SCIENTIFIC SOCIETY.—A meeting of the aquarists' section was held on January 26. Mr. C. H. Ward lectured on "Fighting Fish." He began by saying that Fighting Fish were very hardy and free from disease, and were in his opinion one of the most beautiful of tropical aquarium fishes. He then went on to describe the methods which he uses in breeding these fish. A tank one-third filled with water is divided by a glass partition, and the male and female put on either side. When the male has built a bubble nest the female is introduced to him by removing the partition. Spawning usually takes place within a few hours, and afterwards the female is removed. At a temperature of 80 degs. the young hatch in two to three days. Here Mr. Ward emphasized the absolute necessity of giving the young fish a plentiful supply of *Infusoria* if good fish are to be reared. As the young fish do not develop their labyrinth organs until six weeks old, aeration is used until then. As they grow older they are fed on *Daphnia,* and gradually brought on to vermicelli and proprietary foods. Mr. Ward did not recommend chopped earth worm, as he thought this was inclined to give them dropsy. Reared in this way, the lecturer said that he had had fish which were mature at three months old. To develop the finnage, the fish should be kept in a small receptacle. Mr. Ward then told us of many interesting experiences in the breeding of Fighting Fish, and showed us the three fish which he had brought with him.—G. B. YEATES, Hon. Sec. Aquarists' Section, 58, Downton-avenue, Streatham Hill, S.W.2.

HARROW AND DISTRICT AQUARISTS' CLUB.—The last meeting was held on January 26, the lecturer being Mr. A. Fraser-Brunner. The title of the lecture was "Popular Aquarium Fallacies," and, judging by the number of questions asked and the interest shown, members not only spent a worth-while evening, but received some very excellent tips and advice, which undoubtedly will serve them well in the future. Mr. Fraser-Brunner was warmly thanked by the club for his lecture and visit. The next meeting on February 9, at the "Half Moon," South Harrow, will take the form of an "exchange and market," and any aquarist in the district interested in this venture is welcome to attend.—F. J. Boardman, Hon. Sec., 49, Sherwood-road, South Harrow.

THE GUPPY BREEDERS' SOCIETY. — A new aquarists' society, the first specialist club to be formed in the British Isles, has been started, and, judging by the response from Guppy breeders all over the country, bids fair to develop into quite a large concern. Unlike the usual aquarium club, it deals exclusively with one variety of fish, and as a result of the efforts which are being made by the members in the production of super fish, it is hoped that the present-day type will give way to greatly improved specimens. Standards are being produced for six distinct varieties, and the club has the means of assisting other clubs with their shows by guaranteeing classes for these fish; club secretaries should bear this in mind when arranging shows, and avail themselves of this help. Membership is open to all, and costs a modest 4/- per annum. Full particulars may be obtained from the Hon. Secretary, 64, Penton-avenue, Staines, Middlesex.

SOUTHEND AND DISTRICT AQUARIST SOCIETY.—On Wednesday, Jan. 19, a meeting was held at the Crowstone Café. It was very well attended, and an extremely interesting lecture, entitled "Feeding of Fishes," was given by Mr. Morris. He spoke on the values of dried, prepared, and live foods, and suggested how they may all be included in a fish's diet. We were all very interested to know how fish can be fed on cooked vegetables, and what benefit they get from them. At the close of the meeting there was a table show of *Platypoecilus*, which was very well supported. At our next month's meeting there will be a table show of Swordtails, any variety.

BRISTOL AQUARISTS' SOCIETY.—This society held its annual general meeting on Monday, Jan. 24. The report and statement of accounts were adopted. The election of officers took place, and Mr. R. G. Watson was elected President. Other officers were: Vice-President, Mr. H. Gould; Treasurer, Mr. I. Dawes. The Committee was re-elected *en bloc*. Our Secretary, Mr. H. S. Amos, was retiring after eight years' unbroken service, and Mr. H. C. B. Thomas, of 46, Wolseley-road, Bishopston, Bristol, was elected to take his place.

Arrangements were made to hold the annual members' show on March 2. The annual dinner is to take place on Wednesday, March 30. Four new members were enrolled. This society meets on the fourth Monday in every month at the Y.M.C.A., Colston-street, and any interested member of the public is welcomed.—L. G. Burnard, Reporting Sec.

BRITISH AQUARISTS' ASSOCIATION.—The next meeting will be held on Tuesday, February 8, at 8 p.m., at the Y.M.C.A., Tottenham Court-road, and all members, past and present, are earnestly requested to attend.—R. H. SMITH, Hon. Sec., 27, Burton-street, W.C.1.

* * *

The Changeable Toad (*Bufo viridis*)

(*Continued from page 67*)

keeping one pair in good health rather than half a dozen in inferior condition. Provide a small pan of water, 2-in. deep, to which the inmates will readily retire should air conditions in the vivarium become temporarily too dry.

As Green Toads are somewhat faddy in their food requirements, let them have the first choice of insects which you may happen to catch—most of your other amphibians will accommodate themselves with food more easily procured. Finally, keep the vivarium away from direct sunlight.

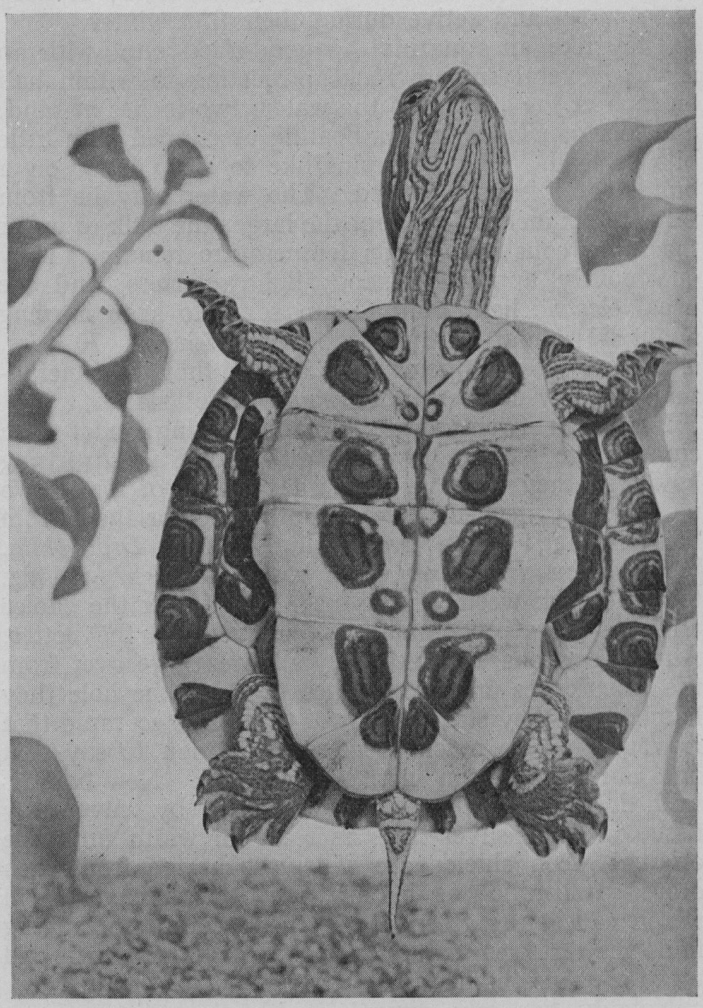
The Elegant Terrapin

By "AMPHIBIUS"

WHEN I was young this Terrapin was named *Chrysemys scripta elegans,* and was considered to be a subspecies or geographical race of the Lettered Terrapin, *Chrysemys scripta.* Since then it has been considered a separate species, and shifted back into its old genus: *Pseudemys elegans.* After all this I expect it will be something of a surprise to learn that the so-called Elegant Terrapin is simply the female of Troost's Terrapin, which I mentioned recently. Such, however, is the belief at the present time of prominent American herpetologists, and is explained as follows by the person who investigated them: All the babies are born as the pretty little green Terrapins with a red line behind the eye, and as such they remain for the first few years of their lives. When between five and six inches long the males (or at least some of them) undergo a process of "melanisation," the green and red coloration giving way to the dark green—nearly black, in fact—of Troost's Terrapin. I have at present an open mind on the question, and in the apparent absence of sufficient museum material to investigate the question, I have written to the States for further information, at the same time drawing attention to two matters which seem to have been overlooked. It is good, however, to learn that the retention of the name "Troostii" is proposed for both, since Troost seems to have been a man usefully active in herpetological circles, and *elegans* would fit a large number of species in the genus *Pseudemys.*

Be all that as it may, *Elegans* (as I propose to refer to it) is a cheap, plentiful, pretty, popular, and at the same time sadly misunderstood little Terrapin. In truth he is quite a tough little fellow, and does not deserve the description "delicate." There is prevalent the mistaken belief that these beasts come from the South-Eastern U.S.A., where there are no very severe winters to be endured, so they do not need to undergo any prolonged period of sleep. This is quite incorrect.

The range of *Elegans* is the area enclosed if a line is drawn from Southern Texas right north to Iowa across through Northern Indiana to Ohio, and then south to the Mississippi basin and back to the starting point. Over a large part of this area (over 70,000 square miles in all, I think) the winters are of extreme rigour. On the Gulf Coast the summer temperatures may go higher than do ours. These high temperatures are, however, *considerably above the optimum existence requirements of tortoises,* so that the very hot summer has no advantages over ours. Similarly, although in North U.S.A. the winter may be more severe than ours, it may be less so in the South. Tortoises cannot distinguish between cold and very cold weather—it's all one to them. As soon as the temperature passes below that necessary for minimal active life, they pass into the state of quiescence known as hibernation. They take care to get well out of the reach of frost by burrowing either in soil or into the mud in the bottom of their pond, and once they achieve this protection, it does not really matter to them whether the temperature is several degrees above or below zero. The chief factor is now the condition of the individual animals: whether they have managed during their active summer life to put away enough food reserves to carry them through.



Regarding hibernation itself, I do not propose to set out here the criteria by which its desirability *in those species which hibernate in a state of nature* has been so firmly established. We cannot do better than try to imitate the conditions under which the beasts live in the wild state, and such conditions, in the majority of the *Pseudemys* species, would include facilities for hibernation. I should like to anticipate the possible objection that *Elegans* in S. Texas would never need to hibernate, by saying that specimens from that part of its range do not get as far as England, all those we buy coming originally from the more northern States down to North Louisiana. Here it is appropriate for me to say that, as far as I have been able to obtain the necessary specimens, I have found that there exist no physiological differences between members of a species drawn from different ends of its habitat. That being so, I should have no hesitation whatever in hibernating Texas specimens if I ever got any.

To get back to our original subject: thousands of little *Elegans* are netted in late summer; sold by the catchers

to the wholesalers, who sell them to the shippers who ship them to English wholesalers who sell them to the pet shops from which we buy them. All this takes time —quite a considerable time, in fact—during which the little mites have no food, and exist under anything but optimum conditions. It is therefore necessary to keep them warm and active during their first winter.

They like an aquarium—a good-sized one—with an island, several smooth rocks projecting to within half an inch of the surface of the water, two inches of sand, and lots of *Elodea,* either floating or clipped with little bits of lead. The Terrapins like to sleep in or on a bundle of this useful weed. The water may be from three to six inches deep, but the larger the bulk of water the more constant will its temperature remain. They enormously appreciate good, light quarters, and the usual electric light bulb (I am sorry to keep harping about it!) about six inches above the island. 70 degs. is a good water temperature to aim at, though a fluctuation of a few degrees either way will not matter.

Fifteen or twenty little Terrapins living under such circumstances are a lovely sight, and it is surprising how well they flourish. A large variety of food—two meals a day needed—is easily provided for them from the following: Meat, liver, fish, *Daphnia, Drosophila,* blood worms, *Enchytræ,* earth worm, Guppies, Axolotls, tomato, duck weed, and lettuce. The wider the choice and the more predominating the live food the better. After two weeks, in which they apparently recover from the experiences undergone since they left the hole they hatched in, they start to grow. Growth is so rapid that it would not be much of an exaggeration to say that one can watch them increasing in size. New bone is laid down, overlaid on the carapace by silver-grey tissue. These silver lines increase in width until the original green shields are widely separated from each other. Infiltration of this new tissue by the layer of oil which causes the green colour then occurs, and spring finds the tortoises about twice their autumn length and up to six times as heavy.

Nobody has any difficulty with them in summer. They will live in a large or small pool, and will remain tame (and very greedy) as long as they are hand fed. When the chill of autumn slows them up a bit, they may be left where they are, which is the least satisfactory way of hibernating them, or they may be loosely packed in earth or moss and stood in a shed, or may be kept in a tank in an unheated but frostproof building on four inches of sand below four inches of water.

I hibernate a number of them and some allied species in a tank on a loggia which faces south. I make a series of caves with bricks and stones below the surface of the water, and the little creatures creep into them or else half burrow into the sand. Drowning is not to be feared since water tortoises practise rectal breathing, and the colder the water the more oxygen goes into solution in it. They can also take an enormous quantity of air into their lungs, which, by the way, occupy most of the space inside the shell. On mild days they will get up and breathe. They must not, of course, be allowed to freeze, but adults do not in the least mind the surface of the water freezing.

Hibernation is not the " near death " that it is often believed to be. Cold-blooded animals can go quite rapidly from hibernation to activity. Since Christmas I have had seven species swimming quite quickly in their pond, but the weather has been most unseasonably mild at times.

The reason why lots of these Terrapins fail to flourish seems to be that many people keep them under conditions which are neither cold enough for them to hibernate, nor warm enough to keep them happy and feeding, and as a result the little things swim dully about, using up energy that is not being replaced, and therefore gradually fail.

The thing to guard against is rickets and a depression which is diagnostic of its early stages. I have stressed the rapidity of growth, and such growth must be consolidated as it occurs by a good mixed diet and plenty of light. Under the influence of a high temperature an increase in size will occur on even a meagre diet, but the growth is unhealthy; the growth rings will be found to be soft, and the outer edge of the carapace falls against the bridge of the plastron. The latter softens, compression occurs, and the Terrapin has hardly room to put his head and limbs in and out. He soon dies. The vegetable foods I have suggested are especially valuable as providers of vitamins and certain bone-forming elements, and should not be omitted. Under no circumstances should Terrapins be fed upon the special Terrapin food sold in tins for them.

As regards breeding, I can only summarize a description of their habits in a wild state. Quite a number of females will set out in search of a suitable nesting site, which may be as much as a quarter of a mile from their pond or river. The texture of the ground is ascertained by scratching, and if it is too hard, the Terrapin moistens it before digging her hole with her hind feet. The hole is about $1\frac{3}{4}$-in. across at the top, $4\frac{1}{2}$-in. deep, and $2\frac{1}{2}$-in. across at the bottom. This flask-shaped nest is commonly met with among Terrapins. The eggs are oval, somewhat leathery in texture and measure about 1.5 x .9-in. The clutch varies with the age of the mother, and when all the eggs are laid she scratches back the soil and flattens it down again. I do not know how long they take to incubate.

* * *

The "Water Life" Aerator

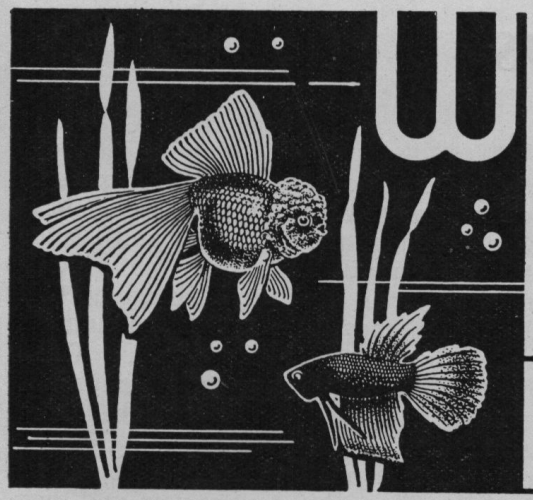
FOR A.C. MAINS ONLY

Owing to the enormous demand for the copies of WATER LIFE containing the article describing the construction of this air pump, they are now out of print. As the demand still continues, however, we have arranged for a supply of copies of this article to be available, price 1/- post free. These are unillustrated, but with the aid of the blue print (price 1/6 post free) readers will have no difficulty in constructing this excellent little aerator.

The copies of the three issues of the paper containing particulars of the second WATER LIFE aerator, which is the oscillating cylinder type, are still available, price 3d. each, post free.

* * *

A stationmaster at a small station near the coast in Scotland constructed a beautiful concrete pond between two sidings. He procured a fair quantity of Goldfish and placed them therein. He had not walked the length of the platform before he heard the shrill cries of some two score Seagulls. They dived and consumed every fish in the pond.—A. H. S. MURRAY.



WATER LIFE

INCORPORATING AQUARIA NEWS

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

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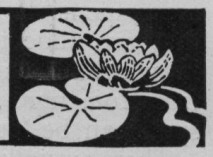


Tortoise Time

By A. E. SPICER

BURIED deep in hay, boxed in far from the light, England's multitudinous tortoises have slept in peaceful oblivion throughout the long winter months, and now the time has come when we must make our preparations to welcome them back to the world of sunshine and dandelions. With an impatience not difficult to understand, some of the livelier specimens will be heard stirring on milder days, and we shall be tempted to unearth them somewhat prematurely. The question of when exactly to bring them out is something of a problem, as our capricious climate seems to delight in giving us alternate spells of warm and cold weather. Some kind of intermediate stage between hibernation and the outdoor life will help to cover this transition period. If possible, the tortoises should be kept indoors for a short time, being put out in the sun, when there is any. A greenhouse is also a good home for them at this time. Later they may be left out all day, if they have a shelter from the rain; but up till near the end of May one must be on the watch for frosts at night, and one's pets will be safer in the house overnight if it is cold.

The hibernation should end during March or April, and when the weather prospects seem favourable the tortoises can be liberated and given a drink. The best way to do this is to place them in a bowl of tepid water; and one must not be impatient if they do not at once begin to drink. The sudden change in their environment must be bewildering to them, and timidity may inhibit their natural impulses at first. After five minutes or so, whether they have drunk or not, they should be taken out, dried, and placed in a warm spot where they can settle down and get used to being awake again. Food must, of course, be offered to them at once. Some tortoises seem to take a long time before they will take anything either to eat or drink, but they must always be given the opportunity.

Any newly purchased specimens may be treated in the same way. One precaution which should not be omitted in their case is "delousing." Parasitic ticks are frequently to be found attached to the folds of skin where the legs join the body, and these should be pulled off with forceps.

Food will consist of practically any succulent vegetable matter, and the first meal should be made as tempting as possible. The appetites of these animals seem to be stimulated by bright colours, and flowers, cherries and oranges are good "bait." The staple diet is lettuce, to which may be added dandelion leaves, cabbage and, in fact, anything going. Frequently they will pick on quite odd things to eat, if given a wide choice. Privet, grass and buttercups have persuaded new purchases of mine to feed where the conventional titbits have failed. A permanent supply of water must be provided in a dish sunk level with the ground.

To introduce the element of novelty, it is worth while buying an extra specimen; or, in the case of experienced enthusiasts, launching out with a more expensive species. Tortoises are so cheap and easy to keep that it is a good plan to add to one's collection each year; this helps to prevent any tendency to boredom which might arise from seeing the same old familiar faces in their enclosure year after year.

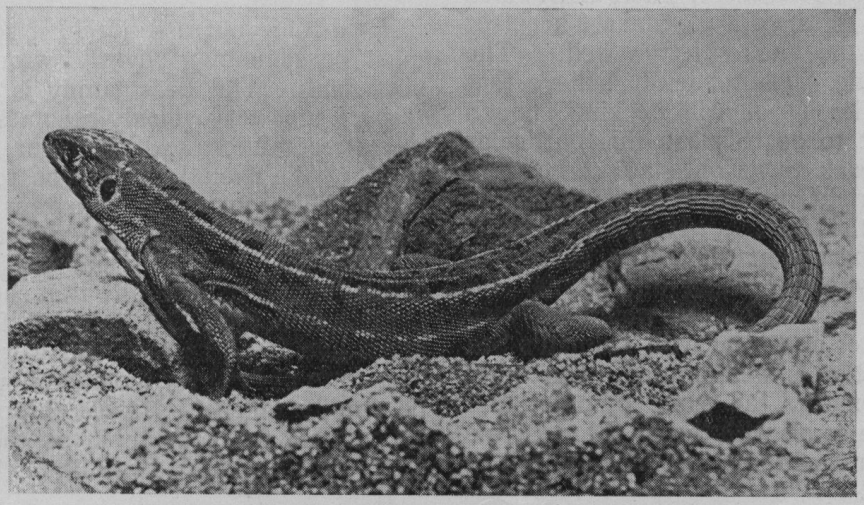
In this connection it is desirable to aim at a steady progress in our hobby. Large expenditure, in an attempt to attain perfection without having first learnt the elements of good practice, will only defeat its own ends. If all goes well, there will be little scope for further progress, and stagnation will be the result. On the other hand, if, as usually happens, the short cut leads to disaster, one is obliged after all to go back and learn by experience. In the gentle pastime of tortoise keeping, it may seem unlikely that one could be over-ambitious; but it is so, and in the early stages the path to success leads not from expensive vivaria and random purchasing of delicate species, but from the humble enclosure in the garden, with its little family of hardy and adaptable Common Tortoises.

The Green Lizard in Brittany

By L. G. PAYNE

EARLY in the morning we set off from our hotel in Brittany with a good lunch and some items vastly more important, to wit: two nets, large and small, a collapsible handle, various tins, and some thin twine—all packed in one of those capacious knapsacks which to the hunter of small reptiles and amphibians who is not keen on answering too many questions from the merely curious, proves a blessing, and indeed almost a necessity.

So up along the narrow sand-blown lane that winds into the hills — but the sand is not blowing to-day, for the breeze is of the gentlest, and a hot sun favours our quest. Out upon the broad headland, with the rolling Atlantic on three sides, the cultivated lands thin out and fields of broad-leaved maize and white-flowered buck-bean give place to occasional patches of carrot or clover. Over these the Swallow-tail Butterflies hover, and, as we watch, a glorious Green Lizard glides slowly from under a patch of carrot leaves, and comes into full view, peering at us with quaint birdlike inflections of the head. Lustrous and metallic green are hackneyed words, but they do exactly describe *Lacerta viridis* in the sunlight.



Green Lizard (*Lacerta viridis*)

An involuntary movement on our part, and away he goes, in short, sharp runs, seeking green cover wherever it may be found. The French peasants erect low boundary walls, and windbreaks, of inverted grass turves, and it is amongst these that the Green Lizards love to burrow. A grass bank of this description will be honeycombed with lizard runs, much as in England a similar site is holed by field mice. We are now on guard, and presently a sibilant rustling, in the long grass at the foot of a windbreak, precedes the appearance of three fine Lizards, which run across a short, bare patch to the sanctuary of the carrot plants. They have left the safety of their burrows to seek their food in the sunlight, for Lizards do not eat or hunt on dull days.

We lie down unhurriedly on the dry patch, and gaze into the jungle of the carrot stems. Two Lizards have taken alarm and are doubtless in hiding not far away, but the third hesitates, and, seeing us remain quite still, regains his confidence and peers around in a jerky manner. This spasmodic jerkiness appears to be the normal action of the Green Lizard, and is characteristic of body, leg, and head movements. As we watch, a mason bee, beloved of Fabre, alights on the ground, and, unsuspecting, begins to preen its wings. This gives the Lizard its chance, and, with a quick rush, the bee is seized. There follows a rapid shaking of the victim, its wings are torn off, and the body swallowed. Are the wings deliberately detached, or is this accidental?

More Lizards appear, in apparent ignorance of our proximity. We must now experiment, and see what chance we are likely to have of taking Green Lizards back to England for our collection. Carefully, the large net is produced and the handle fitted. A handsome 12-in. specimen, with a row of pinhead yellow dots superimposed on the brilliant green, is marked down, the net extended, and crashed on to a carrot plant. The rim, however, fouls a neighbour plant and the Lizard darts away. Again and again this method is tried, but always the Lizard escapes, usually owing to the difficulty of making an effective clamp to earth, but sometimes because the intended victim simply is not there when the net arrives!

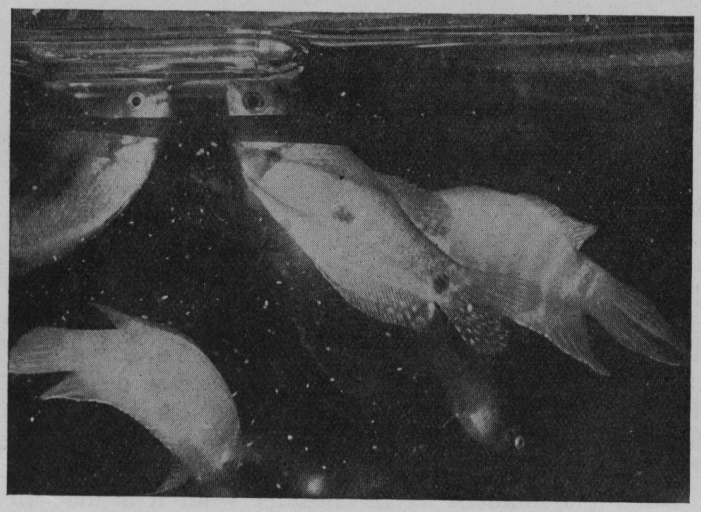
Now this is all very interesting, and even thrilling, but it is also a trifle disappointing, and so I call a halt and suggest lunch. We sit on the short turf listening to the slow roll of the ocean far below, and idly watching white-sailed fishing-boats returning to Cancale.

But again the Lizards claim attention, and—I remember the twine. In Italy, I recall, the peasant boys catch Lizards with a horsehair noose on the end of a stick. I make a slipknot of my twine, and attach this to the net stick, and attempt to lift the noose before a Lizard—but, alas, either because the twine is not horsehair or I am not an Italian peasant, I am completely unsuccessful, and soon this method is discarded.

The sun is high above our heads, it is midday, and we push on along the narrow cliff path. Here the turf is interspersed with prickly gorse—thick, dwarf bushes, which offer certain refuge to the Lizards, which occasionally run in as we approach, while others scamper down the slippery grass declivities seawards where there is no foothold for a human being.

At last we reach the highest point. Below us, a hamlet nestles in the lee of the hill, and there we seek refreshment, where Au Bon Répas invites us to a shaded table. Returning, we skirt the hill, and take a shorter cut through the valley. Here the Tea Plant, *Lycium chinense* grows—a privet-like bush, sometimes used in England as a hedge plant—and here we have a new surprise. We stop to admire the Humming Bird Hawk Moths flitting from flower to flower of the Tea Plant, and, as we look, a Green Lizard runs out along a slender

(*Continued on page* 106)



The Feeding Ring

Live Foods or Dried Foods ?

IT is frequently inferred, by those who favour the use of dried food in preference to live food, that the said live food is necessarily of an animal nature.

Arguing from this false premise, it is then stated that many fish, such as Platies, Mollies, and Fancy Goldfish, *i.e.*, species which are largely vegetarian, do better on dried food than if fed exclusively on blood worms, *Daphnia*, *Tubifex*, etc. Therefore, it is concluded, dried food is better than live.

Naturally, a vegetarian species is likely to thrive better on a good dried food of mainly vegetable origin than if it is fed on " meat." It is often not sufficiently appreciated that the digestive organs of a herbivorous animal are very different from those of a carnivore, and that an animal which is strongly adapted to either of these two extremes is totally incapable of dealing adequately with the wrong type of food.

Live food actually includes both fleshy foods, such as earth worms, blood worms, white worms, *Tubifex*, *Daphnia*, and, of course, raw meat, liver, fish, etc., and vegetable foods, such as algæ, water plants, lettuce, and spinach. The differences between live foods and good dried foods are mainly questions of bulk and vitamin content. Dried foods which are correctly balanced are necessarily too concentrated, and the small bulk does not properly stimulate the action of the intestines, with the result that the fish tend to suffer from constipation. To get sufficient bulk they must include far too large a proportion of starchy foods, and this will often cause indigestion. Vegetarian fishes are accustomed to a large proportion of " starch " in their natural food, and so can deal fairly well with the bulky dried foods. With regard to the other drawback, fish fed on dried food exclusively are as likely to suffer from vitamin deficiency as were the sailors many years ago, when they had nothing but biscuit and salt meat during their long voyages, and consequently used to suffer terribly from deficiency diseases.

Moreover, it seems to me that it stands to reason that creatures which for countless generations have been accustomed and adapted to feeding on aquatic animal and plant life are likely to thrive better on food of this nature than on an unnatural diet of desiccated foods which, at best, have the disadvantages which we associate with preserved foods for our own meals. Good dried foods are very useful substitutes for fresh food, and are much better than a monotonous diet consisting of only one type of live food, but they still are only substitutes, and while, for most fishes, they are quite satisfactory if used in conjunction with live foods, the fish will never be in tip-top condition if fed on dried food alone.

However, you need not take any of this for granted. Try for yourselves. Feed some of your fishes on a good all-round diet of live foods, both animal and vegetable, with due regard to the proper proportion of the two classes of foods for each species; at the same time feed others on dried foods only, and observe the result. It will probably amaze you.

The Green Lizard in Brittany (*Continued from page* 101)

branch at eye level, suddenly sees us, and " freezes " to the twig. So exactly does his contour and colour fit into the prevailing greenery, that we almost gasp, and wonder if it is indeed a live thing. Later this sight was to become a commonplace, and, when in this position, it is interesting to note that the Lizard has two definite reactions depending strictly on the action of the potential enemy. If we stop and look at the Lizard, or point at it, or attempt to touch it, away it goes with such amazing speed along the branch and into the seclusion of the thickest part of the bush that the eye can scarcely follow it; but if we, being aware of its presence, walk slowly by, looking at it, " out of the corner of our eye," it will not attempt to move, even though perhaps only a few inches from us. The reptile seems aware of the camouflage of its environment, and is relying on this.

And so we return to the carrot patch. We approach with some stealth and note a few Lizards still active. We count this fortunate, for the sun has nearly set and the air is cool. Now we stand between the Lizards in the carrot jungle and their home in the windbreak. One or two make a sortie, but retire when our arms are waved. Obviously this is to be our last chance to-day and we wonder if our luck will turn.

Then I realize that fingers and thumbs were made before nets and twine, and so, on hands and knees, I crawl slowly forward to within a foot of where a fine specimen has hidden in a thick mat of carrot leaves. Raising the head, I lean forward, and there, surely, is the tip of the green tail, nearly resembling a blade of grass. Of the body there is no sign, nor can I guess whether this is at an angle from the tail or whether in a line. Nothing for it but to judge as best maybe just where that body is, and so, with rapid movement, eager fingers dive into the foliage. In that same moment comes a squirming, a tighter clasping, and a raising to sight of our first Green Lizard safely caught. His mouth opens and shuts ferociously, but he is quite harmless, and is soon followed into the tin by two others caught in the same fashion.

Enough for to-day—and we'll call it a day—and contentedly return to our hotel.

FOR YOUNG AQUARISTS

Reptiles and Batrachians

THE reptile season starts in March and goes on until September, although some reptiles can be purchased during the winter months, these being kept active with artificial heat, a procedure which tends to shorten the life of any European reptile. Each year I specialize in one type of reptile or batrachian; last year it was Snakes and the year before it was Toads of various species. This year it is Terrapins.

My vivarium or terrarium is simply an old glass aquarium and it serves its purpose very well. The cheapest batrachian that you can buy is the Smooth Newt, which costs you only 2d. or thereabouts, so that you can see it is not an expensive hobby. I have found it very interesting to collect British species; I have had all of them except the Adder and Smooth Snake.

If you prefer to buy your vivarium they can be purchased from most dealers, and are generally made of zinc with a sloping glass front and a perforated zinc door at the back.

Do not make the mistake of buying your specimens almost at the end of the season. If you do you will not have much time to feed them up for a successful hibernation.

I once supplied one of the local shops with about 200 garden snails and they all escaped during the night. Next morning they were found all over the shop, even in the aquariums, and customers were inquiring what the new species of aquatic snail was called!

Toads are very ready eaters, and I recommend them to any intending reptile fan; besides becoming so tame, which makes them in my estimation the most amusing of amphibians. Tree Frogs are also very entertaining, although they will not eat meal worms very readily. Snakes are very showy pets and a four-foot Æsculapian Snake would certainly thrill your friends. Green Lizards are certainly attractive reptiles, but, personally, I do not recommend them as they are not very good hibernators. I think Ground Lizards are the best from the beginners' point of view, and, if you have any spare ground in the garden, do not forget our old friend the Tortoise.

The Crested Newt is a very good inmate for the water vivarium, and its relative, the Italian Newt (*Molge Cristata var. Karelinii*), is even more suitable, as it spends most of its time in the water. Do not forget to give the Newts a floating piece of cork or arrange some part of the vivarium to be above water level, as they are inclined to go on *terra firma* every now and then. A word of warning: do not purchase male Edible Frogs for the indoor vivarium, as they are liable to start croaking very loudly in the middle of the night, which is most disturbing, as you can guess. The various species of Saxifrage are the best kinds of plant for the terrarium, as they are slow growers and make the creatures feel at home. In writing the above I hope I have shown you some of the joys of reptile keeping.—K. ACKROYD.

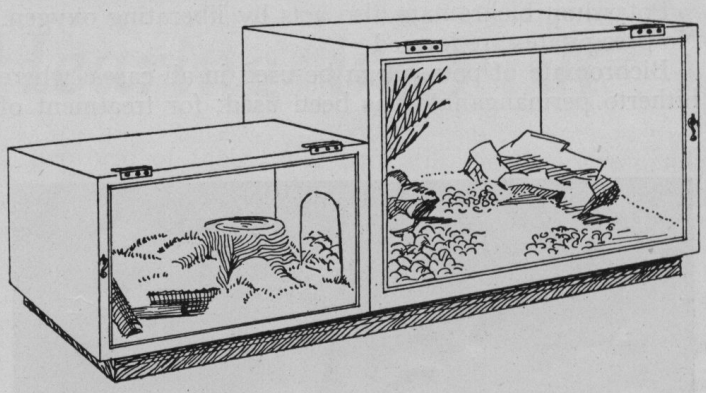
A Wooden Vivarium

By ARTHUR COOPER (Age 13 years)

LAST summer I constructed a fairly large wooden vivarium. It consisted of two boxes, one larger than the other. The larger box was furnished with rocks, sand, gravel, and a fern, the pot of which was covered with cement painted a light cream colour, to give a rocky appearance.

The smaller box was painted dark green and was furnished with moss, bark, and an old stump of a tree.

The two boxes were nailed to a plank, and to enable the inmates to move from one box to the other, a hole was bored through the two sides now touching each other.



Both glass fronts consisted of two old picture frames, which, in order to allow them to open upwards, had the hinges screwed to the top of the box and the frames. I found that hook and eye latches made the best fasteners. The measurements of the vivarium may be made to suit the owner.

In my vivarium I keep a Green Lizard, a dark coloured Wall Lizard, a variegated Wall Lizard, and an English Lizard. Their main diet consists of meal worms, spiders, and gentles. The latter are allowed to pupate in the vivarium sand and then later they emerge into the perfect insect and a natural food. Sometimes the Lizards snap up the gentles before they have had time to bury themselves. The best way is to put some sand in a small dish or saucer, and let the gentles bury into the sand and then stand the pot, saucer, or dish in the vivarium.

There should be a water trough large enough for the inmates of the vivarium to cover themselves thoroughly with water.

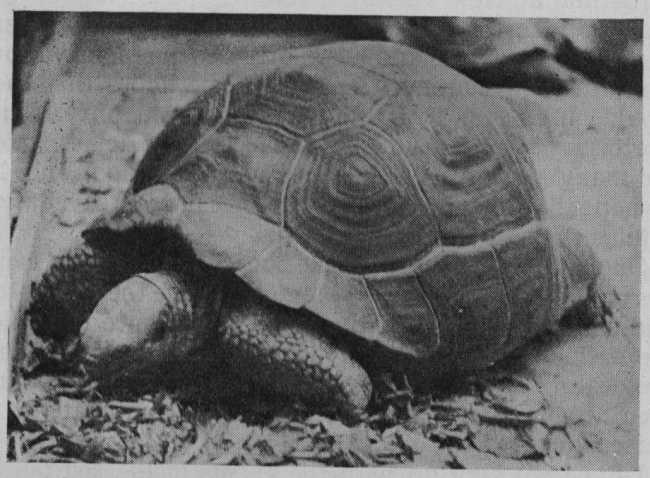
* * *

It is very probable that we shall have some occasional warm sunny days during the next few weeks. When these arrive, keep an eye on your pond fish, because as soon as they begin to become active they will feel hungry. We do not advise feeding fish with dried foods until the warmer weather really settles in, but some *Daphnia*, earth worms, or other live foods will probably be very much appreciated.

Gigantic Land Tortoises

IN time to come, the extermination of the gigantic Land Tortoises will be looked on as one of the worst barbarities of this age. I say " of this age," for although they have been systematically destroyed for nearly three hundred years, there were nuclei of many of the species left even fifty years ago, and, conserved by suitable international action, they would probably have been able to re-establish themselves; and, further, one expects the twentieth century to have learned some sort of a lesson as a result of the extinction of the many forms of life which occurred during the nineteenth.

Millions of years ago, gigantic Land Tortoises inhabited Europe, India, Brazil, and Africa. In the last



continent, they reached about the same size as an Austin Seven! They lived at a time when competition with more progressive animals was very fierce and they gradually declined in the struggle for existence, with the result that we find them to-day only as fossils over most of their range. Madagascar, however, was cut off from Africa before these rapidly evolving and more competent animals had reached it, and so many archaic beasts managed to hold their own there. Among these was a gigantic Tortoise—*Testudo grandidieri*—which was the last of what we may call the " large land-mass " species to become extinct.

Stretching northwards from Madagascar is a series of groups of islands, and even within historic times each of these groups had its own peculiar species or races of giant Tortoises. To-day, out of a huge number, on one island only, South Aldabra, does the indigenous Tortoise persist. On all the other islands of all the other archipelagos they have been swept away. It is probable that the Tortoises reached these archipelagos, which are all continental in origin, before they became separated from the mainland. These islands afforded abundant food and freedom from predaceous animals, and, once arrived, they thrived and grew in numbers and all branched out from the common stock to give the many different species which had ultimately arisen.

A different explanation, however, must be found to account for the other group of surviving Tortoises, namely, those of the Colon Archipelago, in the Pacific Ocean, a few hundred miles from the coast of South America. Nobody knows how the ancestral Tortoise reached these remote islands, which are nothing more nor less than the peaks of volcanoes rising abruptly from the bed of the ocean. The " land bridge " view (tenable in the case of the Indian Ocean islands) cannot be established, and it is difficult to believe that the ancestral Tortoises were carried passively, as many Geckoes and other small lizards are carried to-day, on floating logs, etc., to the islands. The most probable view is that the Archipelago is the remains of a much larger land-mass, nearly all of which has sunk in the course of time, and which was originally inhabited by the ancestral Tortoises. The Tortoises became divided up into groups as a result of this sinking, and have developed, as in the case of the Indian Ocean groups, along slightly different lines, resulting in the establishment of a number of differing races or species.

About three hundred years ago, then, this Archipelago was populated by about fifteen different kinds of giant Tortoise, all occurring in almost unaccountable numbers. What subsequently happened to them all is a most lamentable tale. The first precipitous decline in their numbers was attributable to that industry which is to-day, in the most calculated and cold-blooded manner imaginable, setting about the organized and systematic extermination of another great vertebrate animal, the Whale. Those whalers who hunted in the Antarctic oceans relied upon the Colon Tortoises to supply them with fresh meat throughout the voyage, and many made a habit of calling at the islands and removing simply astronomical numbers of the beasts, which were piled into the holds and drawn upon as required for consumption.

For a long time the islands remained uninhabited, but ultimately (in 1832) an American received permission from the Government of Ecuador to found a colony on, and exploit, the islands generally. A new and heavy burden was thereupon placed upon the unfortunate Tortoises, who were required to feed a colony which in time grew to possess a population of several hundreds! Almost complete extermination of those species on the islands adjacent to the colony rapidly followed, and it became the full-time duty of certain men to hunt the Tortoises from other and more distant parts of the Archipelago. Next it was found that the oil from the Tortoises was marketable, and easily obtained, so instead of, or rather in addition to, providing the whaling expeditions and the colonies with fresh meat, boats remained anchored while the Tortoises were caught, killed, boiled, and the oil packed in barrels. Their bones at this time often covered enormous areas of the foreshore.

This was the position when Darwin visited the islands in the fifties of last century. Several species were either completely or nearly extinct, and ruthless exploitation of the remainder was at its maximum. Darwin's account of them was the first to come from a naturalist, but previously voyagers and explorers, such as Dampier, Rogers, and Colnett, and later Captain Porter (after whom the species in the picture is named), of the U.S.

Navy, gave accounts of the huge beasts, and Porter also took away considerable numbers, which he liberated on various of the South Sea Islands. What subsequently became of these I do not know. Darwin's account (in his "Voyage of the 'Beagle'") aroused a great deal of interest, and speculation began respecting the origin and history of the various *Testudos indica, gigantica, elephantopus,* etc., which were to be found scattered and accompanied by no reliable data in various museums throughout the world. As a result, several scientists took up the study of them—among them Günther in England and Baur in America. The former immediately realized the importance of preservation of the unique creatures, and took active steps to interest learned societies and Government officials in them. His efforts on behalf of the Indian Ocean Tortoises, then in a most precarious condition, met with considerable success. In 1877 he wrote his "Monograph of the Gigantic Land Tortoises, Living and Extinct, in the British Museum," which remained for some years the standard work on the subject.

This awakening of European interest had a further and very unhappy effect, for instead of taking steps to ensure the continuation of the Pacific Ocean species, there started a snatch and grab for the survivors in order to put them in museums. An English museum began the business on a large scale, and during the next few years—ending in the beginning of this century—several hundred specimens were collected and sent to the proprietor, who engaged himself upon a systematic study of them.

In 1905, however, America apparently thought that there was something to be had and she was not getting it, so the famous expedition organized by the California Academy of Sciences reached the Archipelago, and, to use its own words, "During the months which followed, the most arduous collection was vigorously carried out in all the islands of the group, many of the larger islands being visited several times." The expedition secured, I believe, about 250 Tortoises altogether, of which a description was subsequently issued. One contemplates the permanent benefit which might have accrued to the world had this large number been allowed to live unmolested, especially as it included species which had never been known before.

The C.A.S. was not the last large-scale removal of the Tortoises, but since 1905 smaller numbers or odd specimens have steadily been removed, many finding their way to the European animal market. No doubt several of the species—some are most certainly extinct—still survive even to-day, and it may not be too late to save them, but international accord on the subject seems impossible of achievement.

In the last few years, however, an influential champion of the giant Tortoises—as living animals, not bones in a museum—has been working on their behalf. I refer to Dr. Townsend, the recently retired director of the Aquarium at New York. A few years ago, 180 Vilamil Mountain Tortoises (the species from the south-eastern part of Albemarle Island) were distributed among various institutions in Southern U.S.A., in the hopes that they would breed and multiply. The Aldabra Island Tortoises have, of course, been successfully domesticated for many years in the Seychelles Archipelago, and let us hope that some of the Colon species may be saved by a similar process of domestication.

One is forced to the conclusion that their only hope lies in domestication, for in their own home the wild cattle and goats introduced by the settlers, and since run wild, are eating the Tortoises' food; the feral dogs and cats are eating their young, and the rats are eating their eggs. Indeed, an appalling combination of persecutions!

I have not kept up with the events of the last ten or fifteen years—they have become too depressing, but it will be interesting to watch Dr. Townsend's attempt—the first constructive one—to save at least one species from total extermination. "AMPHIBIUS."

American and British Water Measures

By H. J. GOSNELL

IN "The Complete Aquarium Book," by William T. Innes, printed in the U.S.A., there appears:

"To find the gallon capacity (of a tank), multiply the length, breadth, and height together in inches. Divide the result by 231. The result will be in gallons."

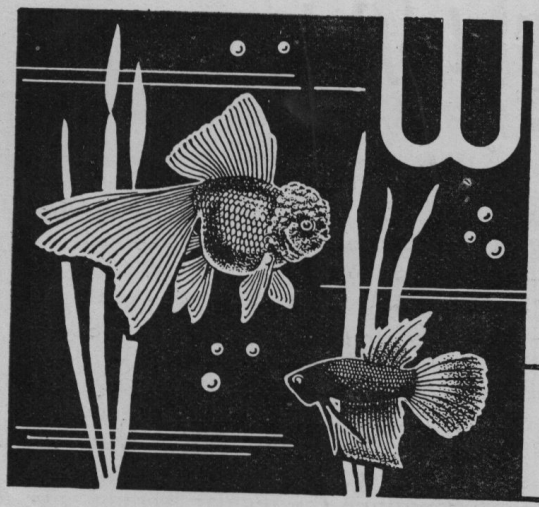
On another page, under the heading "Weight of Water," the following calculations are given:

"A gallon weighs 8⅓-lb. The gallon capacity is calculated by multiplying the inch height, breadth, and length together and diving the result by 231. For instance, a tank 20-in. deep, 2-ft. wide and 6-ft. long, would be computed in this way: 20×24=480×72=34,560 divided by 231=about 150 gallons, which, multiplied by 8⅓=1,250-lb."

Whilst these calculations are correct for the U.S.A., the British aquarist will be wrong if he follows the American rule for estimating the capacity of his tank, the reason being that in U.S.A. they still use for liquids the old English wine gallon of 231 cubic inches, five-sixths of the British gallon of to-day. In England, by Act of Parliament in 1824, the imperial gallon came into existence. This measures 277.274 cubic inches. Thus in this country a gallon of water weighs 10-lb.—not 8⅓-lb. as in the U.S.A.

The British aquarist must, therefore, bear in mind that to find the gallon capacity of his tank he must multiply the length, breadth, and height together in inches and divide by 277.274—not by 231 as they do in America. It will be found that a cubic foot will very closely approximate to 6¼ gallons, quite near enough for all practical purposes.

It will be seen that there is a very considerable difference between the British and American gallon. For example, a tank holding ten British gallons would hold twelve American gallons. The standard sizes, 24-in. x 12-in. x 12-in., 24-in. x 15-in. x 15-in., and 36-in. x 15-in. x 15-in., hold 12½, 19½, and 29¼ gallons respectively.



WATER LIFE

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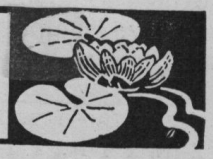

Isle of Wight Reptiles

By ALEX. W. AITKEN

IN writing these notes I do not wish readers to imagine that there are any reptiles in this island which are indigenous there only. They are all found in other parts of the British Isles, with the exception of Ireland—although it has been reported several times that *Lacerta vivipara* has been captured in Ireland. The common Frog and Toad are numerous, but I am not sure about Newts. The Adder and Grass Snake are not found in Ireland, but the Adder is found much farther north in Scotland than the viviparous Lizard.

The Adder is very common in all parts of the Isle of Wight, and in size and colouring varies greatly, so much so that some naturalists consider that there are more than one species. I do not think this is the case. The colouring seems to serve as camouflage by matching the surroundings; the small brown varieties are mostly found on high land, 700-ft. to 800-ft. above sea level, in heath, gorse, and bracken, and these are just as lively in hot weather, and even on a sunny day at this time of year you come across them sunning themselves. I killed one 9-in. in length the other day. It showed fight, but was not quick enough to escape. Considering how common they are, it is remarkable how seldom one hears of anyone being bitten. In the early spring, and even in the first two weeks of February, they come out from their winter hibernation, and, in my opinion, this is the time to keep one's eyes skinned. They are then definitely dangerous, being full of venom. They come out directly the sun gives enough warmth, and, as is often the case here, the sun is quite hot in February, but a passing cloud obscures it and with a cold wind the temperature drops ten to fifteen degrees. Adders then become quite torpid and one is apt to tread on them, though they have enough energy to strike. Being slower more venom is injected and the result is serious.

Adders are definitely less dangerous in hot weather. They are very alert, nervous, and suspicious. The slightest vibration from a footstep is enough to make the Adder protrude its tongue and vibrate it in alarm. It is difficult to get near enough to capture them. I I have only once had an Adder face me instead of gliding out of my way. I should imagine it had just produced young, or was about to do so. They are not always viviparous, sometimes ovoviviparous. This is probably a question of a cold or hot season. This reminds me of the fallacy that Adders swallow their young. I was with a friend once who had a gun and he spotted a large Adder coiled on a rock. He immediately shot it to pieces, being fairly close. When I went up to examine there were eight or ten young, some dead, some wriggling. My friend at once said that that proved that Adders swallow their young and my explanation of unborn young was not believed as you can imagine.

I have had two dogs bitten at this time of year, while they have been foraging in dead bracken. My first died in under half an hour, bitten in the neck close to the jugular vein. The second was very ill for a week, quite unconscious for a day. This one was bitten in the abdomen. I kept the heart going with doses of whisky and milk. This dog did not get over it for nearly a year, and it seemed semi-paralysed in its hind quarters, and all the hair came off the abdomen.

There are several noted snake catchers about here who account for hundreds of Adders every year. One week-end hunt accounted for seventy-eight only last spring. Yet people I know who are great walkers and have lived here years, have definitely *never* seen a snake. Of course, the lovely little Slow Worm (which I hope to write about in a future article) is generally killed at sight, in mistake for an Adder. I understand the smooth Snake, *Coronella austraica*, has been captured here—in the Parkhurst Forest district, which is very similar to the New Forest, where it is becoming less common every year. I have never kept Adders, as I consider they are too dangerous if they should escape. Those men who make a hobby of catching them, do so with their hands, by first pulling the Adder back by the tail and then grabbing it by the back of the neck. I have often seen it done.

A Famous Aquarium Changes Hands

By CLIFFORD W. GREATOREX

SOME months ago the admirable and deservedly popular Aquarium at Grimsby, owned originally by Mr. Albert Sutcliffe of that town, changed hands. It was removed to Worksop, Nottinghamshire's new but very enterprising and progressive borough. Here, it has met with much appreciation.

This fine collection has been purchased by certain of the local residents, who intend eventually to hand the aquarium over to the borough, when, of course, admittance will be free, although for the present a small charge is quite unavoidable. The sixpence charged for an adult and the threepence for a child are trivial when we consider that this expenditure means admission to a representative collection of British, European, and foreign fishes, assembled at very great expense from portions of the globe so widely separated as India and Iceland, South America and South Africa, Great Britain and China.

Under the same roof are also vivariums containing numerous reptiles, and a solarium, exquisitely decorated, in which dwell African Waxbills, several Weaver birds, and some other avian species of striking plumage and remarkable habits.

Naturally, the removal of the aquarium from Grimsby to Worksop was no light undertaking. A large proportion of the exhibits had to be conveyed by road, and the extreme delicacy of some of them greatly increased the difficulties attendant upon their transport. Such an undertaking is possible only where there obtains highly specialized knowledge, both practical and theoretical.

No single article could do justice to the charm and interest of this collection. Here are superb specimens of our familiar British fresh-water fishes—Roach and Rudd, Dace and Gudgeon, Carp and Tench, including examples such as most anglers see only in their happiest dreams. Here are Golden Trout from Greenland so beautiful that they must be seen to be appreciated. Rainbow Trout also grace some of the largest tanks. When we look at them, we realize how very cleverly Nature has designed so many of her creatures in that they are concealed by the blending of their own coloration with that of their surroundings. The aquarium has a very great educational value, and should do much towards encouraging a love for, and an intelligent interest in, the world of animal life.

One of the most beautiful spectacles afforded by our British fishes is that presented by a large number of Roach, Rudd, and Dace assembled in one tank. These elegant creatures glide and turn, their scales glistening like polished silver. They, together with many another exhibit, furnish a striking commentary upon the beauty of our English fish life. In the same tank are some exquisite Bream. The Silver Bream, in particular, compels attention by its wondrously brilliant scales.

The whole of the central portion of the aquarium is devoted to tropical species. Many of the Angel and Zebra Fishes are unusually fine specimens, while some extremely handsome Acaras are included in the collection. Some time ago, a pair of these fishes banked up the sand at the bottom of their tank. In due course they spawned, the eggs hatched, and a host of tiny fry could be seen swimming to and fro. Although these Acaras are largely carnivorous, for some time the adult fishes never, even by accident, devoured any of their young. I have seen a "baby" drawn into the mouth of one of these parents, then straightway blown out again, clearly not one whit the worse. In fact, I understand that this is the parents' method of giving them a good "rub down" and making them quite clean. Later, however, the adults showed a tendency to swallow their offspring, and their children had to be removed.

Mention must be made of the Chinese Fighting Fishes, exquisitely wrought in deep, shining blue. One wonders how the inhabitants of their native land can find pleasure in pitting such lovely creatures one against another in relentless combat, which must end in grievous mutilation, and, ultimately, in the death of one or other of the antagonists

The Cat Fishes, unlike so many members of their secretive kind, do not seem at all loath to appear before the public gaze. Visitors who are unfamiliar with them sometimes express surprise at the remarkable development of the barbels around the mouth in fact, the "whiskers" which have given them their English name.

In the reptile section there are some fine young Alligators, several Lizards, and two Snapping Terrapins. The Chelonians are believed to be of very great age. Considerable caution is required when cleaning their compartment, for their jaws are so powerful that a single bite might easily sever one's finger. On one occasion, a piece of stout rubber tubing was placed in the pond, and a bite from the smaller of the Snapping Terrapins cut it completely in two. Their jaws are as sharp as razors, their palates hard as concrete.

Worksop's aquarium is a credit to all concerned. Not only does it contain the many beautiful and remarkable specimens which were bought from Mr. Sutcliffe, but, since its establishment in Worksop, numerous other exhibits have been added. It merits the utmost support from both visitors and the local inhabitants.

* * *

Ticks and Tortoises

Now that the tortoise season is approaching, we would like to mention, once more, that if you buy any of these creatures, and find that they are infested with ticks, it is much kinder to the tortoise, and death is much quicker for the tick, if you cut the latter off with a pair of scissors. Pulling them off with tweezers nearly always leaves a very sore place on the tortoise, whereas if you cut them off there is no sore place at all.

* * *

15,000 TORTOISES FOR SALE.—Fifteen thousand dormant tortoises, weighing six tons in all and packed in 127 cases, have arrived in London from North Africa to be sold when they awake in April or May.—*Daily Telegraph.*

The Dalmatian Toad

By L. G. PAYNE

IT is with some diffidence that I adopt the above name for the title of this article. The geographical adjective merely designates the country of origin of the considerable numbers imported under this name, and, in the interest of strict veracity, it is desirable to state that the Dalmatian Toad is in fact our common English Toad developed to its maximum proportions. What are the factors which lead to this luxurious development? It cannot be due to a milder climate, for it is well known that the winters of the Balkans are often long and severe. It is probably due to abundance and variety of natural foods available during summer and autumn. The average body length of imported specimens is about four inches, and these are mostly females. Males are considerably smaller and less imposing, and therefore would not be worth importing where size is the obvious factor in "catching the public eye."

Dalmatian Toads are exceedingly slow in all their movements, and the feeding stimulus does not appear to be so easily provoked as in other species. This Toad can be kept quite satisfactorily in the open reptiliary, in the closed vivarium, or in a heated greenhouse.

In order to prove the adaptability of the Dalmatian Toad it will perhaps be useful briefly to put on record the story of the Toad illustrated. This is "Big Bertha," a Dalmatian Toad known personally to many readers of WATER LIFE. Purchased in London some years ago by a friend of mine, Big Bertha passed a happy existence, winter and summer, in a heated greenhouse maintained at a uniform temperature of 70 degs. Under these conditions the Toad was, of course, active all the year round, and was, I believe, fed daily. Then about two years ago my friend asked me if I would accept the Toad, as he was changing his residence. I gladly agreed, but pointed out that I had not the facilities for keeping the creature in the almost tropical conditions which it had enjoyed with him. I further pointed out that this environment was really unnatural, and that I should hope gradually to acclimatize her again to a normal temperature.

Big Bertha actually came to me in October, 1936. Until the following February I kept her in a small vivarium indoors. These months were passed in a semi-torpid condition. In early March I placed the vivarium in a shed, and in April released the Toad in the open reptiliary. In May I introduced her to a male Common Toad of a very light colour—the type which occurs in woods on calcareous soils—and a few days later fertile spawn was produced. The toadlet seen in the picture is one of the numerous offspring, now ten months old, and even at this early age is noticeable for the coppery colour so prominent a feature in its mother.

The fact that a successful mating was accomplished to the stage of the final metamorphosis—and this with a male whose size was considerably less than half that of the female—is further strong evidence that the species are identical. Artificial hybridizing of Toad species has been repeatedly essayed by qualified experimenters, and in some cases tadpoles have resulted, but for these to attain the final stage is excessively rare.

A fact of considerable biological importance is evidenced by this mating of Big Bertha. It shows that a female Toad which is isolated over a period of years does not necessarily become either sterile or spawn-bound; nor, in this particular instance at least, has the resumption of a natural annual function been followed by any adverse effect on the parent.

Dalmatian Toads are usually of a more or less uniform dull copper in colour. The underparts are somewhat strikingly mottled in copper, grey, and white. The conspicuous parotid glands lying behind the eyes exceed an inch in length, while the large wart-like glands of the dorsal surface tend to the conical in form.

Actual figures relative to Big Bertha may be quoted for comparative purposes:—Length, snout to vent, $5\frac{1}{4}$-in.; diameter of eye, $\frac{3}{8}$in.; weight, 10-oz.

Dalmatian Toads thrive well on a steady diet of earth

Big Bertha and diminutive son

worms, and the largest worm will not be too big. If small worms only are available it is a good plan to bunch half a dozen of these together, when it will frequently be found that the whole lot are taken at one gulp. This Toad is the only species, in my experience, which will readily accept meal worms. Beetles and spiders will be eagerly seized if they cross the Toad's line of vision, but he seems incapable of following these up, as do his smaller and more active relations.

One more favourite food is gentles. It is amusing and instructive to watch a Dalmatian Toad steadily wade through a saucer of gentles. Toads of all species are reputed not to be pugnacious, but Big Bertha objects to sharing a meal, and I have to record that should any other inhabitant of the reptiliary claim a share of the meal the big Toad will turn and, apparently deliberately, " snap " at the intruder. Garden snails, if not too large, may also be included in the menu.

The Dalmatian Toad makes an excellent inmate of the open reptiliary, and invariably attracts attention by reason of its size. It may well be associated with Edible Frogs, Lizards, and the hardy Skinks. It should not be allowed with the smaller Frogs and Toads, with the exception of Yellow-bellied Toads, the toxic properties of whose glands suffice to keep any potential enemy at bay.

A noticeable trait in the Dalmatian Toad, and one in which it definitely differs from the English Toad, lies in its partiality for water. It will frequently spend long summer days in the shallow end of a pool with only the head raised above water level. In common with other species, this Toad occasionally changes its skin. This process is, however, a slow affair, the old skin frequently being visible on the legs many days after the rest of the body is glistening in its new covering. When the skin is newly changed the Toad will be hungry, and care should be taken to watch for this condition.

Facilities for shade must always be provided. One large overhanging stone is sufficient for this, and it is surprising how quickly the Toad will learn to retire to this, even when given the run of a large enclosure.

The natural hibernation period of the Dalmatian Toad seems to extend from early October to March, and the short mild spells which cause many other species to become temporarily active appear to leave this Toad unmoved.

The Dalmatian Toad is long-lived, hardy, and easy to feed, and for these reasons alone may be regarded as eminently suitable for the beginner.

* * *

A Fishy Calculation

We regret that the fishy calculation on the Young Aquarists' Page last week was incorrect. Here it is, corrected: A dealer received an order for tropicals, to consist of Millions, Platies, Flames, and Angels, a total of 135 fish. Of Platies there were to be two-thirds the number of Millions, of Flames half as many again as Angels, and of these latter, had there been two more, they would have totalled half the number of the Millions. How many of each were dispatched?

Answer: Millions 48, Platies 32, Flames 33, Angels 22.

Alligators as Pets

BABY Alligators are most interesting acquisitions to those who care for reptiles, and, in my opinion, the hardiest and easiest to keep of all tropical reptiles. I have for years kept Caymans and Alligators, parting with them usually at good prices when they get about the 3-ft. limit of the amateur's accommodation. I notice that they are plentiful and cheap in the market just now. A 24 x 12 x 12-in. aquarium, bottom heated, with about 3-in. of water, makes a suitable home for the newly acquired 8-in. Alligator.

The temperature should be about 75 degs.; if kept at 85 degs., growth will be much faster, as the feeding will be heavier. Alligators, like most reptiles, will only feed when warm; the warmer they are kept the more they eat and the faster they grow. When the animal has reached about 24-in., a larger and stronger tank will be required, as his tail will then be quite powerful enough to smash the glass. A 3-ft. x 2-ft. x 10-in. zinc tank, heated with small lamp or gas jet, will make a good permanent home.

Large worms are suitable for very small Alligators, but they soon tire of these, and small pieces of beef, Minnows, Sprats, Mice are then required. The gullet is small, and care should be taken that very small specimens are not choked. My present specimen is a South American Spectacled Cayman, which, unlike the Mississippi Alligator, retains all its native aggressiveness, and is generally ready to snap.

The Mississippi Alligator soon becomes tame enough to recognize its owner. In June, July, and August my Alligator lives in a stone sink sunk in the garden, surrounded with 12-in. wire netting, in a sunny position. He will leave the water for long periods and bask in the sun, but he will rarely leave the water unless conditions are warmer out of the water than in it, so that, unless in a warmed, enclosed case, facilities for leaving the tank are unnecessary.

VINCENT BUTLER.

* * *

Spring-Cleaning in the Pond

(*Continued from page* 133)

fish than the plants. Many people lose their fish through changing the pond water too early; this loss is accounted for by the fact that the fish have not sufficient strength to withstand the shock of the change. If they show the slightest sign of fungus they should be given a salt bath and fed to repletion on garden worm.

Finally, a word of warning about the present spring weather. Do not be tempted yet awhile to assume that spring is here. Most of the pond fish are actively swimming round, but should the weather turn again to cold, then we shall find fungus and tail rot abounding. As it is the nights are still freezing and the tragedy lies not so much in the cold nights as the long nights. The best course is to keep the fish eating by feeding earth worm and similar live foods. I well remember two years ago when we had a night frost at the end of May, and many fanciers, tempted by the warm weather, put their fry out in the ponds. The result of the frost was hundreds of cases of chilling and the death of countless fry.

The present spell of warm weather compels us to keep our pond fish feeding but not breeding. As the bacteria and similar organisms have awakened too, perhaps now is the time for our spring-clean.

The Annual Awakening

By MARGERY G. ELWIN

LONGER, sunnier spring days, bring increased activity, interest, and entertainment for the water life enthusiast. Fish in aquarium and pond are becoming lively and hungry; in the vivarium, where all has been quiet and almost lifeless through the winter, reptiles will move quickly about in the midday sun, and by night amphibians will be seen as they go their leisurely way in search of prey. Quite likely neighbours are already having their rest disturbed by the nocturnal "crooning" of a love-sick Frog, as he sits up to his neck in the vivarium pool. Spring is here and all shall know it!

Hunger is characteristic of all the creatures as they awaken from their period of dormancy, and we must see that all of them secure adequate supplies of suitable food to rebuild their strength and stamina. In the pond the fish are in a very low condition at this time of reawakening. All the winter they have fasted, and now as they awaken they find all manner of unpleasant enemies are doing so as well. It is at this change of seasons that we lose so many pond fish. Decay has been proceeding very slowly during the winter, but now the increasing temperature provides a stimulus to all the processes of putrefaction going on in the depths of the pond. All those leaves which fell in at the end of the autumn, all that dried food which was unnecessarily offered to the fish during the winter, will now proceed to decay and putrefy rapidly, spreading destruction among the fast-weakened fishes. How are we to combat these conditions?

Firstly, give the pond a good wash out. It is not necessary to empty it or to remove the fish; just allow a slow trickle of water to enter the pond, and so gradually dilute and carry away the polluted and vitiated water. Offer the fish a variety of food in small portions during the sunny part of the day when they are most active. Live foods are best at this time as they are most attractive to the fish. Be careful not to add to the decaying matter already present by excessive feeding with prepared foods. If you are keen on breeding your fish this season, remember that on the way you treat your adults at this critical time will depend the success of the spawning later on.

In the indoor cold-water aquarium, there is not the same dramatic return to active life, unless the tank is situated in a very cold room. Even indoors, however, the increased light and warmth results in bigger and better appetites. Also the majority of Fancy Goldfish enthusiasts will agree that the sunshine and generally brighter light increases the urge to spawn among fishes living under conditions which would seem to be fairly well controlled and similar throughout the year.

In the vivarium there is a general awakening of reptiles and amphibians. They are all hungry, even the Frogs and Toads who are apparently more concerned with perpetuating their species. Live food will be in demand for these creatures, and the gentle and meal-worm boxes must be looked to. Lizards, Snakes, Tortoises, and Terrapins, as they awaken will tend to appear during the middle of the day. At this time they will feed; as the cooler evening approaches they will retire and it will be no good offering them food. It is important that they feed, for they, too, are in a low condition. The Terrapins' dwelling-place always includes water, but we should remember to have an adequate supply of drinking water available for the other reptiles as they come out of their hibernation. They are always very thirsty, and to fail to give them water at this time may have very undesirable results.

Indoors the more exotic and pampered reptiles and amphibians have been living in apparent luxury—a heated and illuminated vivarium, protection from the cold and dreary days of winter, and an adequate supply of food. In spite of all this, however, it is surprising to see the delight with which the tropical reptiles welcome the return of real warm sunshine in which they can bask and wax fat.

Shipments of Frogs and Toads, Snakes, and Tortoises, etc., are now arriving from the Continent, and many readers will probably be purchasing some of these creatures for the first time. There are a few facts to bear in mind. Remember that it is probably quite a lot warmer where these creatures have come from, accordingly it will not be desirable to put them straight into an open garden vivarium without any protection. Doubtless, they will do better out of doors, provided they are given adequate protection and a warm place to retire into at night. Keep them in roomy ease indoors, if outdoor conditions are not yet suitable. Remember, too, that all these creatures are in just the condition of those waking up at home. They are all very hungry and their fat reserves are greatly depleted. Therefore, it is most essential that they be fed soon and adequately. This, of course, is another reason for buying the creatures early. The average dealer has neither the time nor the facilities for feeding large numbers of creatures of these kinds, and if they remain underfed for very long their constitution becomes seriously undermined and often they cannot be persuaded to start feeding again, even by experts in the gentle art of tempting the appetites of reptiles and amphibians.

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Pearl Shells

There are some shells on the market at the present time which make beautiful decoration for aquariums and ponds. These look particularly lovely when the sun catches them, accentuating their pearly iridescence. They are not expensive, and we advise anybody who comes across any to buy them at once, as the supplies cannot be repeated.

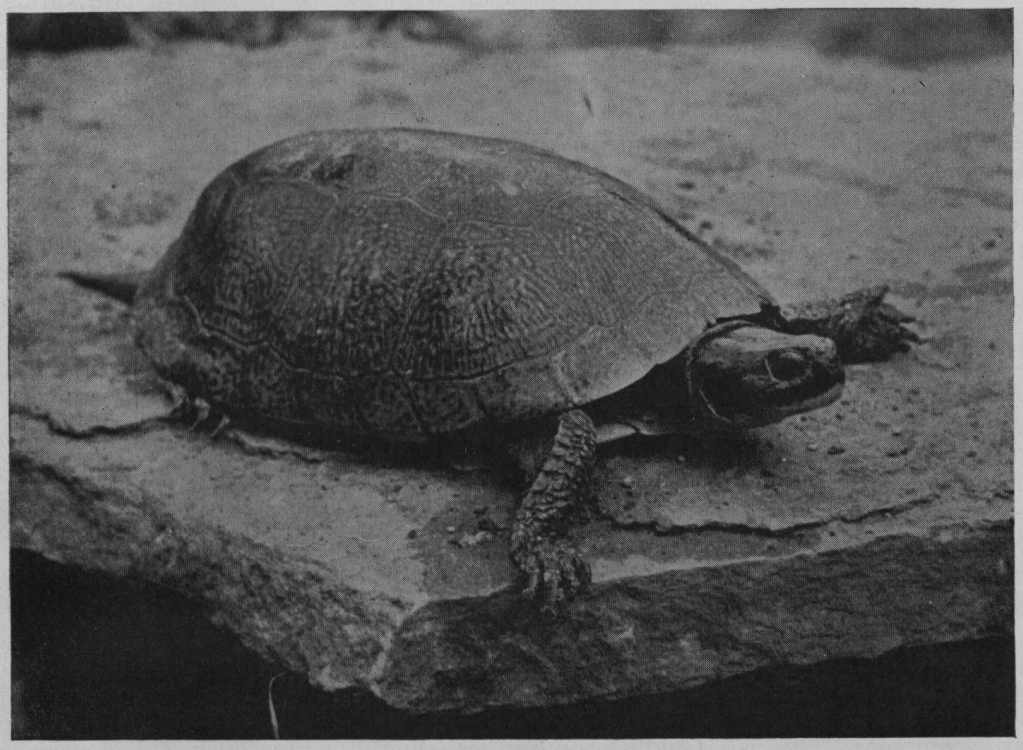
* * *

Mr. William Bassett, who was bitten by an 8-in. South American spider which reached Covent Garden in a crate of bananas, is going on well. No one wants to see the case of Miss Muffet (who alone preserves the word "tuffet" to the language) turned into a tragedy. —*Observator.*

The Genus Emys

By "AMPHIBIUS"

THE time is rapidly approaching when the usual large numbers of European Pond Tortoises will be offered for sale here, so I think a note or two about them will be of interest. Kept under proper conditions, this animal is extremely long-lived, and makes an attractive pet, but unless some effort is made to house and feed it adequately, it will succumb during its first winter.



Blanding's Terrapin

Emys orbicularis (formerly *europea,* formerly *lutaria*) is widespread in distribution in Europe, North Africa, and Asia Minor. It is still common over most of its range, but is extinct in settled areas. The fact that it is edible probably accounts for its disappearance. As it is found as far north as Moscow, it will be apparent that it requires no coddling, and can indeed be left outdoors all the year round with every confidence. This is one of the terrapins which fails to thrive indoors, and the species is very susceptible, under such conditions, to tubercular diseases. If, therefore, no garden is available, leave *Emys* alone.

All sizes are available, and if one wants to have a go at breeding them, large individuals should be bought, as growth is phenomenally slow. I know of an example ten years old which is still only about 4″ long, and I can detect no increase in size in some of mine which have lived under apparently good conditions for years. As terrapins go, they are not large, about 8″ for a female being unusual. The males are very much smaller as a rule than the females, although some museums on the Continent have males with 10″ shells. The males, however, are sexually mature by the time they are 4″ long, and thereafter they seem to me to cease to grow.

Sexual dimorphism is quite pronounced, the shell of adult females being a nearly perfect oval and of considerable depth. The shell of the male is not oval, and is very shallow. Males have more handsomely marked heads, and often more deeply coloured eyes than the female, and the tail is diagnostic of sex; in the females it is quite long but slender, in the males it is long and also very thick at the base.

Courtship occurs in the water throughout the spring and early summer, and is accomplished as follows: The male attaches himself firmly to the carapace of the female, his claws giving him a firm grip in front and behind. He then stretches his neck as far as possible, bringing his head near that of the female's, rapidly chattering his jaws all the time. If the lady doesn't like him she will sit still and sulk, or else make jerky movements to dislodge him, or she may leave the water. If she likes him, she will swim rapidly about with him on her back, he all the time opening and shutting his jaws continually.

The number of eggs varies with the size of the female, from two up to seven having been laid in my garden. The female leaves the water at dusk in search of a suitable nesting site. She appears to favour the near neighbourhood of water, and makes her choice with extreme care, smelling the ground and giving an occasional scratch to test its nature. Having chosen a spot, she settles herself, and gets a good grip with her hands, and then proceeds to dig with her hind feet. The nest itself is quite small; that holding seven eggs measured 2″ across the top, $2\frac{3}{4}$″ across the bottom, and was $2\frac{3}{4}$″ deep. Digging is a very slow process, the hind feet taking it in turn to scoop out a bit of earth. One hole was begun at 7.15 p.m., and at 8.45 the next morning, the female was just covering over the last layer of eggs. I have no doubt that on a nice, light soil it would all be over much sooner, but I often find it as much as I can do to dig in my clay. I have never hatched any of the eggs, but I am installing incubators this season, as we really cannot rely upon the sun, and I believe the eggs to be fertile.

The other member of the genus is North American. Blanding's, or the Semi-box Tortoise, is its name, the latter in virtue of possession of a hinged, anterior lobe of the plastron, a feature, by the way, common also to *E. orbicularis*. It differs in appearance from its relative in shape, being longer and flatter. The neck is much

longer, the head flatter, and the snout more rounded. The lower jaw, the underside of the neck, and the plastron are yellow, and it also grows to a greater size, the one in the picture measuring 11″ long. The species is found from Southern Canada southwards to North Kentucky, and is most rigorously hardy. A friend purchased a specimen only a few weeks ago, and she was put straight outdoors into a pond and went to sleep without any trouble. Blanding's has an enormous gape, but is nevertheless perfectly harmless and friendly to even the tiniest tortoise sharing the pond. They are most amusing at meal times, paddling about with their long necks stuck out of the water, and the jaws wide open for food. I regret to say that eating seems to be the main object of their lives, although they are also interested in sitting in the sun. They usually make a rule of not walking more than half a dozen steps without a long rest, but are nevertheless very nice, intelligent, and non-troublesome beasts to have in the garden.

In spite of the statements of eminent authorities, I have never known a Blanding's to eat any sort of vegetable food. I have only five at present, but have had a large number during my career, and this statement goes for them all. As with its European relative, nothing in the meat line comes amiss to Blanding's. The "little and often" feeding rule requires to be amended to "much and often."

I regret being unable to give any means of sexing Blanding's, and should not be surprised to learn that I have never possessed a male, for all mine have resembled the female of *E. orbicularis* much more than they do the male. Of habits of courtship and oviposition likewise, I have observed nothing.

As regards housing, a good-sized pool is necessary, and there ought to be one part at least 2′ 6″ in depth. Although *E. orbicularis* hibernates readily on land or in a box of leaves, the majority of American ones prefer to spend the winter sleep at the bottom of their pond. Both species enjoy the sun, and an enclosure for them should be suitably placed. They can be kept with any other tortoises and terrapins, and, of the two, the European spends much more time on land, specially the males.

If any attempt is to be made to rear the baby European Terrapins, they should be bought in late spring or early summer, and kept outdoors. They feed well, and can be hibernated either in a shed or in a sheltered box in the garden. They are not happy if brought indoors for the winter, and most fail to live to see a second spring.

The somewhat odd distribution of the genus is easily explained. It probably began either in Eastern Europe or in Central Asia, and spread westwards to give the European species, and eastwards across Siberia and the land-bridge, which once connected Asia to Alaska, to the North American continent. With time, the land-bridge has sunk, but the terrapins have spread widely. Owing no doubt to its flavour, Blanding's Terrapin can no longer be classed as a common species!

Little and Good

By LOUIS C. MANDEVILLE

THOUGH in the aquarium we virtually have the seasons under control, from the point of view of light, heat, and aeration, most breeding is done during the spring and early summer. This is because at these seasons Nature co-operates in a matter over which we have not such close and productive control, namely, the raising of live food. Even though live food is most plentiful during the times indicated, however, there is another factor which seriously hampers the raising of large broods of fry, that is, lack of space.

The average fancier is very limited in his space, and often, almost usually, tends to bite off more than he can chew in the way of fry raising. One female Goldfish, be she fancy or common stock, may lay upwards of a thousand eggs. If all these were raised to a size of two inches, just think of the accommodation they would need. Yet in effect that is what so many of us try to do, for though we may have perhaps tank capacity for a total of, say, forty or fifty gallons, we go on gaily attempting to raise the whole of two or three such spawnings.

Apart from the fact that even those with adequate supplies of live food close to hand would find such a large family rapidly depleting the larder, fry so crowded quickly die, simply as a result of overcrowding and the attendant ill-effects. Though fry which do survive will have received a definite setback from such treatment, and though gradually all but the most robust specimens will drop out, these will not be the fish they might have been had all the available food and space been lavished upon them.

Large broods of fry, be they Cold-Water Fish, Fancy Goldfish, or Exotics, should be vigorously culled as soon as they are free swimming, and a number left which the aquarist can reasonably deal with. There is much more credit in raising 90 per cent. of a reduced shoal of fifty fry, than 2 per cent. of the whole spawning of 500.

The line breeder who is anxious to raise a maximum of every brood, and whose space is limited, presents a particular problem. He should not let his fish spawn indiscriminately, but should arrange that he only has one brood to deal with at a time. Then as soon as the fish are big enough to show character they must be vigorously and mercilessly culled. Then it is time to think about another brood. This might bring us again to a plea for specialization and the devotion of all our resources to the raising of a particular species or strain. Remember, this can be very fascinating, and many aquarists have gained considerable pleasure and profit by concentrating on one breeding problem each season.

The raising of large numbers of class fish demands special conditions: almost unlimited tank space, food, and time. This must be left to the professional and the lucky few of considerable financial means, though, of course, without the will and fish sense, this alone will not get you far. Those with modest equipment must have modest ideas, and then their achievement, though small in numbers, will be first-class in quality.

Breeding Goldfish

By L. C. BETTS

WITH the approach of spring, fanciers should be thinking of their breeding preparations. For those who have not yet attempted to breed or those who have tried but without success, perhaps a few words on the preliminary considerations would not be out of place.

To those who have never spawned Goldfish in tanks, it is pointed out that there is no secret and the act is fairly easily brought about. Good feeding, good conditions, and the right temperature produce conditions in a fish that only spawning will alleviate. Of course, what is meant by good feeding and good conditions may not be quite clear to everyone, but before we get on to that we must decide what we want to do, first of all realizing the limitations.

For the man who has only one tank, say, 12-in. x 12-in. x 24-in., the whole thing is out of the question. As this will barely support a pair of fish in health, it is quite useless to imagine that the tank can be still further overloaded. It is a different matter where a pond is available, but in its absence at least another tank is necessary, and preferably more.

Opinions vary as to the best kind of Goldfish to start with, but I would say the Shubunkin every time. I have always found them ready spawners and, moreover, frequent spawners. The order of "easiness," so to speak, would be: Shubunkin, Comet, Common Goldfish, Fantail, Veiltail. Telescope-eyed and Lionheads are definitely for the man of some experience, and should not be attempted by the beginner. The only reason why one breed is more difficult than another is that some are harder to get into breeding condition than others, and more difficult to maintain in this condition. The chief difficulty with the deep-bellied varieties is their propensity to become constipated with rich feeding. The Common Goldfish seems to require the right sort of day to make a start. With the Shubunkin, however, one can almost spawn it to order.

The raising of fry demands regular attention, and the growth and progress of the babies is in direct relation to this important detail. For the first few weeks, the ideal state is hourly feeds of *Infusoria,* but as this is not always possible, they must be fed at least twice a day. It follows that a commercial traveller away from home two or three days on end will stand little chance of success.

The appetite of fry is prodigious, and usually they can eat as many *Infusoria* as can be raised. A culture takes three or four days to become really profuse enough for feeding, so that six or seven receptacles are necessary to provide a daily rotation. I use enamel bowls procured from the popular stores, making up deficiencies every two days as the contents are used.

The question of supplementary heat requires consideration. Very often a late frost will kill off a spawning in a flash. Some will remember that sharp frost we had at the end of May the year before last, when many fanciers were caught napping. A drop in temperature does not prove quite so drastic as a frost; nevertheless it is serious, for I am a great believer in heat for fry. Therefore, a spare electric heater standing by against eventualities is almost a necessity. Failing that, a car oil-heater, as used to prevent freezing, will keep up the temperature, if placed underneath a tank.

Once past the *Infusoria* stage, the fry will require a regular supply of live *Daphnia*. If this has to be bought, it may prove a costly item and should be considered under the heading of "Expense." Of course, chopped *Enchytræ,* blood worms, and garden worms are all valuable foods, but they cannot surpass *Daphnia* as a staple food. I know there are many recorded cases of fish reared solely on dried foods, but this is a very difficult business and not to be recommended. Actually the less dried food given the better, for the ill effects of constipation are not easily remedied in very young fish.

It is recommended that breeding in a room with a poor light should not be attempted. One of the greatest influences that cause fish to spawn is a bright dawn, and this incentive will be missing in a room that is at all dismal.

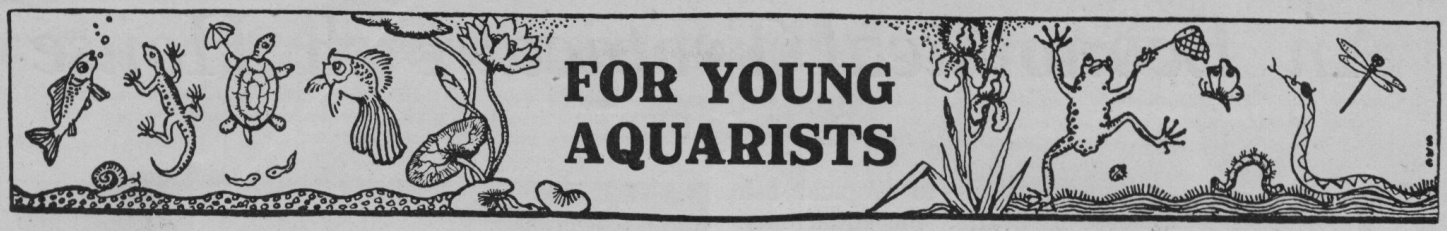
Whilst the price paid for stock is no criterion as to their breeding capabilities, it is reasonable to assume that there is a better chance of success where a fair price has been paid for fish from reliable stock. The old adage about getting a silk purse from a sow's ear still holds good in fish breeding.

The question of whether an aerator is necessary before breeding can be attempted is an open one. It is quite certain that fry can be reared without aeration, and I would go so far as to say that they are better without it, providing always that the fish are kept well within the limits of the tank. Aeration will help to accommodate more fry, but then should the aerator break down overnight, it might mean the loss of a spawning by the morning, if the night is at all warm. Another point is that fry accustomed to well-aerated water will take hardly to non-aerated water when they are transferred later.

Summed up, one can say that the secret of successful breeding is regular, careful attention; plenty of tank space to allow for growing; a liberal supply of live food (*Infusoria, Daphnia,* etc.); healthy parents, not too old nor yet too young; genuine enthusiasm and love of fish.

* * *

Fifteen thousand sleeping beauties arrived in England recently from North Africa. They travelled in 127 specially constructed dormitories, but they knew nothing about it. Nor will they till the warm sun wakes them in April or May. For they are dormant tortoises, shipped here by a dealer who will sell them as children's pets or garden novelties. Mr. O. R. Haase, livestock manager of the Lep Transport, responsible for the shipping of the tortoises, told the *News Chronicle* that they weigh six tons. As they are all lying dormant, arrangements for their journey were simple. It was not necessary to feed them.



The Terrapin at Home

By H. E. D. FROST

THE Reeve's Terrapin is a quiet and placid individual, who hides his feelings under a mask of Oriental impassivity. The only time mine displays any sign of emotion is when he bumps his head on the pond floor in an attempt to snap up a worm. This Terrapin is found in China and Japan, and is one of the smallest varieties, its carapace seldom measuring more than 4". He seems easily pleased, and asks little more of life than a nice, green slimy pond with plenty of weeds, with perhaps a rock to bask on, and meals four or five times a week. Here again he is not very exacting. He will live on raw meat and worms, and will devour ravenously any small fishes or fry, as these are his natural food. Slugs he may or may not eat, but in any case it is better not to give him this delicacy, as the mucus exuded from the slug sticks to him like glue, and leaves him tearing uncomfortably at the sticky curtain which covers his jaw and claws.

It is rather amusing to give him a large worm, perhaps twice as long as himself, and watch the titanic struggle which ensues. His usual method of procedure with small worms is to start at one end, and swallow slowly until the last protesting wriggle of worm has completely disappeared. With the larger worms this becomes impossible, and he decides to " divide " the enemy. He catches the worm in the middle with one snap, and pulls at it with his claws. The worm usually responds by coiling itself round his head, and for a moment or two he is quite frantic until the monster has been dislodged. All this, of course, takes place under water, and so places the wretched worm at a distinct disadvantage. As he basks in the greeny depths of his pond during the summer he is storing up strength for the long winter. Surfeited with worms and bloated with fish, he will turn at last in late October to the little alcove in the wall, filled with dried leaves and straw. His dreamless sleep will last until the first few days in early spring, when there emerges an older, rather solemn, thin Terrapin.

If, during the winter, he were to wander out of his hiding-place, and swim disconsolately round in the icy water of his pond, it would only be in search of food. It would mean that he had not fed well enough in the summer to allow him to pass the winter entirely without sustenance, and a moderately warm spell would be sufficient to wake him up and remind him that his last meal was six months away. As August goes by and the colder days of September arrive, the black, beady, Chinese eyes are as bright as ever. September draws out, and the eyes close more often, until at last the warm retreat of dried leaves becomes irresistible; then, by the simple expedient of firmly closing his eyes, the happy reptile can shut out the world and its inhospitable winter for six long months.

Starting with Reptiles

By K. P. DREYER

THIS article is written especially for those with a shallow pocket, like myself. I propose to explain how to start well with not more than £1. First, the vivariums; these will have to be fairly small. My first was 16" x 12" x 9", and cost 7/6. It had a removable glass front and a sliding back, and was made from tin, and painted with white enamel. This proved very satisfactory, and I should advise a beginner to get one something like it.

The setting up is very easy, and you can use your own discretion about it. A community vivarium, like mine, should be set up to suit all the inmates. My first stock consisted of one Spotted Salamander, one Fire-bellied Toad, one English Frog, and one English Lizard. The case had, therefore, to be divided between a damp and humid, and a warm, sunny atmosphere—a difficult layout, you will agree. I got over it in this way; first I put three small flower pots, containing ferns, along the back of the case, camouflaging them with a bank of stones. In the crevices in the stones I stuck thick green moss. In this way the pots were completely hidden. That was perfect for amphibians, but what of the Lizard? For him I built a stretch of fine, dry sand between the bank and the glass, and in the sand I sank a small dish filled with water for a pond.

You must be careful about the sizes of the inmates for a community vivarium, as otherwise some of the smaller inhabitants may be devoured. I think a safe margin is to have nothing over 3" long with anything under 2½" long, except perhaps for the Salamander, which is a very kindly creature.

I do not mention any reptiles over 3" long, as these are usually impracticable to the small vivarist, for whom this article is written. From your stock money you might draw a shilling and invest it in an ounce of meal worms, to help you through the times when insects are scarce. Part of the excitement of keeping reptiles and amphibians is the fact that when you go for picnics there is always a chance you may be able to collect new specimens.

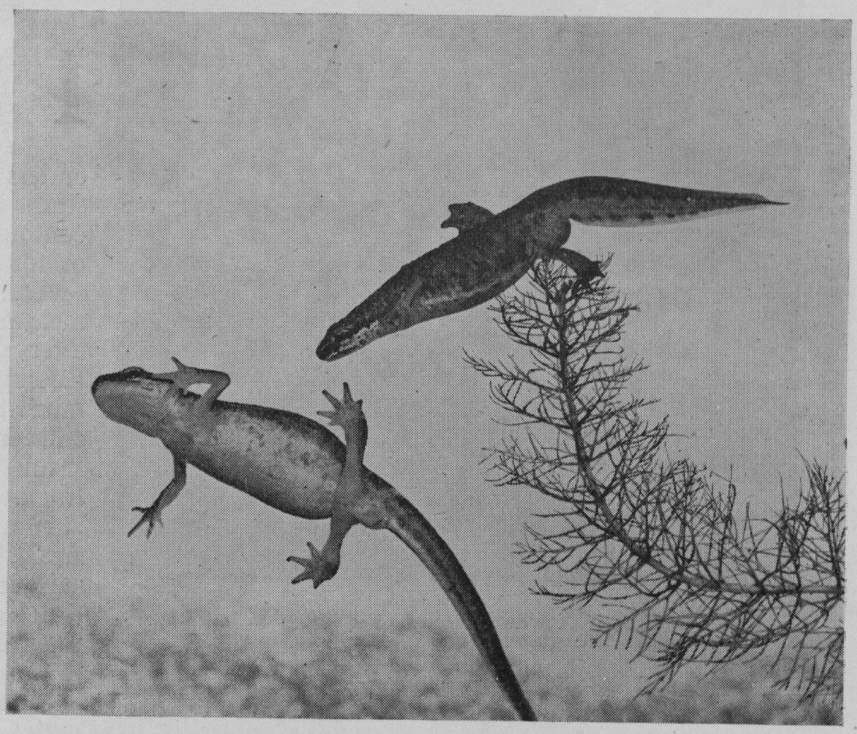
There are two harmless snakes in England, the Grass Snake and the Smooth Snake, though the latter is very rare. There are several kinds of newts to be found, and two Toads, the Common and the Natterjack. An Edible Frog is sometimes seen, but not very often. In your own garden you can find English Frogs, which are very variable in colour. On sunny banks you can find Sand Lizards, and in some places you might find a Green Lizard, if you are very lucky. After warm rain look for Slow Worms; these are snake-like lizards, which, through years of burrowing, have lost their legs. All these will thrive well if given correct conditions and food.

Palmate Newt

By L. G. PAYNE

THERE are in England three indigenous species of newt—it is perhaps surprising how many people who are familiar with the Great-crested Newt and the Common Newt, are but vaguely aware of the existence of the third species—and the vivarium or aquarium enthusiast who wishes to add something uncommon and distinctive to his collection may well turn his attention to the Palmate Newt.

It may be as well to state at the outset that the Palmate Newt is rarely to be seen in the dealers' lists, whereas the other two are commonly offered. The reason for this is not far to seek. The Great-crested Newt and the Common Newt are comparatively large and "showy" species; also they are easily found in the wild state. The Palmate Newt, on the other hand, is small, the colouring is somewhat subdued, and it is of distinctly local occurrence.



Pair of Palmate Newts. The male, on the right, is distinguishable by the pin-like extension of his tail

The natural distribution of this newt in England is peculiar. It is the only amphibian which is definitely more abundant in the West of England than in the East. It is reputed to be decidedly rare near London and in the Home Counties, and in this connection there is certainly scope for interesting work to be done by the amateur in searching for the newt and providing new records of its occurrence.

Palmate Newts do not exceed 3″ in length, and both sexes possess the webbed hind feet, which give the species its English name. The male newt is characterized by a pin-like extension of the tail, which generally persists the year round. The crest of the male is low and straight-edged, while two raised ridges on opposite sides of the back serve further in its identification.

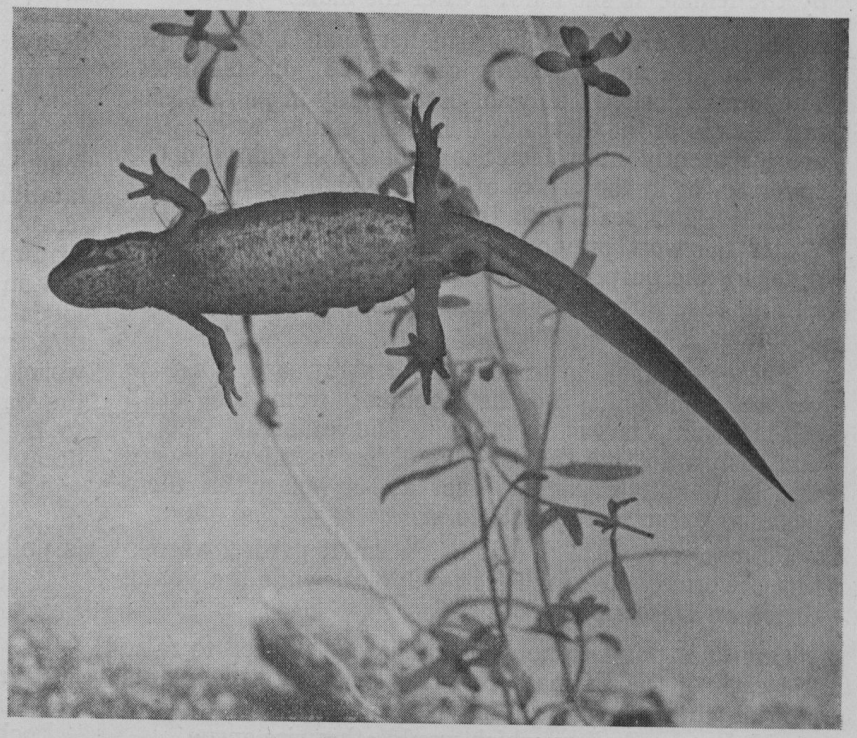
Although any good work on natural history will provide a description of this newt, the beginner is likely to have some difficulty in satisfactorily identifying the female, for it bears a superficial resemblance to that of the Common Newt. It should therefore be helpful to state the points of difference in table form:—

	Palmate:	Common:
Length	3″	4″
Hind Feet	Toes Webbed	Toes free
Throat	Unspotted	Spotted
Tail	Slightly Needled	Obtuse

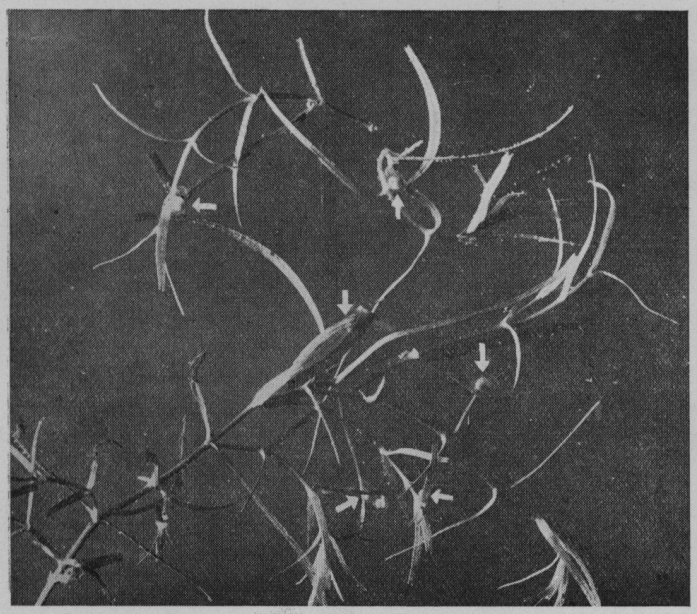
No attempt is made to compare the colouring of the upper parts, for this is inconstant in both species, and may vary from olive-green to a brownish-black.

In early March, if the weather is favourable, the newts leave their winter retreats and return to the water. I have found them in deep pools in slate quarries, and in slow, running streams. The pair photographed were taken near Guildford in shallow, flood water.

Having obtained our newts, how are we going to keep them satisfactorily in captivity? To appreciate the real attractiveness of form and colour in newts, I strongly recommend a glass tank of a size not less than 24″ x 12″. Fine-grade shingle to a depth of 1″ should cover the bottom. At the rear half of the tank, miniature tiers of flat stones and bark should rise to within 3″ of the top. In the front half of the tank, in the shingle, plant *Elodea canadensis* and *Callitriche*, fairly thickly. Finally, put in water to a depth of 4″ and cover the tank partly with perforated zinc and partly with glass. You will then



Female Palmate Newt



Eggs of the Palmate Newt, much reduced. The eggs are indicated by arrows and in the centre can be seen one wrapped up in a leaf.

have an aqua-vivarium pleasant to look upon and one entirely suited to the requirements of this and certain other species of newt for six months of the year. When August comes it will be desirable to reduce the water content of the tank and increase the land area. This can be done effectively and picturesquely, by loosely piling a few small grass turves in the former area of water, leaving only a few inches of water in the front centre of the tank.

If your Palmate Newts are in breeding condition, the male will be seen lightly poised amongst the water plants, rapidly fanning the water with his tail, sinuously curved in the direction of the female. The latter watches, apparently spellbound. Now it is that the male discharges spermatophores, which are absorbed by the female as she follows after the male.

The eggs are noticeably smaller than those of the other English newts, being only 1/16″ in diameter. They are deposited singly, or occasionally in pairs, either in the axils of the leaves of the water plants, where they are apparently unprotected except by a thin mucous covering, or in the centre of leaves which the newt then "folds" and seals with the aid of its rear feet. The Water Starwort previously referred to is an excellent plant for the purpose by reason of its close-growing form and the ease with which its long, thin leaflets are adapted to folding.

The eggs hatch in about a fortnight, according to weather conditions, and development from the small gill-breathing larva is rapid. The amateur who is anxiously watching the progress of the round white eggs will be definitely assured that all is well when these begin to assume crescentic form.

Palmate Newts feed readily on small garden worms, blood worms, and small frog tadpoles, while the young thrive on *Daphnia*.

One final point to note is that if it is desired to raise the eggs of the Palmate Newt to maturity, the plants bearing these must be removed to a separate tank to avoid the cannibalism which would otherwise ensue.

Too Much Food

IT is remarkable how, in spite of frequent paragraphs urging care in the matter of feeding, we receive queries about all kinds of troubles in the aquarium, where the root of all evil is nothing more or less than introducing an excessive amount of food-stuff, which remains uneaten. Try feeding your fish continuously with pinches of food, and see how much or for how long they go on eating. Where there are several fish, a mustard or salt spoon makes a good measure for dried food. A number of small meals at intervals throughout the day is better than one excessive feeding, and remember that a useful guide is to give as much food as the fish will clear up in five minutes, and still remain ready for just a little more. When not quite "full" they will go searching around and clear up any fragments that may have escaped their notice at first.

It is important, too, that food should be of a suitable size. While big fish will often quite enjoy eating, at the surface of the water, food which at first sight might seem ridiculously small, they will in all probability not take the trouble to go searching for all the grains that fall to the bottom. Of course, by no method can small fish eat large food. Observe your fish closely, also, and notice the relative size of mouth in different species. We usually reckon on fish having relatively large mouths. This is probably a result of the apparitions which confront us on the fishmonger's slab, but close inspection of an aquarium fish reveals quite a divergence of size. So it does not follow that all fish 2-in. long can eat food of the same size; one species will require finer food, another coarser.

Many fishes, as has already been inferred, will go searching diligently for any particles that may have fallen unnoticed to the tank floor, but the fishes can only succeed in their search if all places are accessible to them. On a floor made up of pebbles with no sand, food will fall into the interstices, there to remain ungetatable and decaying. Aquarium ornaments and unnecessarily ornate rock work provide similar sites for decay.

The idea may have been gained from these notes that only dried food, when fed to excess, is liable to lead to fouling. Such is not the case and often decaying "live" foods will more quickly lead to decomposition and fatalities among the inmates. The novice is frequently tempted to offer unnecessarily large quantities of live food to his fish, when good fortune smiles on him and he has an abundant supply. Excessive amounts of such foods as chopped heart or scraped liver, will cause dire trouble, while living foods like *Daphnia* and blood worms, though they may be creatures naturally living in the water, will often quickly die in the aquarium owing to the great change in condition. When dead they decay rapidly and potently as the least sensitive nose will discover. Also even if alive, these creatures deplete the available oxygen dissolved in the water, and this, too, is undesirable.

In these matters our watchword must be: "Moderation, and Observation." L. C. M.

* * *

A large Snake is reported to have been seen in the neighbourhood of Stanmore, Middlesex. Another "Loch Ness Monster"?

The Aesculapian Snake

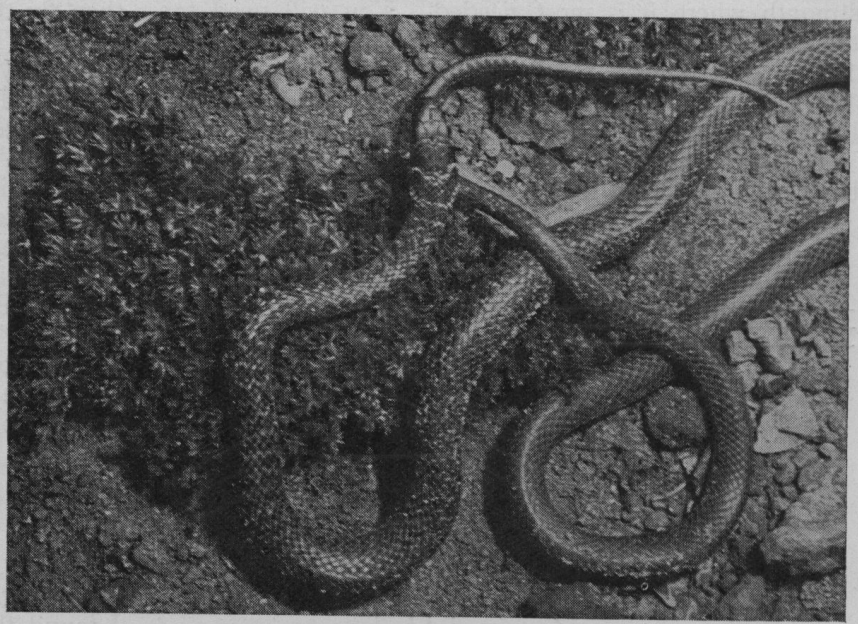
By A. E. SPICER

THE serpent has come to be universally accepted as a symbol of the medical profession, and at the present time serves as the distinguishing badge of the medical corps of many armies, including the R.A.M.C. The particular species which is responsible for this is the Æsculapian Snake, now generally known as *Elaphe longissima,* but formerly referred to as *Coluber æsculapii* (Sturm) or *C. longissimus* (Boulenger). The members of the genus *Elaphe* are considered to be among the most satisfactory for observation in captivity, and live well under such conditions, but it must be admitted that the present species is somewhat of an exception, for, like its relative the Leopard Snake, it is not always a ready feeder, and sometimes will not settle down at all well. Individual specimens appear to differ in these respects, for while I have found them shy feeders, my specimens have rapidly become tame, while others have reported exactly the contrary experience. The latter is probably more general, for reptiles as a class do not seem usually to become tame until after they have accustomed themselves to feeding in captivity.

The Æsculapian Snake is found in most of the countries of Southern Europe, even to parts of Germany and Austria, where its distribution is confined to small local areas in which it is abundant. The wide distribution is thought to be the work of the Romans, who used to carry it with them on their colonizing expeditions and liberate it in the countries subjected, on account of its prophylactic associations. The noble riparians of the Tiber, having adopted the Greek god of health along with numerous other deities, changed his name from Asclepios to Æsculapius and set him up in a comfortable temple at Epidaurus, where he soon found himself in a fair way of business as a general practitioner.

There was a flavour of witchcraft about all Roman religion; and as the serpent is a somewhat occult animal and by tradition the familiar of magicians, it was not long before the priests of Æsculapius set about improving their relations with the Æsculapian Snake, which happened to be common locally, though, of course, it was not called by that name at the time. They are supposed to have performed remarkable prodigies of taming, of which the accounts are, as Huckleberry Finn said of a more sacred passage, " interesting, but steep." At all events they succeeded in connecting in the popular mind the snake and the notion of healing properties, to such good effect that the reptile was soon as much honoured as the god himself.

The Æsculapian Snake is extremely energetic and short-tempered. When in a rage it is an impressive creature, lashing its tail, puffing out its body and hissing, and squirming hither and hither. It will bite if provoked, but its teeth cannot make much impression on the human hand. It can deal surprisingly powerful blows with its tail, but it is doubtful whether this organ is deliberately used as a weapon of defence, being most probably lashed merely as an expression of anger. Four feet or so is a fair size for this species, though larger individuals up to 6-ft. are taken.



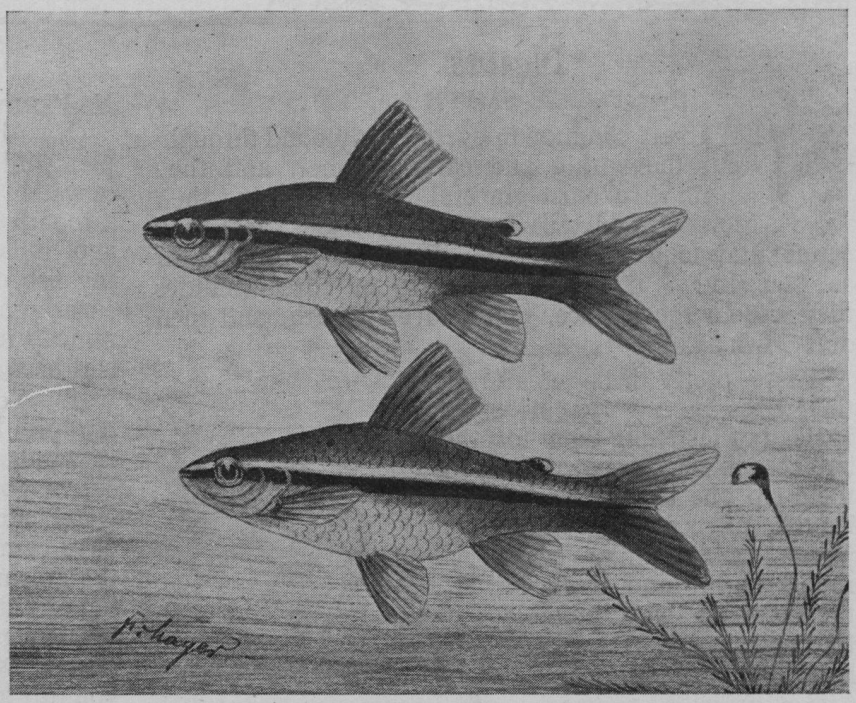
It is a beautiful creature, its most interesting characteristic being a reticulated effect due to the scales being finely edged with white. The head, though rather narrow, is fairly distinct from the body, which is slender for its length, and not much thicker than that of a Grass Snake. Another respect in which it is an exception to its genus is that it has smooth scales, or only very slightly keeled ones. Its colour is somewhat indeterminate, ranging through brown, olive-brown to greenish, with four rows of darker spots distinguishable in young specimens. There is an inverted V-shaped black marking on the nape of the neck, and often a line from the eye to the corner of the mouth—yellow, black, or both. The ventral scales are yellowish. It is a particularly pretty and graceful creature immediately after it has sloughed, its colours then being lighter and more distinct, and its scales glinting with a beautiful glossy sheen.

Its temper, which is especially virulent in newly imported specimens, and its unreliable feeding habits, do not render it a model inmate for the vivarium; but it is nevertheless well worthy of a trial, for the sake of its beauty and interest, and because there is a special pleasure in attempting a difficult task, and not always sticking to the easy road. The diet consists of mice, lizards, young birds, and rats, which it constricts before eating. Newly born mice are perhaps the best things with which to tempt a " hunger-striker."

(*Continued on page* 201)

The Golden Line (*Nannaethiops unitaeniatus*)

By FRITZ MAYER (translated by M. G. Elwin)



NANNÆTHIOPS unitæniatus was first imported into Germany by Willy Dollhopf in 1931; seven specimens, four males and three females, being included amongst a number of fishes arriving from the Cameroons.

After a somewhat protracted period of settling down, these beautiful fishes spawned. The fry, fed at first on *infusoria* and other microscopic organisms and later on *Daphnia* and *Enchytræ*, developed rapidly and at the end of six months were as large as their parents. In some of the females in this brood the distension of the belly caused by the presence of the eggs was very uneven; in very few species is this irregularity so noticeable. This did not in any way impair the liveliness of the fish, on the contrary it would seem from their vigorous driving that the chances of breeding were better with these than with the imported specimens.

On my advice two males were put to spawn with one female but this subsequently proved to be unnecessary. *Nannæthiops* much resembles the *Nannostomus* species in form and colouring and the breeding habits are also similar. The two males, blazing with colour, sparred up to each other, like *Nannostomus* males, with fins spread to the point of splitting, bodies curved, and tails flicking; it was all perfectly harmless, no damage being done. This continued for a while. Suddenly they darted like lightning at each other and in pursuit of the female until finally, after some resistance, she remained stationary over a clump of plants. From both sides the males pressed against the female, who suddenly extruded a large number of yellowish-white eggs, which, fertilized as they dropped by the males, fell haphazard among the plants and stones. After about three hours the spawning came to an end, and the fish, obviously exhausted and breathless, rested in plant thickets. Subsequent experience taught me that to obtain the best results it is advisable to use a roomy aquarium, fairly shallow water, thick masses of fine-leaved plants and a minimum temperature of 73° F. The fry hatch out in two-three days and for a while keep near the bottom, looking for food in the mulm. It is about a week before they can be seen swimming about freely in mid-water.

In shape *Nannæthiops* is slender, with pointed head and mouth, as in the well-known *Nannostomus* species. While the female attains a length of 3″ the male is full grown at 2½″. The general colouring is a brownish olive with dark margins to the scales, the belly is pale and the underside of the tail is a rosy red. From the tip of the nose to the end of the middle ray of the tail fin runs a black stripe (this appears light blue by reflected light). This stripe is limited above by a broad golden band reaching from the mouth to the base of the caudal fin. Both caudal and dorsal fins are a delicate carmine. These colours are particularly beautiful in the male during the breeding period or when excited from any other cause; the fins and base of the tail then become blazing red.

Nannæthiops is a harmless fish which, thanks to the readiness with which it breeds, has become widely spread amongst aquarists. Its beauty and outstanding liveliness make it a most desirable acquisition.

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The Aesculapian Snake

(*Continued from page* 197)

When purchasing these Snakes, one should watch them crawling, and also let them run through the fingers, to make sure they are not injured or ill. Through neglect of this precaution I once bought a Snake with a broken spine; it did not appear to be greatly troubled, but I could not relish the sight of the creature crawling about in its maimed condition, so I killed it. A vivarium for these Snakes should be roomy, and so constructed and placed as to receive the maximum possible amount of sunshine; nevertheless, it is of prime importance that access to shade be provided for the occupants. Drinking water is, of course, a necessity; but not a bath. Branches and rocks must be available for the Snakes to climb about on. Artificial heat is not essential, but in moderation, and combined with electric light, it is most beneficial in helping out our somewhat modest ration of summer, and in inducing one's pets to feed. Æsculapian Snakes can be associated with other snakes of a similar size, provided they like the dry conditions which this species needs; but Lizards would have an uncomfortable time with them.

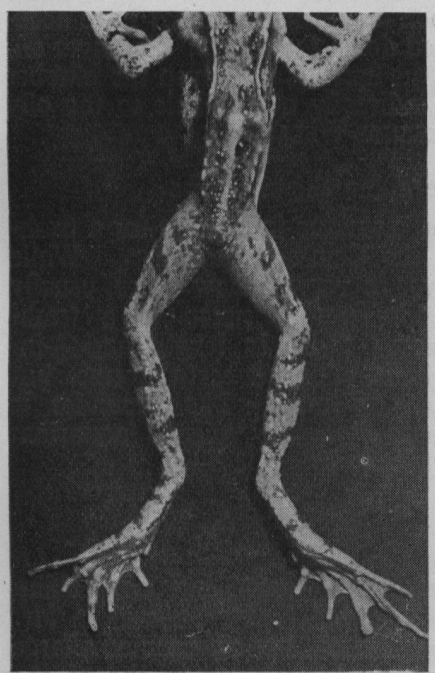
"Mud Frogs"

NO doubt many readers have bought the so-called "Mud Frogs," which have been offered for sale recently, and then been puzzled by the purchased specimens bearing little or no resemblance to the amphibian described by Mr. L. G. Payne in the January 18, 1938, issue of WATER LIFE.

This is a good example of the confusion that arises through the use of popular names which bear little relation to any visible or easily recognized characteristic of the creature. The "Mud Frog," actually a toad, is characterized by the "spade" or horny shovel borne on the hind limbs, and is better known perhaps as the Spade-foot Toad, the commonest species, and that usually offered for sale, being *Pelobates fuscus*. Writing of the Spade-foot reminds us of the statement of an American author who, commenting on the ability of toads to dig and burrow, mentions specifically "the spade-footed toads, who are marvellous diggers with feet designed for excavating, and whose holes not infrequently are fifty or more feet in depth." Believe it or not!

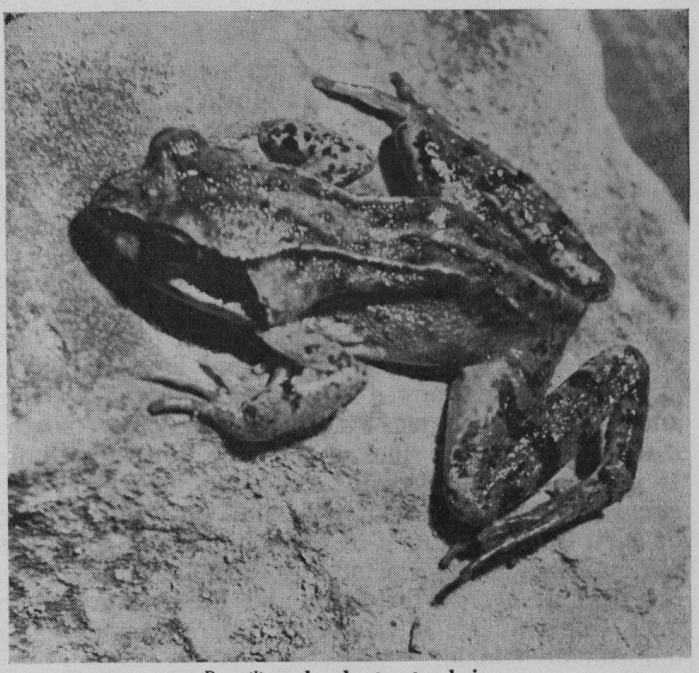
Now the creature offered for sale recently is a true frog, and is, in fact, the Agile Frog (*Rana agilis*), which is credited with being able to make enormous leaps, up to 6-ft. We have not witnessed such feats yet, but the extremely long hind limbs indicate that the frog has unusual jumping powers. If these creatures take to leaping about in small vivaria, they will doubtless harm themselves. So far ours have shown no tendency to do this, but have proved exemplary inhabitants of an indoor vivarium feeding readily on earth worms and spawning.

The mating is unusual in that there is no prolonged embrace, as in the case of the Common Frog. We did not observe the mating of our pair at all, as they just entered the water after dark one evening, spawned, and the following morning were on land again, looking quite unconcerned, and as though nothing out of the ordinary had taken place at all. The female was, of course, greatly reduced in bulk. The eggs, about 250-300 in number, were laid in 4-in. of water, and the mass of eggs rested on the bottom.



Showing the great length of hind limbs relative to body in *R. agilis* (reduced)

Comparing the outward general appearance of the two species, *P. fuscus* looks a typical little toad and *R. agilis* a typical frog. *Fuscus* is of a grey-brown hue, subject to quite wide variation, the most attractive specimens being quite a rich brown, with red spots. The iris is quite golden and the pupil a narrow vertical slit. *Agilis* is much lighter in colour, the back being a pale, yellowish brown, shading to a lighter greenish yellow on the sides, while the belly is quite white. The upper half of the iris is yellow, and the lower half brown.



***R. agilis* male, about natural size**

It will be seen that these two species are really very different, but the fact that one was sold under a name usually reserved for the other has led quite a number of people to try to see the characters of one in the other.

* * *

Fire Breathers!

Having caught a few Newts, both the Common and the Great Crest, I have been observing their habits, and have arrived at the conclusion that I know the reason for the old legend that Newts could spit or breathe fire, as some country people believe. I was watching a Great Crested Newt sloughing, and as it cast the old slough, a Spotted Newt that had been very interested in the procedure swam up and proceeded to eat the skin. As he was in the act of swallowing the filmy grey slough, shaking and worrying it, it appeared like a cloud of smoke coming from his mouth. Anyone not enlightened in the ways of Newts and getting a quick glance would certainly have mistaken it and gone away with the tale of seeing smoke belching from the monster's mouth, and, of course, you know the old saying, "Where there's smoke there's fire." Another habit that Newts have is mouthing the mud at the bottom of their tank, taking a mouthful and spewing it out in a smoke-like cloud. Also, if fed on a worm that is dirty with soil, the worm is swallowed and the soil is ejected some time later in the same smoky way. That is my explanation of this old fallacy.—H. LODER.

The Natterjack Toad

By JOHN CLEGG

SURPRISINGLY few people seem aware that two species of toad are to be found in this country. The local distribution of the Natterjack Toad is no doubt responsible for its being constantly overlooked, although it is really not a rare creature. Where it is found, it usually occurs in quite large numbers, and, in fact, on the coastal sand dunes of S.W. Lancashire, where the writer has had exceptional opportunities of studying it, so numerous are the toads that in spring the noise made by them becomes of such intensity as to be a positive nuisance to those people whose houses border the dunes!

Smaller than the Common Toad, the Natterjack is further distinguished by the yellow line which runs down the middle of the back, while its legs are much shorter than those of the common species. It is far more active, too, and, owing to its shorter legs, runs rather than crawls. For this reason it is sometimes called the " Running Toad."

Usually the Natterjack is found in dry situations, coastal sand dunes being often frequented, and, during the daytime, the toads may be found in burrows which they make in the sides of sandhills, or sometimes they hide themselves under stones, old tins, or other debris. Like the Common Toad, the Natterjack must normally be considered crepuscular in habits; but it is, however, not unusual to see individual toads running about in the daytime.

Spawning is carried out rather late in the season, May being the favourite time, and the strings of eggs are deposited in the shallow pools or drainage channels which are to be found in this type of country. At this time large internal vocal sacs are developed, and the noise made by the toads is almost incredible. To call the noise a croak is scarcely correct, for that term conveys to the mind a harsh, abrupt sound. The noise of the Natterjack is rather better described as a continuous gurgling sound, and can be imitated fairly successfully by running the thumb over a comb with fairly long teeth. As the noise will carry well over a quarter of a mile on a still evening, the effect when sitting in a region containing hundreds of the toads in full cry can well be imagined!

The Natterjack, unlike its commoner cousin, does not seem particular about its choice of a spawning pool, and the shallow pools which it frequents quite often dry up as summer advances. This may explain why the Natterjack tadpole completes its metamorphosis quicker than the Common Toad, only taking about six weeks as compared with eight or ten.

The toads grow slowly and, when mature—between the fourth and fifth year—they are only about 2" long.

IN CAPTIVITY.—The Natterjack makes a very engaging occupant of the vivarium, and, if suitable conditions are provided for it, and not too much is expected of it in the daytime, it will thrive in captivity.

The floor of the vivarium in which these toads are kept should be covered to a depth of 2" or 3" with sand. In this they will usually bury themselves. If one does not live near the seaside, a quantity of sand

may be obtained from a building contractor. With the idea of reproducing more accurately its native conditions, a quantity of sand should also be piled against one side of the vivarium, and if a sufficiently large heap is provided, the toads will burrow into this. The writer has noticed that the ends of the natural burrows are moist, and it would seem a good plan to pour a quantity of water each day down the side of the vivarium where the sand is piled to keep the ends of the burrows damp.

Whether this is done or not, a shallow pan of water should always be provided, for the writer has found this to be much used. Although living naturally in dry surroundings, like all amphibians the creatures need moisture.

The toads are wonderful climbers, and a cover of perforated zinc or other material will be necessary if they are to be kept within the bounds of the vivarium. Insects, worms, and grubs form their natural food, and in captivity they will readily take earth worms, " gentles," or the old stand by, meal worms.

* * *

The London Zoo has acquired, thanks to Mr. T. O. M. Sopwith, some specimens of the giant Land Iguanas from the Galapagos Islands. They are heavily built creatures, about a yard long, with a dragon-like crest of spines running from nape to tail, stout claws, and heavy dewlap. This curious reptile was first brought to general notice by Darwin during his famous voyage in the *Beagle* about a century ago.

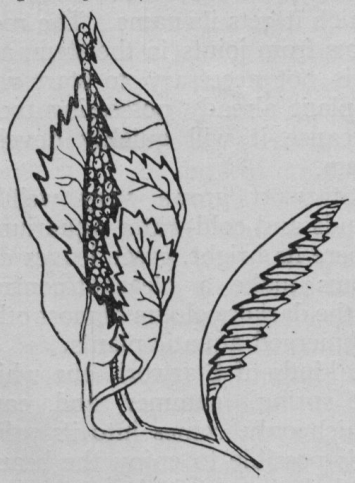
The lizards drive shallow burrows into the sandy areas amongst the volcanic rocks, often riddling the ground so that, as Darwin observed, " it is difficult to find a space sufficiently free from their excavations to permit the pitching of a tent." The female lizards lay elongated, leathery-shelled eggs, which are hatched out by the heat of the sun.—*Observer.*

Tadpoles Up Trees!

THE keeping of exotic amphibians and reptiles has very definitely come back into its own during the last two years, and we are so immodest as to suggest that this has been in no small measure due to WATER LIFE, which has brought to all and sundry reliable and accurate information about these many strange creatures for the first time.

This year there is an unparalleled collection of both common and unsual species available for would-be purchasers. Beside the commoner species we have seen particularly fine specimens of the Æsculapian Snake, Baur's Box Tortoise—which is not often imported—the comparatively rare Giant Salamander, Blue-tongued and Giant Skinks, and adult American Bull Frogs. But the strangest of all these creatures was a Tree Frog from America. A species of the genus *Phyllomedusa,* these Frogs are about 3-in. long and of a dull greyish-yellow colour. The feet are equipped with particularly effective suckers, as can be seen from the accompanying illustration.

It is the breeding of this frog which is of peculiar interest, and it was first described as follows by von Ihering in 1886. "*Phyllomedusa* does not lay its eggs in the water, although the larva develops in that element, but in the open air in masses 50-mm. long by 15-20-mm. broad, between leaves hanging over the water. Willows are frequently used for that purpose. The egg-mass contains rather large white ova, wrapped up between two or three leaves in such a way as to be completely enveloped save an inferior opening. My attempts at rearing the eggs failed owing to the leaves drying up; but I am assured that the tailed larvæ may be seen wriggling in the gelatinous mass. As at a later period the latter is found empty, we must infer that the larvæ drop into the water below. The eggs are found only on plants hanging over stagnant water."



A branch with eggs of *Phyllomedusa iheringixi* enveloped in the leaves.

Truly, this is a Tree Frog, and perhaps some persevering fancier will have greater success than that related above.

Æsculapian Snake. See WATER LIFE, April 26, 1938.

Baur's Box Tortoise. See WATER LIFE, January 5, 1937.

Blue-tongued and Giant Skinks. See WATER LIFE, August 10, 1937.

Giant Salamander. See WATER LIFE, September 22, 1936.

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We shall be pleased to supply complimentary copies to any new readers who are anxious to introduce this paper amongst their many friends.

Phyllomedusa [*Specimen supplied by L Cura*]

Diagnosing White Spot

(*Continued from page* 236)

put into new water. There is also another complaint in which the fish becomes covered with extremely small white spots; this sometimes appears on fish in excessively alkaline water, and disappears almost at once if the alkalinity is reduced. As far as I am aware the cause of this is as yet unknown.

Finally the larvæ of the Bitterling Mussel, which attach themselves to the fins of fish, may be mistaken for White Spot. They are found chiefly around the edges of the fins, and are somewhat yellowish in colour. They are quite harmless, merely using the fish as a means of transport, and in no way injuring it.

* * *

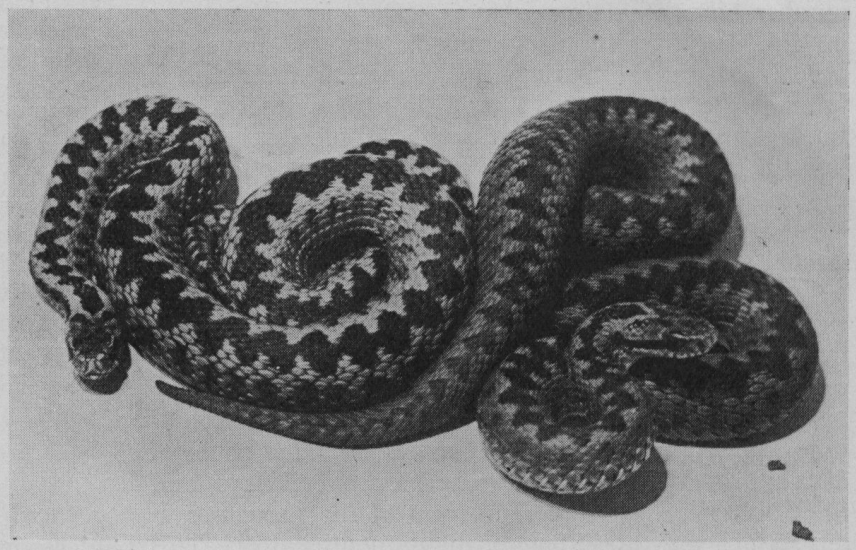
"The Complete Aquarium Book," by W. T. Innes, price 10/6 post free, is exactly the same book only published under a different title at a cheaper rate as "Goldfish Varieties and Tropical Aquarium Fishes," by W. T. Innes, which used to be sold at 16/-. This is an excellent book, dealing with all the aspects of aquarium keeping, including the setting up a tank, with a description of the various plants, the care and breeding of Goldfish and Tropicals, and how to recognize and deal with various fish diseases and parasites. This is thoroughly recommended by us as a book all aquarists should own. The sole agents for this book in the British Isles are Messrs. L. Cura & Sons, Baynes-court, Warner-street, London, E.C.1.

The Viper in Captivity

By ALFRED LEUTSCHER

BEFORE starting on this article I should like to state that I consider the Viper, or Adder, as it is more usually called, to be a definite failure as a vivarium specimen, not so much because it is a dangerous reptile to keep, but rather because it is an animal easily upset when removed from its natural surroundings. The result is that it tends to sulk its life away by slow starvation. It refuses to take any food, and seems altogether resigned to its fate.

However, I have been fairly successful in keeping it, simply by removing all ideas from its mind, if it has any, that it is in captivity. This I have done by constructing extra large vivariums, of many feet dimensions, with the glass fixed in as roofs, and not, as is usual, to one side. In these boxes I have constructed as near as possible a representation of the animal's natural haunt, such as patches of heather and dwarf willows, with an undergrowth of grass and bracken, all on a leaf-mould base. Such would resemble an Adder patch as found in Epping Forest, near London. Isle of Wight Adder spots seem, on the other hand, to be of a more rocky nature; hence, for these island specimens I have included rock work and stones in the box. In each separate vivarium is placed a pan of water, artistically camouflaged with rockery and plants.



ADDERS.—The one on the left is a female, the other, darker specimen, is a male.

In such surroundings the only inkling the inmates are likely to receive that they are in a prison is perhaps the presence of the walls of the box, which are, however, painted to harmonize with the general tone of the plants, etc. The glass roof would, I assume, efface itself against a natural sky background. As for the limits of their home, I do not think this would unduly distress the Adders, as, like most reptiles, they are of a sluggish nature, and seem to prefer lying in the sun, except when hunting or sent to retreat by bad weather. I have many times realized this fact with Adders, by noticing how a particular specimen may be found, day by day, to frequent the same spot.

In studying my Adders, I take great care not to disturb them in any way, as they dislike intrusion, and will at once be on their guard when aware of a strange presence. Adders, unlike lizards, will remain perfectly still for hours on end, seemingly content merely to bask in the sun. Their beautiful markings, however, make them a pleasure to behold. They appear to take food at dusk, and I believe this is natural, as the Adder is supposed to hunt by night. I have actually seen wild specimens on the move long after sunset on mild summer evenings, and also as early as six in the morning. It is interesting to note that, like the cat, it possesses a vertical slit for a pupil to the eye, said to indicate that the animal goes abroad by night. My Adders are fed on frogs, toads, and even mice, which unfortunately will only be accepted alive. The method of attack, though gruesome, is interesting, as it seems to throw a doubt on the theory that snakes can fascinate their prey. I once watched the process unobserved by standing near a vivarium in the dark. The box was illuminated by a dim light specially constructed for the purpose. A mouse was then introduced by a side door, and it at once ran to a corner and commenced to forage among the leaves and bracken. I had not long to wait. After a few minutes a wicked little head appeared from behind a rock, and an Adder commenced to stalk its prey. It approached to within a foot of the unconcerned mammal, and then, by a remarkable display of muscle control, kept its head perfectly still in mid-air, meanwhile gathering its hind parts in coils beneath the head. In this way sufficient length of body was gathered in the coils to allow for the Adder to launch an attack. The mouse by now had stopped its foraging, and was watching the Adder with a sort of idle curiosity. I refuse to believe that it was in any way "fascinated" by the reptile, unless this very elastic word can be interpreted as meaning "curiosity." The mouse did not react as if petrified, nor did it tremble as if in fear, and its little nose was working continually. Then the Adder struck, and its head darted forward with such suddenness that, in my then state of nervous tension, I started violently. The mouse leapt convulsively, and then indeed began to tremble. The poison must have taken quick effect, since the little creature only lived a short while, no doubt in great pain. The Adder meanwhile remained perfectly still, yet alert to the mouse's every movement. As soon as its prey fell over, the Adder started to glide forward, no doubt to take its meal. I was, however, so upset after witnessing such a horrible form of death that I left rather hurriedly at this stage, and did not see the mouse eaten. I have seen Grass Snakes feeding, though. It is an unpleasant sight, since the reptile has to contort its very elastic jaws into unbelievable positions in order to swallow its meal, which is usually a frog.

The young of the Adder are pretty little things, being perfect editions of their parent, some 6" long. The baby Adder bites from birth, as I once discovered to my surprise. The bite, however, is harmless, as the tiny fangs cannot even penetrate the skin. The average number born at a time is five. Occasionally an egg is laid, but this ruptures immediately. I have not been successful in rearing the young, as their diet is unknown to me. I have tried tiny frogs, insects, and sundry small living creatures without success. They live till the next hibernation period, but die off during the winter months.

Adders in captivity are always ready to bite. The animal apparently cannot be tamed, and I always have to use a pair of long-handled tongs or thick leather gloves when moving them. I once had the misfortune to be bitten by an Adder, and the result was not pleasant. The venom travelled up the arm veins, causing very painful swelling of the limb. Subsequent symptoms were fainting, giddiness, vomiting, and bouts of diarrhoea. One is confined to bed for several days, and the after-effects are a derangement of the nervous system, which may upset one for many months after. This occurs, of course, only if the normal course is pursued by the poison and nothing is done to prevent it from spreading.

I had no experience at the time, otherwise all this could have been prevented. I now always carry with me a special snake lancet, together with a supply of permanganate of potash crystals. If bitten, one should at once prevent the poison from spreading by applying a tourniquet between the wound and the heart, with, say, a piece of string, a shoe lace, a tie, or even a garter. The seat of the wound is indicated by two tiny punctures. The skin should be cut here with the lancet to encourage bleeding. Try to remove the blood, together with poison, by sucking the wound. Any poison which is swallowed will not affect the stomach, but beware of cuts or cracks on the lips. Afterwards the permanganate crystals can be rubbed into the wound, and it should help to neutralize the effect of the poison. I strongly advise all ramblers, campers, Scouts, or other people who read this, and are likely to come across Adders in their outdoor activities, to obtain such a snake compact, which can be bought through most chemists.

As regards fatality through Viper poisoning, I consider this to be highly improbable where the average person in good health is concerned. Cases of unhealthy people or children are to my mind doubtful, and require quick attention, while a dog should be treated immediately, as the poison is, in most cases, fatal to it. Rapid treatment with a lancet, crystals of permanganate of potash, and tourniquet should, however, prevent any serious after-effect.

In conclusion, may I make a plea, on behalf of the Adder, our only British poison snake, a beautiful creature I should hate to see removed from our very small list of British reptiles. Do not be tempted to kill this reptile on sight. It is perfectly harmless unless disturbed. Even then it will refrain from biting until as a last resort. It will either remain passively on the defensive, or glide quickly away into the undergrowth. Naturally, it should not be encouraged where people, especially children, are likely to tread. However, if left alone, it will behave like a gentleman, and mind its own business, which, as far as I can see, is merely to enjoy life by basking in the sun and keeping down smaller life by feeding on mice, voles, frogs, and occasional eggs or fledglings.

Adders are to be distinguished by their rather thick-set bodies, with blunt tails and characteristic zig-zag marking down the back. The general colour is of a back and white nature, although brown and even reddish specimens, usually females, may be found. On rare occasions a jet-black specimen may occur. I once discovered such a beauty. An interesting point about this adder, a female, was that she produced five young in captivity, all five being normally coloured, thus contradicting a popular belief that the Black Adder is a separate species.

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Club Reports

SOUTH LONDON AQUARISTS. — Mr. A. Hoare gave an interesting talk on the show points of cold-water fish, particularizing on the Common Goldfish. This was done in view of the series of table shows to be held monthly, beginning in June with a show of Common Goldfish. The next meeting will be held on Thursday, May 26, at the society's temporary headquarters, the Tooting Adult Schools, Garratt-lane, S.W.17, at 8 p.m., when a talk will be given on "Foods and Feeding Fish."

C. LESLIE CALDER, Sec.

WEST SURREY PONDKEEPERS' AND AQUARISTS' CLUB. —Dr. Brown introduced Mr. A. H. Boughton, of the Artistic Aquaria Co., who proceeded with his most interesting lecture on "Fancy Goldfish." Mr. Boughton first dealt with the various standards for Comets, Shubunkins, Nymphs, Veiltails, Lionheads, and Orandas, giving some extremely clear drawings on the blackboard, showing the correct shape, proportions, length of fins, etc. He then went on to describe in detail which fish should be paired to produce the best results for obtaining these standards. He had found that by keeping fry at 70 degs. through the summer, it was possible to get them 3-in. long in three months, and though warm-water-bred, they were just as hardy. It was most important that fry should be well and properly fed for the first three months, as they never really recovered what they lost during that period. He explained in detail the method of hand spawning, and the correct way to hold a fish in the process. A particularly interesting point was that you should dip your hand in water before handling a fish, otherwise the dry hand was liable to remove the protecting slime of the fish, thus making it susceptible to the spores of fungus. Fungus would not attack a healthy fish, and they could be put into the same tank as fish having fungus without contamination. But, of course, it was essential that they *were* absolutely healthy.—W. L. DEIGHTON, Hon. Sec.

(*Other Reports on page* 248)

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Taking the risk of becoming dull, we say, once again, dried ants' eggs are no good as a food for fish.

FOR YOUNG AQUARISTS

Chameleons

By ARTHUR B. COOPER (age 13)

Chameleons are not usually available in small shops, but the larger pet stores often stock them. There are several species, the commonest being the South African Chameleon. Their average length is 6-in. to 7-in., a good half of which is taken up by the wonderful prehensile tail. The feet are shaped something like those of a bird, with toes before and behind, for grasping

branches. They live an arboreal life, seldom venturing to the ground.

Chameleons are well known for the fact that they change colour. This is done by varying the size of the different pigment cells in the skin.

The eyes are in the form of raised cones, almost completely covered with skin. They can move alternately so that the Chameleon may be looking in front and behind at the same time.

Chameleons feed on insects which are caught by their long sticky tongue.

The vivarium for Chameleons should be furnished with a number of stout ferns and branches along the back, and sand and rocks towards the front.

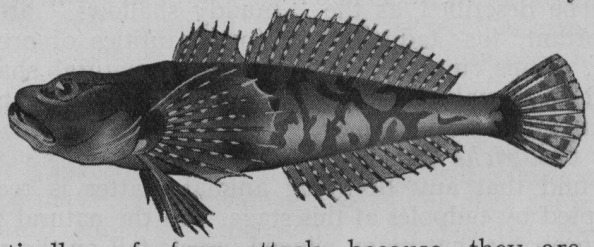
As for food they seem to eat anything which moves, but the following are the favourites—flies, spiders, wasps, beetles, and after a period of fasting meal worms are taken.

Chameleons do not hibernate very successfully and I think it best to keep them active in a heated vivarium. Towards October the live foods will be scarce except for meal worms, and the Chameleons will need a drink more often. The water must be sprinkled on the foliage like dew.

Bullhead or Miller's Thumb

This funny little fish, whose Latin name is *Cottus gobio*, is to be found all over England and Wales, and also in most parts of the rest of Europe.

It lives in shallow, clear streams, and spends nearly all its time lurking under stones, from whence it darts out to eat any passing insect, larva, crustacean, or fish. Bullheads are extremely greedy, and are not a bit afraid of attacking other fish, and as they have enormous mouths, have no difficulty in disposing of fish their own size. At the same time they are



practically safe from attack because they are well equipped with weapons; there is a spine on each side of the head, just behind the eye, the front of the two dorsal fins is spiny, as also are the pelvic fins, so you see other fish will suffer pretty badly if they try to eat the Bullhead.

The picture shows the two dorsal fins quite clearly, and also the wide, flattened head and round, tapering body. Bullheads are small fish, seldom exceeding a length of 4". They vary very much in colour according to the nature of the stream bed where they live, but in the main the top parts of the body are greeny brown, and the underneath parts light grey or yellow.

Because of their tendency to eat other fish, it is wise to keep them in an aquarium to themselves, and, if you have a tank to spare, it would be well worth while stocking it with two or three of these fish, as they are most amusing to watch. They spend nearly all their time on the bottom, being unable to swim fast in mid water, but their habit of darting about on the gravel is highly entertaining.

The name Miller's Thumb is supposed to have been given them because the shape of the head is said to resemble the thumb of a miller, which becomes flattened by constantly sampling meals and flours.

From Tadpole to Frog

By L. G. PAYNE

IT would appear that a certain amount of difficulty is being experienced by readers of WATER LIFE who are attempting to raise common frogs from the tadpole stage. The theory of the metamorphosis is well known, and is a commonplace of nature study, but it is found in practice that under conditions of confinement the final transition is sometimes disappointing. It has therefore been suggested that a few practical hints would be useful at this time of the year.

Let us suppose that you have a number of frog tadpoles with the back legs well developed. Up to now they have probably been happy enough, if provided with a liberal supply of water plants whose leaves function under water. Here let me give a word of warning—do not attempt to raise too many in limited accommodation. Hard and fast rules can always be proved fallible, but I would suggest as a guide that a dozen maturing tadpoles in a tank 2-ft. x 1-ft. x 1-ft. would be ample.

With the back legs free of the body, your tadpoles are now beginning to feel the urge of an amphibian existence, and it is important to provide a gently sloping, sandy, or preferably muddy, base rising from the deeper part of the tank, and emerging above water level for the last 3-in. or 4-in. of available space. What may be described as the " muddy shallows " area is important, for tadpoles imbibe quantities of organic ooze. Thus, matured detritus from a natural shallow pond edge makes an excellent flooring for your tank, and is in no way offensive, especially if thinly planted with *Callitriche* or *Elodea*.

I find that any decaying animal matter is readily accepted by tadpoles at this stage. In the natural state it is probable that many winged insects fall on the pond surface, and, there drowning, the bodies sink to the bottom and become available for food. In captivity your tadpoles may be given dead blowflies or house flies. An alternative consists of small pieces of meat, which may be placed in an open muslin bag or container, and the whole suspended in the area of deeper water. The tadpoles will then hang on to the muslin, and suck the juices and shreds through this, or swim over the muslin and feed freely on the meat. The advantage of this is, of course, that undue pollution is avoided.

Now the lungs will be developing rapidly at the expense of the gills, and frequent trips are made to the surface for atmospheric air. Next, with the front legs free, the frog tadpole appears definitely to prefer the " shallows," and this area should be increased. A characteristic now is that the tadpole, when disturbed, will swim a short distance and scrape the mud surface, thus causing a fine screen of mud particles to cloud the water and effectively hide him from potential pursuers.

The period now arrives when the tail becomes superfluous. The metamorphosing tadpole no longer takes in food; modifications take place in the physical functions, and the tail becomes mostly absorbed. Now is the time to reduce the water contents of the tank further. Arrange three-quarters of the available space with small grass tufts, clumps of moss, one or two pieces of rock or cement, and some bark. The whole should be kept in a damp condition, but not continuously devoid of sunlight. The froglets still have a stump of tail, appearing as it were an elongation of the backbone, but the transformation is practically complete and natural hunger begins to assert itself.

The food to provide now should consist of tiny flies, such as fruit flies. If successive cultures of these are maintained, it is only necessary to cover the aquarium or tank with a glass and release the living flies inside. An easier plan is to find a blight-infested rose bush or other plant (it is surprising what a variety of garden plants may be found at this time of year with living clusters of minute green, brown, or black insects on the stems), cut off 3-in. of infested stem and lay on a bare part of the tank. The froglets may be placed near this and should then feed freely.

A third practical alternative is to catch gnats or mosquitoes in a large butterfly net at dusk, lay the net on a hard surface and pat lightly with the hand. This will kill the flies. Reverse net, and shake on to a newspaper. Pick up individuals with forceps, cut off legs (and antennæ if present) with scissors, and feed the remaining body to frogs with forceps. The reason for discarding the legs is that these appear to hinder the easy absorption of the insect while containing practically nothing of food value.

It may be objected that all this takes time. It is, however, surprising how quickly the whole operation can be done with a little practice, and the enthusiast who has arrived so far on the road to the perfect frog is not likely to grudge this last effort. Finally, after a few weeks of this treatment your frogs will be ready for vivarium life or, perhaps more luckily, for release.

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Swordtails

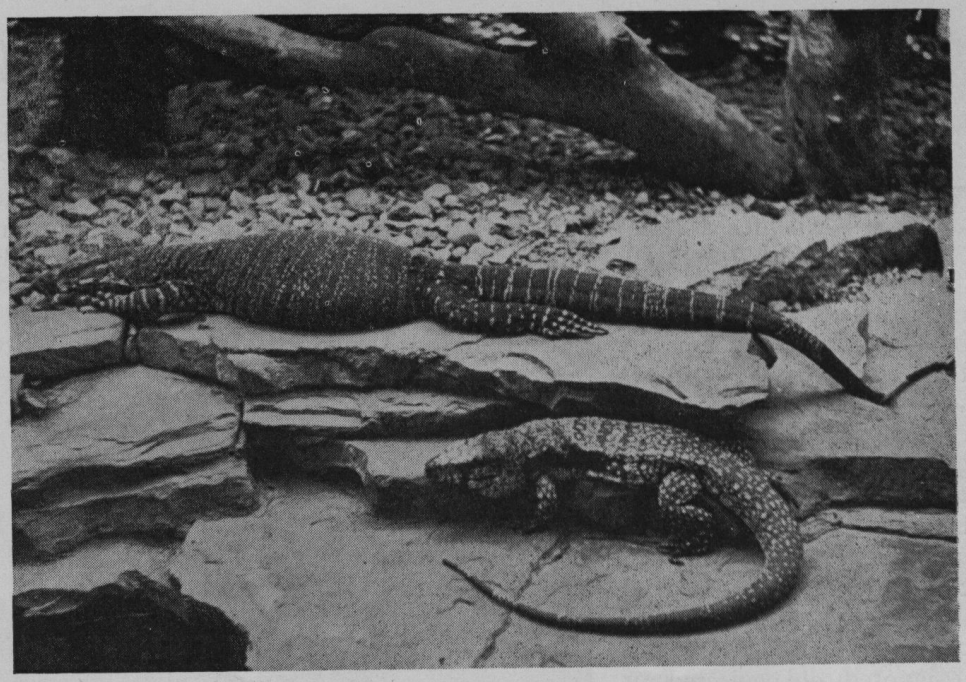
(*Continued from page* 257.)

male Swordtail who hated a female black Mollienisia anywhere near him, but spent endless time and energy courting an unattractive female Fighting Fish. A good-sized, active Swordtail can be a great nuisance because of its very violent dislikes, and it will often so chivvy another fish as to cause its death. This is one reason why large typical adult male Swords are not too popular with dealers, whereas small, under-sized, inoffensive specimens find a ready home in the community aquarium.

The Swordtail enjoys a mixed diet, but as the lips indicate, it is a fish that by nature browses chiefly on vegetable matter, and, if possible, algæ or its substitute should form a large proportion of the diet. But animal matter should be included—*Daphnia, Tubifex,* chopped earth worm, as available—and those who have seen how clean Swordtails will on occasion pick the skeleton of a dead brother or sister will have no doubt about their taste for fresh animal food.

The London Zoo

THE Reptile and Tortoise Houses and the Aquarium at the London Zoo are being constantly visited by readers of WATER LIFE, though naturally with those living more distantly from London visits are necessarily infrequent. From time to time the collections of animals seem to be particularly interesting and attractive; there are not necessarily a lot of entirely new and rare creatures, but, as at present, the range is particularly varied, and there seems to be much of peculiar interest.



Lace Monitor (*Varanus varius*) **Great Teguixin** (*Tipinambus teguixin*)

Perhaps the most interesting exhibits in the Reptile House at the moment are the several species of Iguanas. The Nose-crested Iguana (*Iguana rhinolopha*) from South America is a very handsome creature. From the Galapagos Islands Mr. T. O. M. Sopwith, of America Cup fame, brought back specimens of *Conolophus*, the Burrowing Iguana, of which Darwin gives such an excellent account in his "Voyage of the Beagle." From the island of Haiti comes the Rhinoceros Iguana (*Metopocerus cornutus*), which carries three conical horny protuberances on its head.

It is strange to think of these great lizards being so comparatively inoffensive in their habits. They are chiefly herbivorous, though they are reputed to have a liking for eggs, and *Iguana* is mainly arboreal in habit, though a very capable swimmer when it takes to the water, as it frequently does. They are apparently easily caught, soon tiring of being chased, and just waiting to be taken up.

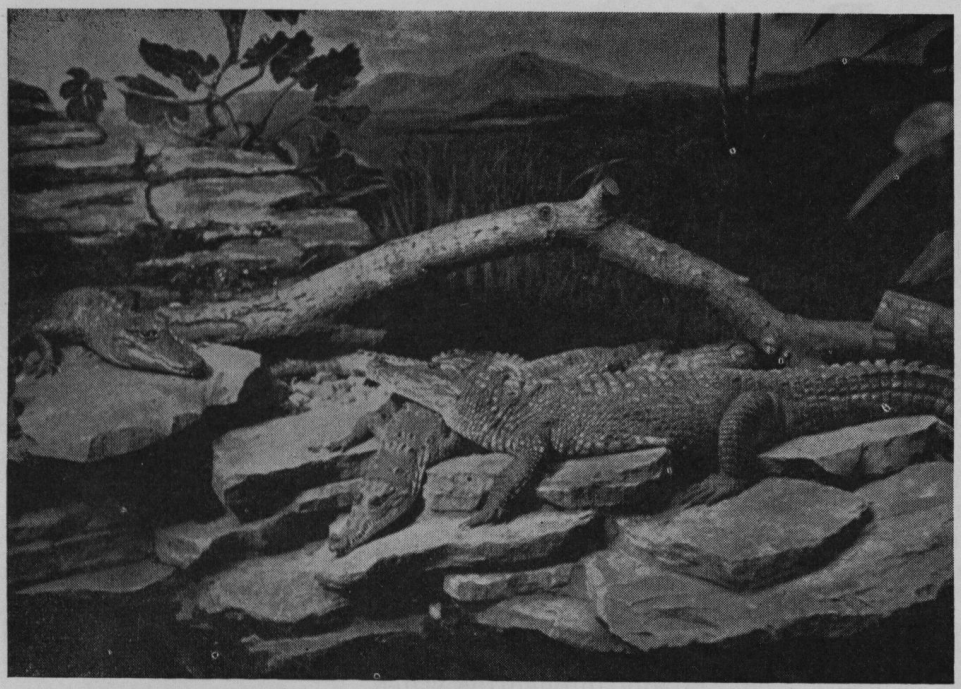
The chief reason for catching the Iguana is that it makes good eating, being said to resemble chicken in taste. Those who have read the recently published novel, "Serenade," will have a good idea of how Iguana can be prepared for the table, though this is probably not the usual method. We hope not, especially because it involves dropping the living Iguana into a pot of boiling water, rather like a Lobster!

In contrast to the Iguana one should notice the Monitor, which is strong, fearless, and a fine hunter. Even small specimens vigorously demonstrate their dislike of humans who come too near. The Lace Monitor (*Varanus varius*) is particularly handsome, and is of considerable size. The Monitors are Old World lizards, but the New World can also produce its "tough guys," as evidenced by the "Teju" (*Tipinambis teguexin*), which, though only about three feet long, is fast and strong, using its great claws to advantage. It has a preference for chickens and eggs, but is a match for large snakes, and in battling with these the massive, muscular tail does good work. This lizard is sometimes called the Teguexin, which is derived from the Aztec "teco-exin," meaning "rock lizard," and really refers to a totally different creature.

Nose-crested Iguana (*Iguana rhinolopha*) **Galapagos Iguana** (*Conolophus subcristatus*)

While looking at the *Crocodilia*, do not forget Old George, who lives all by himself, fenced off from his fellows. Perhaps your 18-in. Alligator will reach such massive, unsociable old age with good feeding!

Some nice specimens of Ornate Terrapins (*Chrysemys ornata*) have recently arrived, and among the *Amphibia* the Golden Tree Frog and some fine large Japanese Newts catch the eye.



Crocodiles

In the Fresh-water Hall of the Aquarium there is one tank with a shoal of young Salmon, which might be said to be something of a novelty. The Marine Hall has recently been enriched by the addition of a new Octopus of quite a fair size, but even so he escapes some folks' vision, for we saw three people standing in front of his tank asking a keeper for the Octopus. He had retired inside a large shell.

One tropical tank in the Marine Hall always takes the aquarist's eye. In this are found, among other interesting fish, the *Scatophagus* and *Psettus* species. Scats the size of saucers and *Psettus* as big as tea plates fill any aquarist with envy, but there is no doubt that both these fishes lose much of their beauty at such large size. The Scats, all *S. argus* by the way, are very dark, the spots not showing up well, and the *Psettus* lack the beautiful glistening silver of the small fish of normal aquarist's aquarium size.

In the Tropical Hall there has been some rearrangement, some of the small aquariums having been given over to tropical marine species. One aquarium contains the lovely little black and white Coral Fish (*Dascyllus aruanus*), and another the Cardinal Fish (*Apogon imbertus*) which is red in colour. We believe this is one of the Sea Perches, in which the male incubates the eggs in his mouth, as in some of our aquarium Cichlids, the mouth breeders.

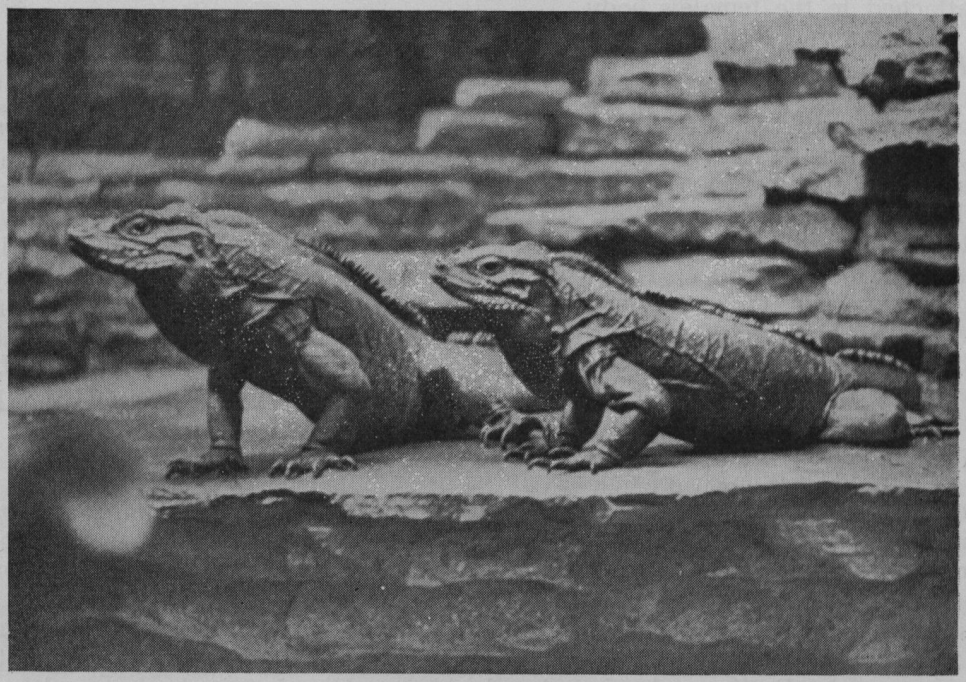
The introduction of these marine fishes has necessitated moving some of the fresh-water tropicals, and in one of the large " built-in " tanks we find the exotic aquarist's dream. A simply enormous community tank of small species, Swordtails, Platies, Danios, several small *Barbus* species, Black Widows, Flame Fish, and small Angels making a unique and beautiful living picture.

The big Cichlids at the London Zoo are always fine to look at, and two splendid Pompadours (*Symphysodon discus*) grace the large Angel tank. The Piranha, a Devil Fish, looks bigger and more bellicose than ever in his necessarily solitary confinement, and there is a fine crowd of Mud Skippers (*Periophthalmus*).

As a record of the longevity of an exotic fish in the Aquarium, that of the Sail Fin (*Polypterus lapradis*) must be hard to beat. He has been in captivity for thirty-two years, and he looks good for as long again! Especially strange fishes on show at present are Henry's Mormyrid (*Isichthys henryi*), and the Mormyr (*Marcusenius longianalis*). There are African fishes of apparently quite small size, which are equipped with electric organs. In shape they are particularly strange, as they have massive heads containing, for fish, relatively large brains, and *I. henryi* has the appearance almost of a minute whale-bone Whale. These are particularly unusual fishes, which are reputed to be very difficult to maintain in the aquarium.

* * *

One aerator will usually serve several tanks. To set up such a system the use of rubber throughout may prove a costly item. The cost can be greatly reduced by the use of glass tubing. This is sold at about 2/- a pound weight, and there is usually about 50-ft. of tubing to the pound, the length varying according to the diameter of the bore. Bends can be made by bending the tubing over a gas jet or using small lengths of rubber tubing. This glass tubing can be bought from most manufacturing chemists.



Rhinoceros Iguana (*Metopocerus cornutus*)

The Alpine Newt

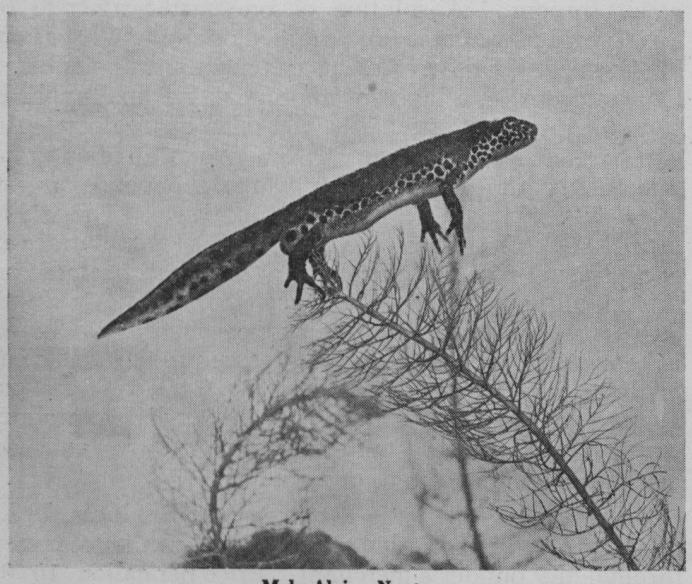
By GEORGE COWAN

THE little Alpine Newt (*Triton alpestris*) is one of the most pleasing of this genus—from the points of view of display and hardiness. Though called the "Alpine" and found in the Swiss Alps, it is very widely distributed, living in Holland, Belgium, and parts of France and central Europe.

The most noticeable feature of this Newt is the lovely orange colour of the underside, which is entirely unspotted. The female is coloured green over the back, covered with a darker green fine marbling, and the ground colour fades to quite a definite blue on the flanks, with some black spots along the junction with the orange of the abdomen. The toes are orange with dark bars across the upper sides. The male is very dark in colour and shows no marbling, and the junction with the orange of the underparts is clear cut, with no blue zone on the sides; along each side of the tail is a quite clear blue stripe. At the breeding season the male does bear a crest along the back, but it is relatively poorly developed. It might almost escape notice when compared with that borne by the Great Crested Newt. Males grow to about 2¾-in.; the females are larger, reaching 3½-in.

Like all other Newts, Alpines are very easy to feed; all they ask is a supply of small earth worms. Where Newts are to be kept in an indoor aquarium this species is especially to be recommended, as it is very aquatic, spending most of its time on show instead of hidden away under moss or stones. The Alpine Newt is also a good breeder, both in the garden vivarium and indoors. In my experience of these Newts only those which have hibernated will spawn; Newts kept awake in indoor quarters throughout the winter will not oblige.

An aquarium of not less than 18-in. x 10-in. x 10-in., in a sunny place, with plenty of *Elodea, Potamogeton,* Starwort, and *Sagittaria* growing in it, will make a nice home for a breeding pair. A piece of bark on to which the Newts can climb out of the water should be provided, and a good, well-fitting cover to the aquarium is



Male Alpine Newt

Female Alpine Newt

essential, for the creatures will readily crawl out and away. Covered with dirt and fluff and hidden beneath furniture, they are very difficult to see and recapture.

The mating of Newts is a pretty sight. The male "pirouettes" before his lady, whipping the water with his tail and displaying himself in all manner of graceful and grotesque curved postures. Readers will no doubt remember those lovely pictures in WATER LIFE in April last year, showing so clearly the actual mating of a pair of Crested Newts. The Alpine behaves in just the same way. The female, holding a leaf of the selected plant with her hind feet, lays her egg, and then folds over the edges of the leaf to protect it. After pausing she goes on to lay another. About fifty eggs seems to be the number laid by a normal female.

The eggs go on developing for about a fortnight, and then the young begin to hatch out. They are about one-third of an inch long, of a sandy, translucent colour, with two dark stripes along each side, and feathery external gills. They are easily overlooked, and for the first eight or ten days of life lie on the bottom practically motionless, though sometimes they give a convulsive wriggle which moves them a short distance.

After about eight days they become more active and begin to take a marked interest in the all-important function of feeding. Small white worms and *Tubifex* are the foods to offer them, and then they grow rapidly. The front legs are the first to appear and then a few days later appear the first signs of the back legs. When a month old they are regular little Newts, about three-quarters of an inch long.

They have, like all young Newts, very large appetites, and can never be filled to repletion. Blood worms in quantity disappear with great rapidity among a family of two or three dozen youngsters, and the final tussle over the last few is a most amusing entertainment.

Every fish keeper who has an odd-planted aquarium should give Alpine Newts a trial. They will open up an entirely new vista of interest and entertainment for him.

Alpine Newts "Over There"

TO most people Calais is just a Channel Port, a place of temporary delay on the route to Paris; to you and me it can be the immediate gateway to happy days of collecting.

France on a May morning with a clear sky and bright sun, a knapsack with net and tins, an ample lunch, a bottle of red wine, and the day before me—I ask little more of life. So by train to a small village nearby from whence I set out on my hunt.

Up the lane and past the orchards pink with blossom, and yet higher by stony outcrops where one-storey farms nestle in the rocky shadows. Distantly, loose grass-grown shaly hummocks scarcely hide the scars of old quarry workings. Last year there was 10-ft. of water in the quarry, now I expected less by reason of the drought. What, in fact, I found was an empty hollow floored with moss-grown stones. Amongst these stones was good hunting; Spotted Salamanders, Midwife Toads, and Parsley Frogs, being in themselves ample reward for the journey. These were happy in the damp conditions and the fulfilment of their love cycle seemed in no way urgent.

The real tragedy of the waterless pool, however, was revealed by the dry and almost lifeless Alpine Newts. In the bed of this dried-up quarry were many hundreds of these attractive little newts waiting for the rains which can surely never fill the pool this year.

We can only speculate on the cause of this disappearance of the water. The most feasible seemed to be a cracking, or a fissure in the rock bed, for subsequently I discovered that similar pools in the neighbourhood were at normal level. Immutable instinct had brought those Alpine Newts along the slopes from their winter retreats to the site where their breeding water should have been. As each day lengthens, and the summer sun becomes stronger, so their chances of survival must become less and less.

Over the hill I passed to a long, narrow crag-lined valley where jackdaws woke the echoes in their sudden flight. Here a shallow pool gave better promise. Alpine Newts, Smooth Newts, Crested Newts, Palmate Newts, all in one pool! And the most abundant were the Alpine. What an El Dorado for the enthusiast and the collector!

The Alpine Newts seemed, more than any of the others, to choose the flat stone surfaces just below water level on which to lie, the males conspicuously bluish in the sunlight and the females mottled green and brown. It was possible to approach to within a foot without causing alarm to the newts, but at the slightest agitation of the water surface they would glide swiftly to the protective shelter of the stone slabs.

At the further end of the pool, where the white Water Buttercups had thrown out long intermatted stems, courtship and spawning were in full progress. Resplendent males were "fanning" the water while the females swam slowly round and underneath. Brilliant orange bodies gave a distinct impression here and there, that dead newts were floating, belly upwards. This was not so. Closer examination revealed that these were females spawning and clutching stems of *Ranunculus*. I have since noticed the same attitude with specimens brought home, and while I should hesitate to assert dogmatically that this position is always adopted, one cannot resist the conclusion. I have not noticed it with other species.

A curious feature was that female Alpine Newts outnumbered the males in the proportion of about four to one.

It was interesting to speculate on the food of the newts in this pond. Five years ago, on my first visit, tadpoles of the Midwife Toad were abundant, and newts few. Twice since then I have noted a gradual reversion of the ratio, and this year tadpoles were entirely absent. All this suggests ecological problems affecting the balance of life which must be left to another occasion.

Meanwhile the Alpine Newts of the Calais hinterland live out their lives in undisturbed seclusion.—L. G. PAYNE.

[The photographs of the mating and spawning of Crested Newts appeared in the issues of WATER LIFE dated April 13 and 20, 1937.]

* * *

On Test

MATURING the newly made concrete pond is a tedious process, and frequently this most important process is scamped, with the result that later there is a gradual seepage of alkali into the water with unpleasant effects on the fish. At this time of year, when it is particularly desired to get the new pool into a presentable and attractive condition as soon as possible a process which will hasten this process and which can at the same time be used with safety and certainty is especially desirable.

"Sealocrete" is a liquid dressing for sealing the surface of concrete, thus eliminating porosity and undesirable seepage. The product is extremely simple to use. The concrete should be absolutely dry. The surface should be thoroughly wirebrushed to open up all pores and voids, and then the pond brushed out with a soft broom. A solution of one-part Sealocrete to three-parts of water is now applied, thoroughly soaking the surface. This treatment is repeated after twenty-four hours. After a lapse of another day a final application of increased strength, one-part of Sealocrete to two-parts of water is given. Allow two or three days for this to dry thoroughly, after which the pond can be filled and stocked with absolute confidence. The whole process takes less than a week. The treated surface is of a pleasing pale brown colour, a great improvement on the appalling whiteness of new concrete, and is particularly dense, resisting vigorous wire brushing. The liquid is economical in use, a ¼ gallon can proving sufficient to dress a small pool 12-ft. long by 6-ft. wide and an average depth of 2-ft. This is a reliable product employing a simple standardized procedure, and we heartily recommend it to our readers.

"Sealocrete" is made by Sealocrete Products, Ltd., of 45-50, Holborn Viaduct, E.C.1; and can be obtained through any builder's merchant. Price per gallon, 10/6.

Cruelty!

THE title expresses my feelings, and it is the poor Tortoise who submits to it. The noise of their struggles is in my ears, the stench of their decaying bodies in my nose.

. . . .

There can be no bigger difference in the extremes of sound than a dock quay during work and after working hours. It is as the noise of bedlam to the silence of the tomb. It was after working hours I was walking through the sheds adjacent to a dock quay. The silence was oppressive, when without warning I became conscious of scratch—scratch—scratch. I came to the conclusion that it could not possibly come from rats.

Investigation disclosed a dump of crates on end, and, peering into these, what did I see but live Tortoises packed tighter than pineapple chunks. The smell which was previously "strong" now became offensive. All around me were these crates, each one approximately 3 x 2 x 1-ft., and marked on the outside was the shipping mark and the figure "120." Just imagine 120 live animals packed into a space less than six cubic feet, with no packing to ease the crushing and a batten of wood to hold them in and prevent them falling out!

Crushed shells and broken limbs were on all sides, for many of the Tortoises, in their desperate bid for liberty, had managed to wriggle clear from a broken batten only to fall on the concrete with disastrous results. Truly a pitiful sight to see a Tortoise with a damaged shell and a broken limb ambling round in manner so characteristic, in a fruitless search for food or, more likely still, drink for parched throat.

But the broken limbs did not only come from falling out of the crates. No, these injuries came from the effect of being packed one crate upon another in the ship's hold and the consequent rough sea voyage. Loading and unloading from the quay, too, had taken its toll, for Tortoises would not even get the consideration afforded glassware.

It does not take much imagination to picture the utter misery and suffering that had been endured during the preceding six weeks. Away in its home in North Africa at least four weeks would elapse before the first Tortoise would be caught and the last Tortoise packed. Once packed, they would have to remain on a semi-tropical quayside awaiting the exporting steamer. Then would follow the harrowing journey across the sea lasting fifteen days. Do you recall the stormy weather we have been having?

Amazing, too, the condition of these poor, maimed creatures had been pronounced as satisfactory by an official of an association purporting to be concerned with the interest of defenceless creatures.

Journeying across England to various destinations, they then find themselves in shops—I understand that they are for one of the big chain stores. Here at last they may receive life-giving water and lettuce leaf, after buffeting and starvation lasting two months or more. Not winter months, mark you, but summer months, with the blood flowing freely in the veins and the appetite keen. What of their ultimate fate, supposing they survive? For the most part they will find themselves in homes where crass ignorance is no excuse for the perpetuation of their suffering. Their chances of finding a home with an owner who will appreciate their requirements is a thousand to one.

What is to be gained by all this suffering? The Tortoise does not make a very suitable pet unless one is prepared to give it a miniature replica of its own native conditions. Just let loose in the garden, it will quickly make itself unpopular by nipping all the tenderest shoots and, more likely than not, leaving them uneaten. Because of its slow movement, it is the prey of any cat or dog. It invariably prefers the neighbour's garden to its own. It is as like as not to be injured by pick or fork during gardening operations. Under proper conditions, it is a friendly and interesting creature and worthy of the most considerate treatment; nay, more than that, it should have only the finest treatment. People prepared to give that are in the minority, and on that account the Tortoise will never attain the popularity of the Goldfish, and goodness knows the Goldfish has suffered enough before its true requirements were appreciated!

Why, then, is it permissible to import 50,000 of them as ballast in the hold on one ship alone, knowing for certain that the vast majority will die a lingering death? Perhaps my reasoning is faulty, and it is possible to popularize the Tortoise, and it will come into its own sooner or later. But at what cost? All animal lovers must unite as a body to see that these poor, lovable creatures are treated humanely.

The stench of blood remains in my nostrils, I see the broken limbs, and still I hear the ceaseless tattoo of their claws beating out their message: "For love of God's animals succour us."—LEONARD CHARLES.

EDITOR'S NOTE. — Readers may think the picture drawn by our contributor crude and exaggerated. Such is not the case. We are ourselves amazed at the lack of concern in official quarters. Combined and simultaneous protest by individuals and organized bodies of lovers of our hobby might produce some satisfactory legislation. We must take this opportunity of expressing our approval of the methods employed by one multiple store at the retail end of Tortoise marketing.

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The Marine Aquarium

(*Continued from p.* 281)

to an aquarium and lives well providing young unbroken clumps are chosen. Bits of old clumps will gradually decay from the edges. The long, thin, green strands of *Heteromorpha,* will grow in aquaria if they form complete clumps and are attached to stones. The pretty red seaweeds will not usually live well unless they are put in complete with the piece of rock on which they are growing. Do not be misled by attractive, bright orange weeds on the shore, for these are red weeds in the first stages of decay. Brown seaweeds, *e.g., Fucus* and *Pelvetia,* are not to be encouraged in aquaria, for they produce slime and so many spores that they tinge the water brown.

In my next article I will introduce to you the most suitable animals to keep in the aquarium.

Aquarist's Badge

THE pleasures of a hobby are considerably increased and the troubles and difficulties diminished if fellow-aquarists can meet to discuss their particular interests and problems. Where there is a local club it is a simple matter to get in touch with other aquarists, but our readers are scattered all over the world, and there are many who are not in a position to join any association. In fact, we estimate that club members form very considerably less than 10 per cent. of our total circulation.

Now we know from letters received that many of these "unattached aquarists" would be very pleased to meet other people who share their interests, and the problem of helping these to get in touch with one another has been occupying us for some time. The first step which we are taking to solve the problem is the production of an aquarist's badge, a replica of which can be seen in the advertisement columns of this issue. This badge which is ¾-in. in diameter, consists of a silver Stickleback on a light green ground. There is no wording on the front of the badge, the object being simply to enable aquarists all over the world to recognize those of kindred interests. At the present moment about the only way you can tell an aquarist is by seeing him with a fish can!

We feel sure that if you buy one of these badges and wear it habitually, you will come across many people who are also aquarists. It may even be that you are acquainted already, but have not realized that you are both interested in the same hobby. Anyway, give it a trial. Buy the Aquarist's Badge, and see how many fellow-hobbyists you can find in your own district.

Box Tortoises

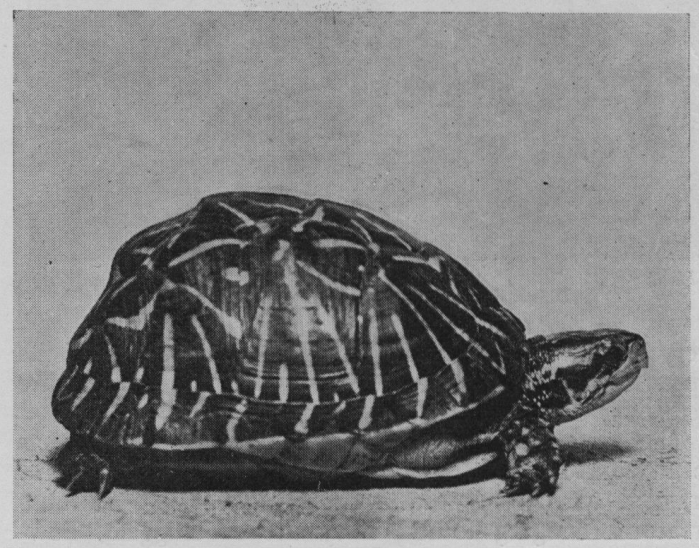
THE common Tortoise (*Testudo græca*) is frequently credited commercially with being an effective eliminator of garden pests, slugs, snails, caterpillars, and the like. Such is known by those initiated into the wonders of the Tortoise's ingestion and digestion to be incorrect. Nevertheless, the Box Tortoise, which is perhaps more of a terrapin, will most certainly oblige in this respect, being particularly partial to slugs. But it also has quite an appetite for more delicate foods, such as minced raw meat, banana, pear, tomato, and so forth, being altogether a very omnivorous feeder.

"Closing time."

Box Tortoises should be given a garden enclosure similar to that suitable for the common Tortoise, and there should be provision for bathing and drinking. Though they do not bathe often, they do enjoy an occasional good soak, and they drink frequently.

The name Box is given to this Tortoise because the plastron or under shell is in two sections, moved independently by ligaments attached to the upper shell, so that after the head, tail, and limbs have been drawn in, the shell can be completely closed. It is noticeable that the shell of the Box Tortoise is highly arched; this is probably an adaptation to allow plenty of inside room for the accommodation of the extremities when these are retracted.

This effective mechanism is no doubt defensive, but the captive specimen soon becomes quite tame, and only



Baur's Box Tortoise.

the roughest treatment will cause them to "shut shop." Ordinary handling is accompanied by an even longer and more inquisitive neck stretching than usual. Indeed, the Tortoise illustrated had difficulty in closing at all, He was so well fed that it was quite a laborious process getting comfortably inside. When the head got in and the front end closed, the tail and legs insisted on hanging out and *vice versa*. At length, after much wriggling and squelching the difficult feat was finally accomplished, and it can be seen how well the shell does close up.

The species most often for sale is the Carolina Box Tortoise, which was fully described in WATER LIFE, January 5, 1937. This year Baur's Tortoise has been available, and that is the species illustrated. Its dark brown carapace is marked by groups of radiating yellow lines, as can be seen in the photograph.

As far as wintering is concerned, the "Carolina" proves quite hardy, and "Amphibius's" specimens hibernate at the bottom of a pool with other terrapins; while Gadow's specimens dug themselves a hole in the earth and buried themselves. Probably "Baur's" could be treated similarly, though the hibernation of this species has, as far as we know, not been observed out of doors in this country.