

The  
**AQUARIST** and  
**POND-KEEPER**



(Incorporating "The Reptilian Review")

**Devoted to the Study of Aquatic  
Reptilian and Batrachian Life**

## EDITORIAL

It is becoming increasingly evident that, if this hobby is to survive, much trade will have to be built up in home-bred stock. That this presents little or no difficulty can be readily seen if the system existing in Germany when the war is understood.

Simply, we already have a fair number of dealers with ample convenience for breeding much of their own stock, just as Germany had in pre-war days. These dealers, in this country, must concentrate more seriously than they used to on the production of their own stock. Even so, just as before the war, their supplies must be augmented, and here the pre-war German system could be utilised. Few German dealers or "middle-men" produced a tenth of their exports. Amateurs specialised, and all German dealers knew where they could obtain their supplies of certain species. When they received an order for, say, a thousand Swordtails, a small run-round of those breeders always produced the required quantity. Both in this journal and others we have constantly urged the development of a similar system here, but no one ever took it seriously. Perhaps to say "no one" is to be too general. A few breeders did, and they most definitely reaped the

benefit that could have been shared, without loss to anyone, by everybody. It is essential that something of the sort be done now. Already one or two of the big dealers have inquired at the offices of this journal for information as to available supplies from amateurs and breeders, and what can we say?

That it applies equally to tropical and cold-water fish goes without saying, but both amateur and potential professional breeders must realise one thing. In the old days we frequently heard that amateurs with surplus offered the stock to a dealer, who promptly refused it. In most cases this was due to two things, or one of them. Immature stock was offered, and the price demanded was equivalent to the price paid for the mature breeding pair in the first instance. Now, anyone who buys a breeding pair of, say, Red Swordtails at 5s. the pair, and expects to sell the half-grown youngsters back to the dealer at 2s. 6d. each, surely must be the world's greatest optimist. Yet it happened many times, or at least it was "tried on."

It did not, and will not, work, of course, but if the amateur and breeder will get down to business and start doing things thoroughly and

# THE AQUARIST AND POND-KEEPER

(Founded in 1924 by A. E. Hodge)

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All communications for the Editor should be addressed: The Editor, *The Aquarist and Pond-keeper*, 20 St. Andrew Street, London, E.C.4." In every case the name and address of the writer must be given.

The Editor welcomes the opportunity of considering original contributions on all branches of the hobby and its allied interests; authentic breeding records, personal experiences, and photographs. Contributions should be typed or clearly written on one side of the paper only. MSS or prints unaccompanied by a stamped addressed envelope cannot be returned, and no responsibility is accepted for contributions submitted. Correspondence with intending contributors is welcomed. Copies of any article published, together with its illustrations, in pamphlet form, for the use of schools, museums, clubs, etc., may be obtained on application in quantities of not less than 50 at prices to be obtained from the publishing offices.

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Specimens for identification, etc., should be securely packed and be accompanied by return postage if return is desired.

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Wrap fish in clean wet cloth without squeezing; then wrap in greaseproof paper, pack round with cotton wool in tin box, and despatch as soon as possible after death. This method of packing is important.

Readers who obtain copies of the **AQUARIST AND POND-KEEPER** from newsagents are reminded that—as is the case with other periodicals—it is now necessary to place a definite order with the newsagent to ensure the availability of magazines.

## EDITORIAL—Continued

properly, he can lay the foundations of what will eventually prove a lucrative business. This war won't last for ever, and it will be many a long day before Germany can recover her position. Let us have the business she used to do, and let us keep it. Business, like clarity, should begin, and stay, at home.

One big drawback existing is the end of the new importations, i.e., species never seen before, and the temporary cessation of stock which has failed to breed in captivity. This can largely be compensated by the improvement of existing stock.

Finally, we have a suggestion to make. If breeders and amateurs likely to have stock available to the trade care to follow it up, we shall be pleased to give them every encouragement. We have arranged with our Advertising Department to form a "Breeders' Cards" column such as is available in many other "fancy" journals. This consists of displayed advertisements giving the name, address and telephone number (if any) of the breeder, and the species in which he is interested. The charge for one insertion will be 2s., payable with order, with a discount for three-monthly insertions or more. This will enable the trade, as well as the average reader, to get in touch with breeders direct, and should react to everybody's benefit, particularly now that this journal is once again in the same position it occupied for so long up to a few years ago, namely, that of the only journal in the British Isles solely devoted to the hobby of fish and reptile keeping in all their aspects.

\* \* \*  
Congratulations to the Derby and District A.S., who held their annual dinner and prize-giving on 6th April. No details are to hand at the moment, but congratulations are earned for their efforts in thus carrying on the good work.

\* \* \*  
A contemporary has it that "there is also the question of size; a pond of less than 24 square feet surface area or capacity of 3,000 gallons is not to be recommended," when dealing with the subject of "Making your own Garden Pond."

Elementary arithmetic reveals the fact that a pool of 24 square feet surface area holding 3,000 gallons means one about 6 ft. by 4 ft. and 20 ft. deep! We're all in favour of depth as a protection against frost!

# Day Lilies

By HARRY A. DAY, F.R.H.S.

AS an all-round waterside plant, both in foliage and flower, the Day Lily (*Hemerocallis*) is surpassed by few water-plants. Except for the winter months, its decorative effect is a permanent feature wherever it may be planted, because the bright green foliage remains as an excellent waterside grass after the flowers have passed. Although the individual flowers are very fleeting, lasting only a day or two in full bloom, they are produced almost daily for quite a long time; and if you plant several varieties, each with a different blossoming period, you have a continuous flower service from May or the beginning of June to the end of September. In their wild native state they grow alongside streams and in boggy places, and if planted by the waterside in our gardens they will flourish and increase amazingly well. A very good point to be recommended is the sweet fragrance of these flowers, and in this respect they are very useful as cut flowers. Cut in the half-open bud state, they open and remain in good condition for quite a long time.

As waterside plants the *Hemerocallis* may be grown in large masses or in small clumps. To secure the latter the semi-tuberous roots may be cut and divided as often as is necessary to restrict growth to one spot. But if you can allow the plants full scope they will well repay for the space allotted to them in sheaves of flowers topping the ordinary grass-like foliage.

Most people are acquainted with the Day Lily in the form of *H. flava*, the common yellow flower plant to be seen in the majority of gardens where, if allowed to grow as it likes, it becomes more or less a nuisance in the flower-border by its spreading habits; but these habits may be turned to good account near a stream or large pond, where its foliage will form a handsome contribution to the various grasses, reeds and sedges, and as its narrow, drooping, arching foliage is a very light green colour, the effect is brilliant. The flowers are of a distinct lily type and are borne in terminal clusters on long stems.

But of recent years the range of colours has been improved and now includes shades of yellow from light to dark, with orange, rose, pink, red, scarlet and bronzy hues, and the



Photo]

[H. A. Day

Day Lilies, showing the clusters of lily-like flowers and graceful leaves of *Hemerocallis flava*.

species and varieties are getting very numerous. The chief species include *Flava* (yellow), *Fulva* (bronzy-yellow), *Forrestii* (orange-yellow), *Middendorfii* (orange-yellow, dwarf), *Multiflora* (rich yellow), *Kwanoo* (bronzy-orange-red, double flowers), and *Kwanoo variegata* (with variegated foliage), *Sempervirens* (orange-yellow). These bloom in June, July and August. *Fulva cypriana* is a novelty in having brick-red flowers. There is a large number of hybrids, amongst which *Byng of Vimy* is a delightful shade of terracotta, *Cissy Guiseppe* is a deep rose, and *Apricot* a rich apricot shade.

Mr. Amos Perry has greatly interested himself in these beautiful flowers and several novel varieties have been introduced by him. One

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# The Lionhead

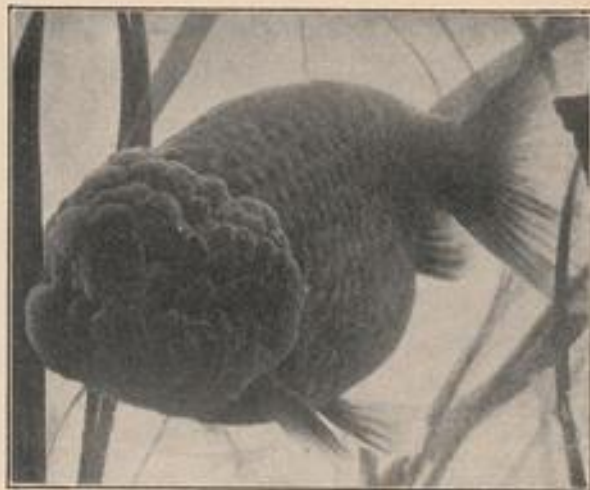
By N. HILL

**D**URING the course of the last 500 years, the Chinese and Japanese have, by careful selection, produced many different varieties of Goldfish. The Lionhead, sometimes known as the Buffalohead, is probably one of the most amazing results of selective breeding in any creature. Comparison between it and the common Goldfish, from which it originated, shows that there is very little resemblance between the two fish.

The rather long flattened body of the common Goldfish has been developed, in the Lionhead, into one which is almost deeper than it is long and the consequent crowding of the digestive organs has given these fish the appearance of having been pinched just above the vent. The hinder part of a Lionhead's back is very much rounded, which, together with the fact that it has no dorsal fin, gives it a very humped-backed appearance. The most remarkable characteristic of these fish is the extraordinary fleshy growth on the head and gill-plates, which has given rise to their name. It seldom begins to show before the fish is six months old, and is not usually fully developed until it is at least three to four years of age; it increases as the fish gets older until the eyes become almost invisible and the gill-plates do not show at all. When this happens, Lionheads often experience great difficulty in breathing, and for this reason adults should be kept in well aerated quarters.

It is usual for them to have double anal and caudal fins, the lobes of the latter being rounded and short. One of the only similarities between common Goldfish and Lionheads is that of colour. Lionheads, like their common cousins, are usually an even gold colour, though red and red and white are not uncommon. Plain silver or white specimens are rare and are very valuable.

Though Lionheads have been known to survive in sheltered ponds in the summer, they do very much better in indoor aquariums. While the water should never be allowed to drop below a temperature of 60 deg. F., these fish do not like to be kept at more than 75 deg. F. An average of about 66 to 70 deg. F., suits



The Lionhead

them best. They are heavy bodied fish, and must be given plenty of room, at least two and a half gallons of water for every body inch of fish.

Owing to the shape of their bodies and their lack of dorsal fins, Lionheads cannot swim well, and tend to limer through the water in a clumsy manner. Because of this it is advisable to use only the stronger plants such as *Sagittaria*, *Vallisneria*, Willow Moss, Giant Anacharis, etc., otherwise they will be continually breaking them. It is also to be recommended that all plants should be given at least a month in which to become well rooted before Lionheads are introduced to an aquarium.

They are omniverous fish and require a mixed diet of live foods, such as *Daphnia*, small earthworms or bloodworms, and good dried foods with a proportion of fresh vegetable food such as algae. Bemax is a very good substitute for the latter and will also help to prevent them from becoming constipated, a trouble to which, owing to the unnatural compression of their digestive organs, they are rather prone. *Tubifex* are not very suitable for these fairly slow moving fish, because of their habit of contracting swiftly into the sand at the bottom of the aquarium.

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# Frogs and Toads

Nature's "Ugly Sisters"

By TREVOR HOLLOWAY

**P**ERSONALLY I had never paid much attention to either frogs or toads until one day last spring. I was on the look-out for a Little Grebe when I saw a truly amazing spectacle. Across the width of the lake stretched a long black column composed of thousands of tadpoles. The column was about a foot wide by six inches deep and moved with well-ordered and almost military precision. If the leaders turned in their course to avoid some obstacle, the entire "column" would follow suit when that particular point was reached. At a rough guess I estimated that every foot of that slowly moving procession represented well over one hundred frogs-to-be.

Perhaps it was the sight of such a multitude which made me "frog-minded." At any rate I have never regretted the time devoted to subsequent observation. As with all other nature topics, the more we pursue them the more interesting they become.

I suppose that frogs and toads are universally regarded as being amongst the most repulsive creatures of nature's family. Nevertheless, the life history of both these batrachians is indeed amazing. Humorists down the ages have poked fun at them, while countless natural enemies slay them in millions.

Actually the spawn has few, if any, enemies. Not so the resultant tadpoles. Fish regard these as delicacies indeed, whilst legions of aquatic larvae slay them unmercifully. Those that successfully reach maturity are harassed on all sides—snakes, herons, hedgehogs, owls and badgers—all are waiting to pounce on the "ugly sisters." Frogs are also in big demand at the biological laboratories for dissection purposes.

In view of these facts it seems surprising that either frogs or toads manage to survive at all. The reason is, of course, the enormous number of eggs produced. Every spring each female frog will produce more than 2,000 eggs and thus their race survives purely by reason of numbers. These eggs are familiar to most of us, large masses of jelly-like globules floating in the water.

In the case of the toad, the eggs are seen about a month later (generally April) and are festooned in a double string from one water plant to another. They may number anything up to 7,000!

In passing, it is interesting to note two unusual methods of incubation. When the Midwife Toad lays her eggs, the male gathers them up and entwines them round his back legs. Some three weeks later, when the eggs are due to hatch, he submerges into some nearby pond and so releases the young tadpoles. One species of tree frog forms a small cone of leaves in a bush which overhangs the water. In this cone she deposits her eggs and when they hatch the tadpoles wriggle out and fall into the water beneath.

Those of us who are interested in frogs and toads never cease to marvel at the deadly efficiency of their tongues. Inch by inch the creature will advance towards some unsuspecting fly or other insect. Suddenly, almost too quick to observe, the fly is gone! The tongue is attached to the back of the mouth and the tip reposes down its gullet. The tip itself is covered with some adhesive substance and a well-directed "flick" seldom fails to achieve its object.

Many people are puzzled as to why the frog's throat is constantly on the move. This is due to the fact that these batrachians lack the normal type of diaphragm for breathing purposes. The muscles of the mouth and throat carry out these duties and if for some reason or another a frog was unable to close its mouth, the necessary vacuum would be broken and the creature would die of suffocation.

It is not generally known that frogs and toads carry an "emergency" water supply. If provoked to anger they will forcibly eject it in an attempt to drive off their adversaries. Unless this reservoir can be speedily replenished, the creatures die within a very few hours.

The Common Toad is distinguished from the frog by reason of the wart-like eruptions on its back. These protuberances are organs for secreting a poisonous alkaline fluid which has

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# Choosing Fish for the Garden Pool

By HERMAN W. HEATH

FOR anyone who has made a garden pool and is contemplating stocking same there are so many different species of fish that it is usually a difficult proposition to make a choice of which kinds to select, especially if the pool is only of medium size when the number will consequently have to be restricted.

There are a great number of different breeds of fish that will live and thrive in an artificial pool, but, although hardy, all of them are not really suitable if the most colourful effect is desired. It must be remembered that a pool is viewed from the top, so it is only possible to see the back and a little of the sides of the fish, therefore, those that are very highly coloured and easily visible, even from a distance, should be chosen. Golden Rudd, Roach, Minnows, Gudgeon and Green tench are all very attractive and interesting fish for an aquarium where they can be fully viewed, but in a pond are inconspicuous, as they do not show much colour. The latter two species also spend most of their time on the bottom nosing amongst the sand and stones.

For adding a real splash of colour to a pool the common goldfish is practically unbeatable, being moderate in price and easy to obtain. Prior to the war, a vast number of them were regularly imported from Italy, where they are bred extensively, and could be purchased from the large stores for a few pence each, but as this source of supply is now cut off owing to the restrictions on shipping the present cost of them is naturally somewhat slightly higher.

The Goldfish (*Carassius auratus*) belongs to what is called "the largest natural family of Fishes, the Cyprinidae"—Carps, Minnows and Daces. It was first bred in China many hundreds of years ago, and there does not appear to be any authentic record as to the exact time it was introduced into this country. Most probably it was somewhere about the middle of the eighteenth century. Since then many beautiful strains of fancy Goldfish have been produced by selective breeding, i.e., Calico Veiltails, Fantails, Celestials, Lionheads, Orandas, etc. Most of these varieties, however, are unsuitable for a pool as they tend to be

delicate and are unable to stand being out of doors during the winter.

The common Goldfish is obtainable in a great variety of colours and a pleasing collection can be made by putting pure reds, yellows, and golds with fish of mixed hues. They make ideal pool fish as they are slow in their movements, easily seen and, being hardy, will withstand very low temperatures. Providing food is given to them every day at the same hour, they soon become very tame and quickly learn when it is feeding time, when they will congregate at the edge of the pool in great expectancy, taking small worms or bits of biscuits from one's fingers.

How long Goldfish will live seems to be another rather doubtful point, but under good conditions in a medium-sized pool they will survive ten years or more, whilst in very large ponds or lakes there are cases on record of fishes having lived over forty years and exceeding two feet in length. They begin to breed when two years old and spawning takes place several times between April and September, but usually only the fry from the early spawnings manage to survive the rigours of winter. The fry are dark coloured when hatched and generally do not assume their vivid hues until a year old, sometimes the period is even longer than this, whilst a certain percentage may never change at all, reverting back to their wild ancestral type.

Shubunkins which have originally been bred from Goldfish are another good fish for the outside pool. They differ from the latter as they are scaleless and do not grow as large, being about six or seven inches when fully grown. Their bodies, however, are beautifully mottled in many rich shades of blue, purple, red, orange, yellow, silver, black and intermediate hues. They are fairly hardy, surviving all but exceptionally severe winters and are easy to breed. Shubunkin fry are coloured when hatched, and a pool of young fry swimming about in the sunlight transforms the water into a moving mass of colour, which is difficult to aptly describe.

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### FONTINALIS GRACILIS

*F. gracilis* is the Fine-leaved Willow Moss, which is found in most parts of the world. There is no question about its decorative value in a small aquarium, or even a large one, providing enough can be obtained to form a really noticeable clump.

The stems are cotton-slender, and covered with diminutive moss-like leaves. Both stems and foliage are pale green, turning to olive-green as they age.

*F. gracilis* does nicely in either full sunlight or partial shade. You will notice that after a short period of direct sunlight, myriads of oxygen bubbles will rise from its stems toward the surface of the water.

There is no necessity to tie stems of this dainty true aquatic moss to a rough-surfaced stone in order to ensure that it will prosper in the aquarium. A number of healthy fresh green stems pushed in the sand will always give as good results.

*F. gracilis* has a temperature range of about sixty degrees. That is, from ice-cold to about blood-heat. Once it has been acclimatised to warm water, it will grow most luxuriantly in a tropical tank all the year round. And as a spawning plant, it is far more useful than any of the quite over-rated *Myriophyllums*.

J.H.

### COLLECTING LIVE FOOD

Now is the time to arm yourself with a long-handled fine muslin net and a fish can, and go out on a live food collecting expedition.

There is no need to go miles out into the country. There are plenty of spots in and around our towns and cities where suitable live food may be found.

A few sweeps of a net over or through a bed of wild *Myriophyllum* or *Callitriche* and what will be your reward?

Most probably countless cyclops, fresh-water shrimps in all stages of growth, water-bugs next to be confused with fish-lice, blood-worms and hosts of invisible and almost unobtainable organisms.

If you are one of the lucky ones you may come across daphnia. If you are one of the unlucky ones you may not pests like leeches, *Fedra*, and the larvae of various aquatic beetles.

However, you can enjoy yourself sorting the good from the bad (for the fishes) after you reach home. There is no question that what may be bad for your fishes will prove interesting to you.

You've no idea how quickly your fry (if you have any) will grow if fed for a few days on small pond life, while for conditioning the adult fish, there is nothing finer than any of the larger creatures.

J.H.

### FROGS AND TOADS

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both an unpleasant taste and odour. Few animals will interfere with a toad more than once!

Perhaps the most deadly species is the South American Poison Frog. So virulent is its secretion that at one time it was used for poisoning the tips of arrows.

Only two kinds of frogs flourish in this country—the Common and the Edible. The latter are found chiefly in the Fen district and tradition tells us they were introduced by monks for their Friday menus. I know of at least one frog farm in the Eastern counties and it is said to be a very paying concern. Frogs' legs are served at several London restaurants, whilst in Paris it is estimated that over 100,000 francs are spent on these delicacies annually.

The well-known American Bull Frog is also one of the edible types and finds a ready market in the United States where it is specially fattened for the table.

The Goliath, as its name implies, is the largest known specimen, but is extremely rare. In size it would compare favourably with a cat or small dog!

The Flying Frog is no mere fable. It hails from Borneo and by reason of its peculiar webbed hands and feet it can execute some amazing parachute-like glides from one branch to another.

Last year a Wiltshire bathing pool attendant witnessed a most remarkable phenomenon. Thousands of tiny frogs descended in a shower of rain. Needless to say the bathers scrambled out of the water with the utmost speed!

[\* At Trowbridge, Wilts, on 20th June, 1899.]

## CLEARING SEDIMENT LADEN WATER

Nothing spoils the appearance of an aquarium so thoroughly as water made hazy by too many floating particles of sediment.

These particles not only retard the growth of the plants by choking up their pores, but in time will even kill them. And that goes for the toughest.

Also, it is a well known fact that many fishes fail to prosper in almost habitually sediment laden water. Fluffy scum settling on some fishes' eggs often results in a large number going bad, too.

For those aquarists fortunate enough to possess all the necessary paraphernalia, there is no question that the quickest way to render muddy aquarium water clear again is by means of a small electric air pump and a properly packed filter.

The beginner, however, seldom starts off with these rather expensive refinements. And not a few really expert aquarists never feel any need for them. Yet their tanks always seem to contain clear water, flourishing plants, fishes in the pink of condition.

This state of perfection is not obtained by using a dip-tube several times every day, or frequent replacing of some of the old aquarium water with fresh. It is obtained solely by stocking with plenty of reliable growing water plants. And by plenty we mean PLENTY.

So if any of you newcomers to the aquarium keeping hobby are troubled with muddy aquarium water, plant up till you cannot see the back or the sides of the aquarium for the masses of greenery.

If you cannot afford to buy the more expensive water plants by the dozen, don't despair—just throw a few healthy stems of cheap *Elodea densa* on the surface of the water and leave them to grow on in a floating state.

By the time this fast-growing weed has filled up about three-quarters of the aquarium with a tangle of long, trailing stems, the water will have become crystal clear, and should stay clear indefinitely.

That is, unless you spoil everything by feeding the fishes too heavily, or introducing some scavengers like Thunder-fish, or *Corydoras paleatus*, which really perform their job just a trifle too boisterously for the well-being of the average smallish, or medium-sized aquarium.

J.H.

## CHOOSING FISH FOR THE GARDEN POOL

(Continued from page 72)

Another eminently suitable and handsome fish for the garden pool is the Golden Orfe (*Leuciscus orfus*). This fish has a long slender body, the back and sides being coloured a golden orange, it has a silver belly and the fins are red-tipped with white. They are very lively and graceful in their movements and a small shoal of them in a pool is a wonderful sight as they dart up and down turning round in formation with a rapidity that is positively amazing. These fish are extremely hardy, but more shy than Goldfish; therefore a little extra patience and perseverance is required to get them really tame. They grow very quickly and will attain a length of 18 inches, given good conditions, but are difficult to spawn successfully. As they are exceedingly fast in their movements they naturally need much more oxygen than Goldfish, but for a medium or large-sized pool they make a perfect choice.

A few specimens of each of these types of fish introduced into the outside pool cannot fail to add colour and charm to the water garden. All of them are easy to keep and will thrive well, given reasonable conditions and a little attention. They are not fastidious as regards eating and will take any of the advertised brands of fish food that are on the market with an occasional meal of small garden worms, tubifex, water fleas, etc., as a special treat.

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## THE LIONHEAD

(Continued from page 70)

The breeding habits of Lionheads are similar to the other members of the Goldfish family. They should be provided with plenty of fine-leaved plants, or finely rooted floating plants, on which to deposit their eggs. The plants should be removed from the aquarium as soon as the eggs are fertilised, as the risk of the parents eating them is very great. It is not to be expected that more than a very small percentage of the fry from one spawning will be true Lionheads, but the aquarist has done well if he can hatch and rear one or two good fish from a batch of eggs.



# "BENJIE"

By FRANK LEPPAN

THAT little tortoise is called "Benjie" because that happened to be the name that flashed across my mind when he thrust his ugly little head through the hole near the bottom of a sheet of corrugated iron of which the sides of my pump-engine-house consist.

I had started the engine, and was sitting on an empty petrol case, smoking, and subconsciously listening to the rhythmical action of the machinery.

Suddenly a little round snake-like head appeared in that hole, and two beady black eyes peered inquiringly at me.

Then the head was withdrawn, and a few moments later a little tortoise entered the door. "Hallo Benjie," I exclaimed, "What d'you want here?"

Benjie paid no attention to my inquiry. He seemed oblivious of my presence, as he proceeded, in that deliberate and determined way peculiar to all tortoises, across the concrete floor of the room. He arrived at the base of the concrete buttress, upon which the engine is fixed, where, with the air of a tortoise that has reached his goal, he settled down.

In a moment his head and feet disappeared beneath the edge of his armour-plated "traveling roof," and Benjie, apparently soothed by the vibrations and reverberations of the machinery, went off to sleep. For the rest of the day that little tortoise did not move, except occasionally to try to edge even more closely towards the base of the engine! Why?

When I closed down for the night, I lifted him, took the consequences, and placed him beneath a shrub outside. He did not remain there for more than a minute. He waddled off as if he had some definite object in view.

"And what about it?" I imagine some one inquiring.

I can only reply: "Well, nothing!" Except that Benjie still turns up whenever I start that engine.

First he takes a sort of reconnaissance peep through the hole, which barely admits his head, then after a few moments he comes blundering in at the door, crosses the floor and goes straight to precisely the same spot at the base of the engine, where he goes off to sleep, just as he did when I first met him 13 months ago.

Only once has he varied in his movements. Upon that occasion he had been asleep only

a few minutes, when he rose suddenly and waddled swiftly (for a tortoise) through the doorway to the edge of the water. He took a few sips, then returned, with the air of a boy-scout who has just done his day's good deed, and settled down in his chosen spot, to get on with his day's rest.

What happens to Benjie on days when he is locked out, and the engine is not working, is, as Mr. Potash would say, "something else again."

Benjie has not, as far as I can judge with the naked eye, added anything to his stature in the past year! At this rate he will be a thousand years old before he's grown up.

I see a lot of life—amphibian life, and other small animal life, from my pump-house door, when many little creations thinking themselves unobserved, come out from their funk-holes to carry on their struggle for existence.

One day I witnessed a battle royal between an iguana and a puff-adder.

From the start, the likawaan (as iguanas are called in South Africa) seemed to have the advantage.

That amphibian is more active than the lazy land-lubber-puff-adder.

Moreover, the iguana's means of defence, or offence as the case may be, is its long scaly tail, so when the puff-adder struck, its fangs met something resembling a steel spring.

When the snake least expected it, it received a blow from that tail that seemed to daze it.

It changed its tactics, coiled itself up, and seemed to be waiting for the iguana to make a frontal attack.

It was sadly disappointed.

The iguana moved backwards, a little nearer to the puff-adder, and hissing as loudly as the snake itself, rained a shower of blows upon its body.

Presently it ceased to belabour the puff-adder, and casting a contemptuous glance at its prostrate enemy it slithered down the river bank and swam swiftly across the reservoir, probably to tell its mate how it had "learnt that puff-adder to be a snake."

Being human, I killed the puff-adder.

One of its fangs was broken.

I see a lot from my pump-house door, but magazine space is more limited than ever in these, the last days of Hitlerism.

However, as we put it in this country "More is nog 'n dag"—(to-morrow is another day), and Britannia still Rules the Waves! For which Benjie is devoutly thankful.

# Port Logan Fish-Pond

By E. R. McCARTER

**T**HIS famous fish-pond is situated at the North-end of Port Logan Bay facing the tiny village of the same name. It is located in a deep pit in the rocks, the sides of which are clothed with the trailing evergreen *Mesembryanthemum*. This location accounts for the peculiar lighting in the photograph, as a very full exposure was necessary for the foreground in deep shadow, so that the brilliantly lit rear wall of the pit is grossly over-exposed and the figures in particular seem white and ghostly.

The sea has access to the pond but the fish of course are held captive and cannot escape to wider waters. Various species of fish are represented, but cod predominate. In the photograph some are seen approaching the side of the pond to take mussels, limpets and similar shell-fish from the hand of the keeper. Except when newly fed and replete, the fish can always be brought to the surface and side of the pond by rattling a bucket or something similar. They are very tame and greedy and often nearly snap the fingers off the keeper and they make a great noise while feeding, the snap of their jaws being plainly audible.

Ordinarily, the pond is open to the public on Mondays, Wednesdays, Fridays and Saturdays, but I cannot state the war-time practice. Access is gained by the steep path seen at the back of the photograph. There is no charge, but a gratuity to the keeper is usual.

I am sorry I have no details as to the arrangements for stocking—whether the cod, etc., breed in the pond, or whether mature fish are added when old ones die off. The pond has certainly been "run" successfully for a large number of years and is visited by people from all over the world.

Another attraction at Port Logan are the Logan gardens attached to Logan House, the residence of Mr. McDonall, a direct descendant of the ancient Lords of Galloway. Here semi-tropical plants and trees grow freely in the open air. The public are admitted at times, but generally there is a ban on photography. The gardens are well worth seeing in the summer.

Port Logan itself is a delightfully quaint old village and quite unspoilt. There is good bathing from the fine beach, but the water, as at most places on the west coast of the "Rhinnns," is pretty cold. I have floated here on my back and could just see over my nose the Antrim and Down coasts, with, further south, the Mountains of Mourne sticking up out of the water just like little pimples.

A lovely area for a quiet holiday.



Hand-feeding the cod in the "fish pond" of Port Logan. This is reminiscent of feeding the giant carp at the London Zoo, a pastime of visitors "behind the scenes" at the Aquarium, now closed down owing to the war.

# Breeding Goldfish

A Monthly Programme (2)

By KENNAIRD THOMSON

HAVING finished up last month by getting all our tanks in order, whilst still continuing to feed our breeders as before, we must now see about getting our spawning tanks set up ready. For these we shall want a good supply of fine-leaved plants such as Myriophyllum, Fairy Moss or any other similar plant. I prefer the first mentioned, and I have yet to come across a better plant for our purpose. The very fine texture of its leaves make an ideal depository for the eggs, which adhere to it in clusters. In a good spawning I have counted as many as fifty eggs on one small plant. Before setting up our tanks we must make sure that the plants have been well disinfected, for, as I have mentioned before, prevention is better than cure, and to be careless in this matter may be the cause of a lot of trouble to us later on. It is very disheartening to find a nice tank of fry gradually disappearing, and nothing to show where they have gone to until suddenly we find we have a large colony of hydra in our tank. We should get a good supply of plants at once, and get them well established and growing before we are ready to spawn. It is no use leaving this until the fish are ready to spawn, and then have to dash about looking for plants out of our pools, or perhaps ditches, and perhaps be forced to put up with any kind that we can get.

I have had this experience more than once and have deeply regretted not having seen to it earlier. I have lost the whole spawnings from valuable fish through it. There are two ways in which we can set out our tanks. They can either be planted the usual way in gravel so that they can grow naturally, or they can be arranged in bunches. Of the two methods I prefer the latter, as it is much easier to keep the tanks clean without the grit. Another reason is that once the fry have hatched out and are free-swimming, the plants can be taken out and disinfected. They can then be used on some future occasion if necessary. The plants should be made up in bunches, by placing a small strip of lead around the bottoms, and arranged thickly at the back and end of the tanks, leaving only a clear space in the front of the tank so that there is sufficient

room for the male to chase the female before driving her up amongst the plants.

Now that we have got our tank ready for spawning, we can leave it to take care of itself for a while and concentrate on getting together a good supply of infusoria for our fry when they are born. When I say a good supply I mean as much as we can possibly get together, for once the fry have commenced feeding they must be kept doing so, and a continuous supply of infusoria as important. Nothing will ever make up for a lack of live food at this stage, but more of this next month.

As most of my readers know, there are several ways of breeding infusoria, but for the benefit of those who have not had any experience I will explain how I do so. I believe in having several strings to my bow, so therefore have several methods in use at the same time. Get together as many 2-lb. jam jars as possible, a dozen at least, and fill them with water, and in some of them sprinkle some pea flour; in others put some lettuce leaves that have dried until they are brown. If any more jars are available, scald some hay in a bucket and allow to cool, then dilute it with sufficient water to make it a nice golden brown colour, and fill up the remainder of the jars with this liquid. All these jars should now be placed on a shelf in a warm position with not too much light. We must now introduce some infusoria. One can usually find this in any old water that has been standing out of doors, such as in an outdoor pool or rain-water butt. A little of the water from these should be added to the culture medium in the jam jars. If this is not successful, a little soil taken from the garden about six inches below the surface will usually do the trick. At any rate, we must persevere until we are sure that we have found some.

After two or three days, with the aid of a magnifying glass, we should be able to see the infusoria in the jars. In a good culture it appears like a fine cloud of dust, but always on the move. Once that we have even a few, it is a very simple matter to keep the supply going, as one lot of medium can be charged from another by just adding a little water from

*(Please turn to page 79)*

# Fascinating Fossils: Lessons for Children

By ELIZABETH CROSS, N.F.U.

SOMETIMES it is difficult to obtain sufficient live specimens for lesson illustration, particularly in town areas, but it is always possible to get hold of some sort of fossils in order to awaken interest in the subject generally. All teachers agree on the importance of actual "real" objects to be used as a lesson basis, and how much more valuable is direct observation than any second-hand information, however well presented. They will also realise how very useful is the "collecting" phase through which children nearly all pass. Fossil collecting can be an extremely educational hobby, and one which can grow as the child grows, with no need to be dropped with maturity.

Altogether we shall be wise to make a point of introducing fossils and their fascinating histories to our various classes. There is no need to overburden an already full time-table, for lessons on fossils can be usefully made part of so many schemes either in the Nature work, Geography or even World History. Naturally, the introduction must vary according to the age of the children, but I have found it perfectly satisfactory to point out a few simple facts to such very young people as inhabit the kindergarten! As soon as a child is capable of grasping the fact that hard bodies can make an impression on soft ones the time is ripe! Most small children to-day, with their busy fingers involved in clay modelling are very well aware of these facts and can quite well understand how the marks of a shell may be preserved on a "stone."

One of the main difficulties I have always found when dealing with the subject in general has been the extremely long and seemingly unintelligible names. Names are, to most children, a very real stumbling block, and I sincerely advise all teachers to consider this point carefully and decide on some sort of a compromise. Unscientific it may be, but I am sure it is psychologically sound to "name" the fossils first dealt with in some sort of rough and ready popular manner. Thus, for the younger classes (and for introductory lessons to older pupils) we classified fossils into "large

singles," "large doubles," "small" and "chalk shells" (as we had a microscope), "sponges," "sea creatures," "oddments." This may sound rather shocking to genuine fossil enthusiasts, but it served the purpose of fixing the attention on the actual specimens rather than giving an impression of difficulty by means of incomprehensible terms. Later, when the children have become reasonably familiar with the subject and are actually on good terms with fossils, then is the time to introduce a few correct names. It is then surprising how quickly the names are picked up and remembered, for the children are, by this time, ready to understand the meaning of the names and to welcome them as labels to be attached to something they truly know.

I have dwelt at what may seem excessive length on this aspect, because I have seen so many children's awakening interest completely killed by the seeming difficulty of these alarming names. There is not only the trouble of the actual names of specimens, but also the names of periods of time or of rock strata. The only way to overcome this time and rock difficulty is to make plenty of simple class illustrations in diagram form with a simple scale of time. Of course, for young children (say, under the age of eight or nine at the most) it is a sheer waste of time to worry about anything more than the vaguest conception of the past. "Ages and ages ago" to them may mean when great-grandmother was alive! However, this need not preclude us from giving some simple facts about the fossils, as the mere introduction to them may bear fruit later on. We have always to remember that unless we seize the opportunity of dealing with a subject the children may miss a valuable aspect of the universe. This may sound rather pompous, but even if only one child becomes wholly aware of the implications of the subject we shall have done something worth while.

Now, where shall we find our fossils? To the uninitiated this may seem difficult, but after reading quite simple little books on the subject it is obvious that our specimens are widely distributed. Our own introduction came quite

by chance during a walk on the South Downs. A venerable old gentleman suddenly picked up a flint, thrust it under our noses and demanded "what's that?" and, when we professed more or less ignorance, began to explain about fossil sponges. This soon led to talks about other fossils and in no time the children were possessing on every available flint and examining it with passionate thoroughness.

It is useless to plan any expeditions (except for those teaching very small numbers in an informal way) until some preliminary work has been done. After this, though, the real thrill of fossil study is, of course, to go hunting for oneself. Expeditions may be planned or children may be encouraged to look for themselves in their free time or during the holidays. Parents are always glad to welcome a new hobby that is both healthy and cheap! So try and find out what sorts of opportunities the children will have, where they are likely to go and then make suggestions. Seaside visits should give plenty of chances, for so much of our coastline is rich in fossils. Gravel works, brick works and other cuttings (including railway sidings, provided there is a grown-up handy) all give a chance to the eager eye of the fossil hunter. Then there are the heaps of flints that are ready for road-mending. Every flint is based on some fossil and although we may come across many sections that contain nothing, yet we are bound to be lucky sometimes. Children love learning how to split flints in a professional and "cave-man" style, finding the natural lines of fracture and hoping for treasures within, so let them have some chances to experiment. A word of warning, however, remember that flints can be razor sharp, and let the children be duly careful, and remember to carry a little first-aid in the shape of iodine and sticking plaster on all expeditions.

A fossil collection is well worth while and a communal one is soon built up, while the most enthusiastic children will begin private collections of their own. A simple guide book on the subject, plentifully illustrated, is essential if specimens are to be identified and labelled, but there is no need, at first, for any deep or expert manual.

Fossils can be a very worth while study and appeal almost immediately to all children, and perhaps especially to those who have had some previous work on aquatic subjects. They will be able to trace some of the earlier history of

the animals they can watch alive to-day and, in some cases, find how very little alteration has taken place throughout thousands of years. For any detailed scheme on evolution a certain amount of fossil study is essential and it is a considerable help to any historical scheme.

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## BREEDING GOLDFISH

(Continued from page 77)

the jar which we know is charged to the new one.

A number of old water butts or tanks in the yard or garden will be of great assistance at this stage, as they will guarantee us a plentiful supply of infusoria. My method is to get an old sack and place in it a good quantity of hay, lettuce leaves or banana skins; in fact, many a time for want of better things I have put in a quantity of half-decayed garden weeds and they have answered the purpose admirably. The sack is hung in the butt so that the water covers the decayed vegetable matter. This method has the advantage that we can take out the water charged with infusoria entirely free from any decayed lettuce, etc., and is, therefore, not so liable to foul the tank when fed to the fish. An additional advantage is that should the water get too foul, the sack can be lifted out and left out until the water clears again, which it will soon do. The sack can then be put in again. This has never failed me.

There is one important thing I have not mentioned and that is that we must make certain that no daphnia, cyclops, etc., are present in any of the water that we are using, or we shall find that they will consume the food we have gone to so much trouble to prepare for the infusoria, and thus diminish our supplies of the latter.

Now that we have got our tanks, plants and live food going well, we must think of possible ailments. These we do not want, and have done our best by way of cleanliness to avoid, but the best of plans go wrong sometimes, so we must prepare for any troubles that might occur. It is wise to lay in a supply of the following: Epsom salts, permanganate of potash and some quinine sulphate. Any chemist will make up the latter to a solution that will equal three grains to a tablespoonful, but more of ailments later.

(To be continued)

# Edible Reptiles and Batrachians

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

THE mere suggestion of eating reptiles inspires the average home-staying and inexperienced diner to something like hysteria; but he recovers his nerve and appetite with surprising suddenness if introduced to a basin of turtle soup, cheap at five shillings per small portion.

Admitting the green turtle to be in a class by itself, fully a score species of other reptiles find favour with civilised gourmets the world over. Some are so good one is tempted to wonder at the turtle's pre-eminence, unless it be the exorbitant price demanded, for fresh turtle meat, which rarely comes the diner's way, loses its natural delicacy of flavour when dried and ready for conversion into soup. Then, the flavour must be put back by the cook, and only a master of his art can do so. All turtle soup is supposed to be made from quarter-ton Ascension Island green turtles. Actually, a lot is derived from undersized "black fish" gathered in all warm waters. The various kinds of Loggerhead are also in requisition, and even the Hawksbill can provide a very tasty basin. At best, turtle is wasteful, less than a quarter of the animals bulk can be used; but it has one great claim to public favour—it is in "top form" at any time of year.

In U.S.A. the word "Turtle" has a wide significance. "Turtle" is such an essential to the millionaires upkeep that all kinds of fresh-water tortoises are used, and some of our leading London hostilities import them for their wealthy clients. The S.E. United States supply the big four pound "Slider" terrapin which commands a shilling per pound weight in the autumn and winter. The Diamond Back tops the bill, eight-inch examples selling for over a pound sterling each, and the demand is so great that this species is in some danger of extinction. One can easily understand how the edibility of the giant land tortoises led to their premature extermination.

Reluctantly conceding tortoises to be "possible," the home diner will still wrinkle his nose at lizards or snakes. New York bonvivants, however, pay through their noses for the common tuberculated Iguana of the



"What? Eat reptiles? I'd rather starve!"

Southern States, and many Zoo examples have been bought in the local markets. The reptiles are tied together in bundles by the tendons of their hind toes, a repulsive practice which seems to have no ill-effects once the creatures are liberated. I have tried this lizard, also Monitor, Tegu, Zonure and Mastigure—*en casserole*, and can commend them all. Reptile flesh, without exception, smells when fresh like fish, with the faint "cucumber" aroma peculiar to the smelt. It is somewhat lax in texture, but with cooking becomes firm and white, loses its fishy odour, and tastes like young and very tender chicken. But to the writer's taste at least there is no saurian to compare with crocodile or alligator. Many carcasses from the Florida 'gator farms (which supply the bag and shoe trade) reach New York and command fair prices. Crocodile meat, when stewed, is almost indistinguishable in tint, texture or taste from the best veal and might easily pass as such.

New laid crocodile eggs, whilst quite palatable, are inferior to turtle's. These, by the way, will bounce without breakage when raw.

and refuse to "set" however long they are boiled.

In Picardy I was once invited to try a dish of "Hodge eels." The eels tasted very odd-like, but of firmer texture and the bones at once gave them away as large grass snakes. With snakes generally the bones tend to be in excess of the meat, even in a middle cut of twenty-foot python. All snakes tend to taste alike, and the flesh of the most deadly snake is quite innocuous, at least when cooked. Tinned rattlesnake can be purchased any day in London, and whilst good of its kind, tends to be swamped by the condiments.

Most batrachians are probably good to eat—if nothing better offers. The Giant Salamander of Japan is commonly angled for and marketed, and a six-footer certainly promises generous helpings. I can say at first hand that Axolotl—extensively farmed for market in Mexico—is equal to frog, as also is its adult *Ambystoma* form. For some reason the frog has never found much favour in this country as a fish, though not much over a century ago it figured largely in the Pharmacopoeia. The early veterinary surgeons prescribed live frogs for various equine disorders, and the Anglo-Saxon plagued with toothache simply spat into a frog's mouth, after ordering it to remove his source of discomfort. The prevalent batrachian flavour is that of spring chicken.

In France the edible, and in U.S.A. the much larger bull frog, are extensively farmed, the promiscuous capture of wild specimens being quite inadequate to meet popular demand. Since only the hind legs can be eaten, the bulkiest crop provides a very small yield. Our climate has defeated all efforts to breed the bull frog on a commercial basis.

In conclusion, however good some reptiles or batrachians may be to eat, their general use as food is to be deprecated, just as is their slaughter for the bag trade, or wholesale capture for the live-stock market. They play a vital part in the uneasy balance of nature, and the frog in particular is to be encouraged in these Dip-for-Victory days. As Dr. Burgess Barnett and others have pointed out, reckless killing or capture, even of poisonous snakes, inevitably brings Nemesis in the form of rat and other vermin plagues.

Expanded from the culinary viewpoint, the reptiles deserve a place in the Gourmet's

choicer memories, rather than a regular position in his larder!

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### SPRING-CLEANING

About this time of the year busy housewives become engaged in that fetish known as spring-cleaning.

That is to say, things which in any properly conducted household are kept scrubbed and polished and renewed and refreshed at their appropriate times all the year round, suddenly have to be re-scrubbed and re-polished and re-refreshed and re-renewed all in one sudden burst of feverish activity which usually starts just when the Lionheads are about to spawn or Mrs. Molly decides to have a family.

The majority of male aquarists become so mentally disturbed by the whole procedure that not a few of the married ones seriously contemplate a divorce, or worse.

However, come what may, Hitler himself or rationed soap, spring-cleaning must proceed.

And so we find long-suffering male aquarists staggering under the weight of their just moveable tanks from dining room to drawing room, kitchen to scullery, and, in some dictatorships, from attic to cellar. Most probably the fishes imagine they are back in their exotic native lands and a series of major earth-tremors are going on.

But the point is, since the fish have been disturbed by so many joltings and jerks, one might just as well go the whole hog and spring-clean their homes up, too.

For instance, it is a good idea to syphon off half to three-quarters of their old water and refill with matured fresh. By matured we mean clean rain-water, or ordinary tap-water which has been left to stand for at least two days before being introduced.

Then there's the plants. Cut off the decaying stems of these, and pull up those plants which are unimportant and threaten to give up the ghost. Fill the spaces with new stock. It is a good plan to plant up with something you have never had before. There is nothing like new plants (or fishes!) to sustain interest.

Juggle the fish around so as to leave one or two tanks free for breeding purposes. If you produce only fifty saleable fish by the end of the summer you will be doing some dealer a good turn, and yourself one, too.

## READERS' RECORDS

The following letter, sent to our contributor, Miss Baker, will undoubtedly be of interest to readers who number Box Tortoises among their pets.

"I want to tell you that I enjoyed your article about box tortoises very much. I have kept these droll animals since I was a small child. I do not think I ever missed the opportunity of picking one up when in the country, although on a few occasions I have simply removed them from an automobile road so that some car would not crush it. At times I have had as many as 10. There was one which I kept about 20 years, and it was killed by an extra severe winter when I did not bury it deeply enough.

"My method of preserving them over the winter is to dig a hole about a foot deep. At the bottom of this I place a mat of excelsior about three inches deep. Then I put about four inches of excelsior on top of the turtle after setting it on the bottom excelsior. Earth is then piled over everything and raised up into a mound. Sometimes I place a litter of rags or leaves over the mound. Of course, your climate does not call for quite so much protection. In our country turtles usually burrow into old leaves and soft earth, and do not go down very deeply. I was successful in wintering some of the little babies in the same hole with the adults. Sometimes I have placed as many as four adults in one excavation.

"You are quite right in saying that different individuals vary in tameness. Some of them take to captivity almost at once, scarcely taking the trouble to close their shells when picked up. One thing I notice is that without exception the bright ones lose their bright colour in captivity. I do not know whether this is from lack of proper food or from lack of sufficient direct sunlight. I am inclined to think the food has a good deal to do with it. As these animals are omnivorous, it is very easy to feed them on the handiest thing. This means that we do not take the trouble to catch earthworms for them, nor to feed them on berries that they like. I have been unable to find any food that they would not eat. Of course, the easiest thing is to give them bread that has been soaked in milk, but this does not sound like a very good vitamin diet.

"I have had quite a number of eggs laid by these different tortoises from time to time, but never had any of them hatch. The babies

were some I secured from a neighbour who seemed to have no trouble in breeding them. Unfortunately, the babies disappeared before I could make any notes on the process of their growth. I think boys in the neighbourhood were responsible.

"In placing tortoises under ground for the winter, the head end should be tipped upward a little. I usually dig them out myself in April.

"Sincerely yours,  
"W. M. T. INNES.  
"INNES PUBLISHING CO."

Philadelphia.

*Guppies.*—I have found that segregating Guppies early is very important if one wishes to line breed them.

I have found that if one waits until the colours appear in the males, it is then often too late, some of the young females by then having already been fertilised.

I have never been able to sex them at two weeks, and I have never seen their colours appear under eight weeks and I don't consider they are fully matured under eighteen months.

E. MILLEN.

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## TEST YOUR KNOWLEDGE

(The answers to these questions will be found on page 84)

1. What is the scientific appellation of the Australian Stump-tailed Lizard?
2. *Ambassis buroensis* is native to the island of Boeru, or Buru. Is this island in the East or the West Indies?
3. What is the common name of *Umbra krameri*?
4. How many of the following are Anabantids:  
(1) *Sphaerichthys osphromenoides*, (2) *Parosphromenus deissneri*, (3) *Otenops pumilus*, (4) *Helostoma temminckii*?
5. Are the flowers of *Ludwigia* produced (1) above the surface of the water, (2) below it, (3) or both?
6. Is *Barbus callensis* indigenous to Africa or India?
7. If a friend wrote informing you that he was sending you a can containing some *Petromyzon fluviatilis* and some *Amin calva* would you prepare a cold-water or a tropical tank for their reception?



# The Amazing Salmon

By JOHN GRAHAM

It seems strange to think of the salmon spending a great part of its growing life in the utterly dark waters of the deep seas, for we are so used to thinking of it as a river fish, but nevertheless this is a fact.

To the west of Great Britain, France and Spain, the sea-bed drops very steeply from the comparatively shallow water called the Continental Shelf, down into the deep abyss of the Atlantic Ocean. These slopes are inhabited by herds of large deep-sea shrimps of a bright red colour and as the locality is too deep for normal fishing and there is a super-abundant supply of crustacean life upon which the young salmon can gorge, they find here an ideal feeding ground. It is an interesting fact that the characteristic pink colour of the flesh of salmon which have returned from the sea is produced solely by the assimilated pigment of the red shrimps upon which they have fed.

They remain in the sea for about two years. Then with the approach of maturity their reproductive organs begin to become active, and under this glandular activity the fish become sensitive to an influence which, until now, they had ignored.

The rivers flowing into the sea are not therein immediately lost, but continue to flow out into the oceans, gradually becoming more and more saline as the marine waters slowly mix with their own pure current. This ever weakening stream flows on until it even reaches the dark depths of the salmon's home. There the sexually aroused fish, becoming aware of it, swim in the direction from which it comes. As they do so, they find the fresher water suits them better, they can breathe more freely, and with the improved oxygenation of the bloodstream their sexual glands begin to enlarge and become yet more active. The salmon, thus made still more sensitive to these fresher waters, go further, reach the river's estuary and begin to ascend. A kind of "vicious circle" has begun, for the more highly oxygenated the water the greater the stimulus to get more air still. This strange journey continues for a varying period, depending upon the length of the river and the time the journey began. Nevertheless the months of November

and December find them all approaching their final goal at the river's head.

Changes have taken place during the ascent. Formerly the fish leaped eagerly at food and was the angler's joy. But gradually the ever-growing reproductive bodies cramped the other organs and digestion became difficult and finally impossible. It took no more food. Now, starved for many months, the fish has used up nearly all its reserves of energy. Despite the glorious marital colouring and the plump belly, a critical inspection reveals a gaunt look. The plumpness is largely due to the swollen sexual glands which now account for a tenth of the weight of a male and as much as a fifth of the weight of a female. Such proportions are quite unknown among terrestrial creatures!

In December and January the females make troughs in the shingle of the river bed by rubbing their bodies on the bottom. Often they are aided by the males. Then with wild excitement, pairing takes place and the eggs are laid and fertilised in an ecstasy so great that it is possible to approach the fish and touch them during the act.

Afterwards, torn and scarred by their journey and the preparation of the marital trough, they are borne away by the river, so utterly exhausted that they are swept here and there, willy-nilly, by the current. Emptied of roe, they are now little more than living skeletons and, dashed against rocks and easily preyed upon by sundry creatures, most of them die. A very few, finding a favourable and sheltered spot, are able to rest, recover sufficiently to feed again and so live to reach the sea once more. Later they will make another ascent of the river and spawn again, but it is only a very few who make more than two journeys.

## IN THE RIVER

The eggs which were laid in December or January hatch about the middle of winter. The fry are tiny transparent creatures with enormous yolk-sacs attached to them almost as large as themselves. Upon these they must depend for sustenance until the spring and the appearance of infusoria. In the meantime they gradually develop their fins and assume a reddish-brown coloration. When spring does

arrive, the yolk-sac is gone and the fry are active little fish not much larger than the day they were hatched.

Throughout the summer they live upon infusoria, and the very tiniest of other forms of life, and by the time winter arrives, are sturdy little chaps about two to two and a quarter inches in length. Then with the cold weather comes a shortage of food and they have to fast until the warmer weather returns. Then, more ravenous than ever, they pass on to larger and yet larger forms of food. When the end of this summer comes and the chill of their third winter is approaching, they have grown prodigiously and are almost six inches in length! Something else has happened too, in addition to growth. They have changed colour. Now their backs are a dark bluish colour, their bellies are silvery and upon their sides are azure patches. During the winter these colourings are intensified and, with the arrival of spring, they are resplendent with gleaming rainbow hues.

In the early part of spring the smolts, as we now call them, leave the shallow water and, still for the most part facing upstream, drift with the current into the deeper water. They continue to feed as they go, showing greatest activity after dark, and during the day keeping to the deeper parts amid-stream, drifting all the while. After a few weeks they reach the estuary and here for a while they rest until they accustom themselves to the salinity of the water. Then they vanish into the black depths from which their parents came.

Now what is the urge which compels a salmon first to leave the wholesome fresh waters which have been its nursery and take a risky journey into totally different waters, which would destroy the average fresh-water fish, and secondly to undertake an incredibly more arduous journey back again to the regions it had previously forsaken?

I explained earlier in this article how in the sea the sexually awakening salmon experienced a desire for more highly aerated water and sought it in the rivers. The original descent to the sea seems to be due to the fact that with their change in pigmentation the smolts are not so well protected against the sun. The light now seems to upset them considerably and so they seek the deeper waters where light cannot penetrate.

It thus appears that the salmon is a fish waylaid by two powerful idiosyncrasies:—

- (1) A desire for plenty of oxygen, and

- (2) a dislike and extreme sensitivity to light.

As a little fish, it is the second of these two which holds sway and the fish retreats to the dark sea, but with the maturing of the sexual glands its system becomes more urgent in its demand for oxygen. Then the salmon, choosing the lesser of two evils, returns to the unwelcome light to gain the air upon which its system insists. You will notice that in the daytime salmon usually lie quietly in deep holes, doing most of their travelling by night, and the smolts during their descent to the sea behave similarly.

The scales of a fish bear "annual-rings" similar to those seen in a tree-trunk section. These reveal to the expert not only the age of a fish but quite a lot of its life's history. We can discover by this means those fish which have survived the spawning act and returned to the sea to recuperate. This is shown by a characteristic ridge in the scale produced by the hardships of the journey up-river. It is thus we can tell that so few ever spawn more than once. Professor Louis Roule, to whom I am indebted for much information, says that "one or two out of hundreds and thousands, show *two* spawning marks. These have spawned twice and are returning a third time. Very rarely indeed, giant salmon are found which have on their scales signs of three or even four spawnings. More than this have never been found."

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### PRAISE INDEED

In a letter to a reader, Mrs. C. J. MacMeekin, of the San Francisco Aquarium Society, says: "I wish more of our members subscribed to *THE AQUARIST*. It is by far the best in the aquatic field." Such praise from an authority is appreciated, and we extend greetings and thanks to this good lady and her society.

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### ANSWERS TO "TEST YOUR KNOWLEDGE" QUESTIONS

(See page 82)

1. *Trachysaurus rugosus*.
2. East Indies.
3. Dog-fish.
4. All of them.
5. Both.
6. Africa.
7. A cold-water tank. *P. fluviatilis* is the common river lamprey; *A. calca* the Bow-fin from America.

# pH for the Aquarist

By K. BIDWELL

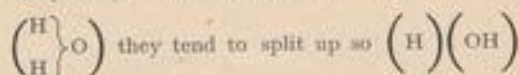
THE subject of pH is one which many aquarists must have been interested in at various times, and I hope this article will enable them to understand it. It is supposed that the average aquarist, as a nature lover, has no specific knowledge of chemistry, and every effort has been made to keep matters relating to chemistry as simple as possible. This article is not meant to be a complete thesis on pH, as this would fill many volumes, but gives the aquarist a clear outline of this very intricate, yet interesting, study.

There are two aspects of pH, the scientific one, and the aquarist's. It is easier to understand from the aquarist's point of view if one understands the scientific side of it. First of all, one must understand what a molecule is. It is the smallest particle of a chemical compound which can exist (nearly all the materials met in everyday life are chemical compounds). If a molecule is split, the parts no longer have the characteristics of the chemical compound from which they were derived. Water is a good example. Molecules of this are made of two parts hydrogen gas by volume, and one part oxygen gas. If the molecules are split (this is done by electrolysis) one gets oxygen and hydrogen gas left. Both of these are very unlike water, and have no characteristics of it. About 100,000,000,000,000,000 molecules of water could be put on a pin's head. Needless to say, they have never been seen, yet it can be proved they exist by scientific experiments.

Water is given the chemical formula  $H_2O$ , which is self-explanatory. H represents one part of hydrogen and O one part of oxygen.  $H_2O$  therefore, means that for every part by volume of oxygen gas, one has two parts of hydrogen gas, in every molecule of water.

In an aquarium then, there are these countless billions of molecules of water. But it is not so simple as this. Due to the activities of electro-positive and electro-negative charges in

the water, the molecules, or some of them, tend to split up. If we represent them as—



and go about as H and OH parts. This splitting is not visible, and can only be detected by delicate experiments. These parts are called IONS. The H part is called the Hydrogen Ion and the OH part the Hydroxyl Ion. The Hydrogen Ions are the Ions which affect pH; the Hydroxyl Ions do not concern us. Now comes the important phenomenon which started all this pH business. If we add an ACID to water the number of Hydrogen Ions increases. Well-known acids are:—

Hydrochloric acid (spirits of salt),  
Nitric acid,  
Sulphuric acid.

If we add an ALKALI to water the number of Hydrogen Ions decreases. Well-known alkalis are:—

Caustic potash,  
Caustic soda,  
Washing soda—shows slightly alkaline nature, but is not true alkali.

This is the whole basis of the pH system; if you understand this you should find no difficulty in understanding any pH problems.

Now it has been found by experiments that in 1 litre (1,000 c.c.s. water approx.) of neutral water (neither acidic nor alkaline) there is .000001 grammes of hydrogen ions, or ionised hydrogen. A convenient way to write this is  $10^{-7}$  (indice is 1 more than number of 0's).

If we add an acid the number of hydrogen ions increases and we may now have—

.00001 grammes H ions/litre.  
(1 is taken for simplicity.)  
Written  $10^{-6}$ .

If we add an alkali the number of hydrogen ions decreases and now we may have—

.00000001 grammes/litre.  
Written  $10^{-8}$ .

A Danish scientist named Sørensen who was interested in pH decided it would be easier to write—

$10^{-9}$  as 9 or pH of 9  
and  $10^{-5}$  as 5 or pH of 5  
and  $10^{-7}$  as 7 or pH of 7

and thus simplified the expression. He called the value resulting, the pH value. He may have had the idea of potential hydrogen concentration in his mind, but probably he chose pH for no specific reason, but merely by chance. Thus Xy would have been equally suitable. For any mathematically-minded aquarists—

$$pH = \frac{1}{\log Ch}$$

where Ch = number of grammes of ionised H/litre.

Thus, neutral water has a pH value of 7. Acidified water has a pH value of anything below 7, e.g., pH 5. Alkaline water has a pH value of anything above 7, e.g., pH 9.

Now—

pH 7 = .0000001 grammes H ions/litre  
pH 5 = .00001     "     "     "     "  
pH 9 = .000000001     "     "     "     "

Intermediate values such as pH 8.3 (i.e. with decimal figures) can be worked out by mathematically-minded aquarists using the expression—

$$pH = \frac{1}{\log Ch}$$

However, a whole number such as pH 5 is sufficiently accurate for most aquarists' requirements, and indicators do not facilitate very accurate readings unless an expensive outfit is obtained.

There is one more point to bear in mind before we start on the effects of pH on the aquarium, and that is the formation of salts in the aquarium. This is best explained by taking a common example.

If we mix some caustic soda with a certain amount of hydrochloric acid (found by experiment), the caustic soda is neutralised. The substance left is a solution of salt in water. This does not burn like an acid and is not caustic, in fact it has no characteristics of the acid and alkali from which it came. Many other acids and alkalis act in the same way, i.e.—



Some salts which can be formed like this are sodium chloride (common salt), potassium nitrate (saltpetre) and sodium sulphate (Glaubers salt). If a strong alkali and a weak acid are used the salt tends to have a pH value of over 7, and if a strong acid and a weak alkali are used the pH is a little below 7, e.g., washing soda is a salt made from a weak acid and a strong alkali, and has pH of over 7. These salts, in solution in the aquarium, although very dilute, do affect the pH and this is why unexpected things happen when we start rectifying the pH with acids and alkalis.

pH, however, was not used at first for aquariums. Its original use was for testing soils. Agricultural experts often wanted to know how acid the soil was, so that they could grow the correct plants which would be suitable for the particular soil. People used to talk of a "sour" soil when it was acidic, and a "sweet" soil when it was alkaline. They found that certain plants and crops grew better in acid soils and others in alkaline soils, and tried to change the pH to suit them. Soon many research workers began experimenting and methods for correcting pH were evolved.

Later, large salmon and trout fisheries in America became interested in pH as they found that it influenced the mating and spawning of their fish in many ways. Thus pH came to the notice of fishkeepers.

Most of the interest in pH, however, developed in America and, as the aquarium craze swept that country, it was only natural that the pH enthusiasts should spring up in its wake. An Irishman named O'Brien is credited with the first publication on pH and the aquarist, in "Aquatic Life." Soon many American and German aquarists took it up as they hoped it would solve their breeding problems. Later it came to England, with the development of the hobby in this country.

Nowadays, many outfits are on the markets of America and England and are quite suitable for the aquarist. The outfit usually consists of a box, containing two test-tubes, a bottle of indicator, a colour chart, a dropper, and perhaps some chemicals for rectifying the pH.

A typical indicator is that supplied with the B.D.H. outfit. It has a pH range of 3.0 to 11.0 and is known as the Universal Indicator. Other more accurate indicators can be obtained which operate over a smaller range. The chart

supplied gives a series of colours with pH values opposite each. Chart of Universal Indicator is given below:—

Acid	
pH up to 3.0	Red
.. .. . 4.0	Deeper Red
.. .. . 5.0	Orange-Red
.. .. . 5.5	Orange
.. .. . 6.0	Orange-Yellow
.. .. . 6.5	Yellow
7.0 = Neutral.	
Alkaline	
pH up to 7.0—7.5	Greenish-Yellow
.. .. . 8.0	Green
.. .. . 8.5	Bluish-Green
.. .. . 9.0	Greenish-Blue
.. .. . 9.5	Blue
.. .. . 10.0	Violet
.. .. . 10.5	Reddish-Violet
.. .. . 11.0	Deep Violet

The usual method is to take about 10 c.c.s. of the aquarium water and add 1 drop of indicator. Then compare the colour obtained with the chart, and the pH reading is found. Thus, bluish-green would be found to indicate a pH of 8.5. There are a few points worth noticing in taking a reading—

- (1) All test-tubes used must be either perfectly dry or well rinsed in **DISTILLED WATER** (tap water interferes with the pH).
- (2) The pH should be tested in the morning and evening (for reason—see later).
- (3) The water of the aquarium should preferably be stirred up or aerated previous to a test in order that the readings are uniform (pH may vary in different parts of aquarium).
- (4) Add exactly the same amount of indicator to each sample and, using a well-washed rubber bung, gently invert the test-tube. This is sufficient to mix the indicator and the sample. Vigorous shaking is neither necessary nor desirable.
- (5) Read instructions in outfit carefully and do not expect very accurate results.

Now that we understand pH and know how to take readings, how and to what advantage can we apply our knowledge to fish keeping?

Let us consider what things in the aquarium have any effect on pH. First, the glass with which our aquariums are glazed. This affects the water slightly. It has been proved that water which has stood in a glass vessel for some years contains traces of silicates of sodium and other metals. These are basic and tend to increase the pH value, i.e., make the water alkaline. For normal purposes, however, this can be ignored and anyway there is no suitable substitute for glass in an aquarium.

Next, the sand and rocks. These influence pH. If the rocks or sand contain any limestone they render the water alkaline. Harder rocks, like granite, will have less effect over the same period of time. Another reason for the condemnation of mermaids and castles in an aquarium, is that they have considerable effect on the pH. They usually contain some chemical such as Plaster of Paris for a base, and dissolve slowly in the water with disastrous effect on the pH. The paint on them does not help either; coral, even if well washed, will bring with it a load of trouble for the pH enthusiast. For, besides containing traces of many marine salts, it is built from calcium carbonate which dissolves, as calcium bicarbonate, into the water. Aerator diffusing blocks which are made of a porous limestone, such as oolitic, have the same effect as limestone. Usually, however, they are not present in sufficient quantity to do much harm.

The greatest changes of pH in an aquarium are due to the living and organic parts of the aquarium however. Take plants for instance. During the day, under the influence of light, plants in the aquarium take in carbon dioxide and mineral salts and build complex carbohydrates, fats, and proteins such as protoplasm. Thus they continually extract carbon dioxide from the water. Carbon dioxide, present in sufficient quantities, makes water acid; therefore, plants, in removing it, continually stop the pH from falling below 7 or 8. Also, by absorbing mineral salts they effect pH according to whether the salts they absorb are acidic or alkaline by nature. Also, during the day-time when the sun is shining or when there is sufficient artificial light, oxygen is given off by plants. This is a by-product formed during the building up of food or, photosynthesis, as it is called. This oxygen, which is liberated, tends to oxidise any organic matter in the aquarium, and thus alters the pH considerably. However, day and night the plants are breathing, i.e., taking in oxygen and giving off

carbon dioxide. The carbon dioxide tends to make the water acid and the pH value drops. During the day this is counteracted by the photosynthesis and is not usually noticeable. At night, however, the photosynthesis stops, but the breathing continues. Thus, in the evening the pH may read 8.0, i.e., alkaline, but in the morning it may have dropped to 7.0, or less in tanks with many plants. This is the reason for taking pH readings in the morning and evening, when any change in pH, due to the plants, can be ascertained. Too many plants in an aquarium will obviously have a great effect on pH. In the day the water will become so alkaline by photosynthesis that it is doubtful whether the water will ever return to acidity, or even neutrality. Decaying plants, as organic matter, greatly influence pH also.

pH affects plants to a certain amount, but the kind and amount of salts in the water has naturally the greatest effect. Phosphates, nitrates, sulphates, etc., all help to make the plants healthy, and too much or too little of any single salt will soon have its effect. pH naturally is no guide as to what kind of salts are present and cannot even indicate the concentration of these salts.

The fish, like the plants, breath continually whilst they live, and continually lower the pH. If many fish are kept without plants the water becomes very acid. The food of the fish if left to decay on the sand soon begins to be attacked by bacteria and chemicals are set free in the water. These, together with chemicals and salts from the excreta of the fish, tend to influence the pH value of the water very considerably.

It is said that acid water stops diseases such as tail rot and fungus. Whether there is any truth in this statement remains to be seen. Breeding is said to be influenced by pH, and many people believe that Angels, for instance, will only breed in acid water. There again many Angels have been bred in the Steinhart Aquarium, N.Y., in definitely alkaline water.

It is often supposed that changes from acid water to alkaline and vice versa, affect fish as does the temperature of the water. This again is open to doubt, as certain Killifish have been subjected to sudden changes in pH and suffered no ill effects.

Thus it is clear that much research awaits anyone who wants to obtain more accurate information on this subject. The effects of pH

are not fully understood yet, and more research is necessary until the science of pH can be successfully applied to the breeding, and rearing, of fish in an aquarium. It is up to all aquarists who can spare the time, and who have the enthusiasm, to experiment with pH and record their results for the benefit of their fellow aquarists.

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## DAY LILIES

(Continued from page 82)

of these is May Sadler, a lovely colour combining red, brown, orange, yellow and blooming in July; Margaret Perry produces its striking orange-scarlet flowers from July to September; Iris Perry has very graceful foliage and for a couple of months from July provides numerous bronzy-orange flowers; and Gladys Perry has thin grass-like leaves and flowers of a rose-bronze-yellow-buff mixture, opening early in July.

Many people may consider the fact that the Day Lily blossom only lasts one day to be a great disadvantage. The first part of the scientific name—"hemero"—comes from the Greek *hemero*—a day; and the latter part, "callis," from the Greek *Kallos*—beauty. The name itself, then, may be taken as meaning "beauty for a day"; and the fact that the plant produces at least one flower each day for several weeks takes the disappointment out of the short-lived blossom. Each plant also sends up several spikes of flowers, and one or more of them open every day, so that a clump is a very showy affair for a long time.

It must not be thought that because the Day Lily likes a moist soil that it is partial to shady or crowded conditions. On the contrary, the plant must have full exposure to the sunshine, otherwise the blossoms will not open very widely; in fact, on a dull day the flowers are often half-closed. Whether the plant is in flower or not, the foliage is of a kind that gives great pleasure both in its artistic appearance and bright pale green colour, so that even when the plant is out of flower—say, during the early part of the summer and the autumn until frost comes—you have a very fine plant for the waterside. It is one of the best for the side of a small stream or pool, and it gives the effect of a flowering rush or reed.

# "My Lilliputian Island"

By WALLACE GLEGG

**I**N a previous article I described how I made an indoor vivarium in a garden in Devon. At present I am living on a houseboat on the Thames, with only a small garden and no greenhouse. My interest in reptiles has not waned, however, so I decided to build an open air reptilium, after seeing the one at the London Zoo.

The first thing I did was to look around for a warm, sunny site. I then set to work building the walls of my reptilium, about eighteen inches high, of warm red brick, and topped them with old rugged tiles. Next I dug down another two feet round the insides of the walls, heaping the earth in the middle to form an island. On the outside the wall was surrounded by a gay border of dwarf flowers. To make escape impossible, I cemented a moat, two and a half feet wide and with many bays cutting into the island, to give it a natural appearance.

When I had fixed the general lay-out, I started shaping and modelling the island. In the sunniest part I put several spadefuls of peaty soil, and into this very carefully transplanted some bell heather, harebells, and two small bushes of yellow brooms, which has given



"... the 'sun-bathing' resorts of the attractive little brown lizards..."



"... the shadiest corner was converted into a retreat for toads..."

it a decidedly moor-like effect in miniature. I also embedded several lichen-covered rocks, which became the "sunbathing resorts" of the attractive little brown lizards, which I caught on an old sunny wall during my summer holiday in Devon. They soon made themselves at home, and dug jealously-guarded burrows underneath the roots of the heather.

The shadiest corner was converted into a retreat for toads, frogs, salamanders and slow worms. Here I constructed a cool cave for summer days, and as a "hide-out" for them during the winter, when they sleep peacefully buried in the warm earth. In summer their cave was surrounded by bright green ferns and blue lobellias, and on wet days and at dusk the fernery would become the happy hunting ground of the hungry throng.

The margin of the moat was fringed with blue and yellow irises, multi-coloured clumps of polyanthus, forget-me-nots, celandines and marsh marigolds. Part of the island consisted



"... the only visible owner being a moorhen ..."

of a rockery well stocked with alpines and umbrellas; this was the happy home of "Whizzbang," an Italian wall lizard who, beside being the proud owner of a green waistcoat, scuttled about chasing noisy bumble bees at every "passing" opportunity.

I filled the moat with water and had to wait patiently for a week while the lime in the cement dissolved out and became harmless. After that I syphoned off the water and then carefully covered the bottom with a few inches of loamy soil. Finally I put down a layer of gravel and sand. The moat was filled again and the shallowest part planted with water buttercups, frogbit and duckweed. In the deeper water I dropped in bunches of starwort, anacharis, hornwort and willow moss attached to pebbles to weight them until their roots had gained a foothold on the gravel.

One day, while out for a walk, I was lucky enough to find some miniature yellow water-lilies growing in a wayside pond, the only visible owner being a moorhen. I pounced on my booty and went off home with the lilies carefully wrapped up in a wet handkerchief. They soon took root and thrived, giving my pool a very pretty appearance.

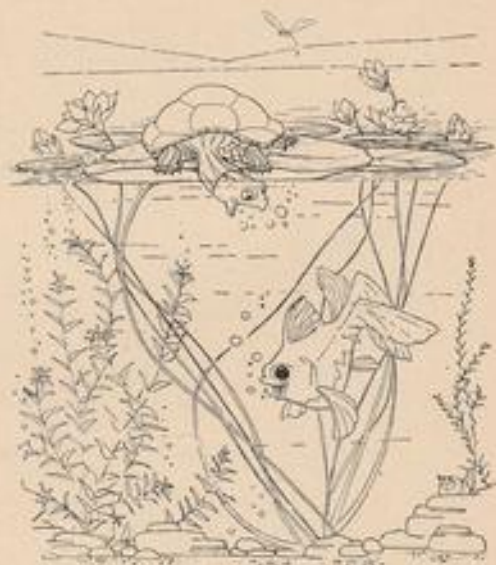
I was rather amused because the local cats seemed to regard my reptilium in the same light as we do a circus. They never attempted to jump inside for a closer inspection, evidently being put off by the water in the moat, or perhaps it was the "snakes."

On a sunny day there was always great activity on the island. The lizards dart in and out among the stones, playing hide and seek, while a funny little toad, with a bright yellow

line down the centre of its back, hurries over the rocks in a most untoad-like manner. This is the natterjack in search of his dinner. While he was thus actively engaged, his two fat and placid friends, "Humpty" and "Warty," being ordinary and sensible-minded toads, would just while away the sunny hours under a shady leaf, blinking and doing nothing.

I once played a little game with "Humpty" and "Warty" to see if I could arouse their interest in life. I secured a large and succulent fly and attached it to a length of black cotton. And then the fun began. Dangling this tasty morsel on the end of a miniature fishing rod, I flipped it backwards and forwards in front of the two toads. Only "Humpty" took any notice—flipped out his tongue once, missed, blinked twice, and resumed his somnolent posture, and no amount of dangling would interest him again!

As soon as the island was bright with spring bulbs, the surrounding moat became the rendezvous for all the water-loving inhabitants who had spent the winter on shore fast asleep. The frogs and toads filled the air with their croaking, and in a short time the water was alive with tiny black tadpoles, for the spring sunshine warmed the water and stirred the jelly masses of spawn with the realisation of life.



"... Poor Algy ... was continually being chased by the ever-greedy water tortoises ..."





"... The surrounding moat became the rendezvous for all the water-loving inhabitants..."

The newts become very handsome at this time, growing wavy crests along their backs; then off they go a-courting! As soon as one of the males spies a possible lady-love, he leaps in front of her, waving his tail violently parallel with his body and displaying his brightly-coloured stomach. I don't know what the object of his attraction thinks of all this, for the expression on her face remains as blank as a barn door!

To add to the beauty of the pool, I purchased a small shoal of plump baby "trifail" goldfish, who always swim round the island after a bright red and silver leader who gloried in the name of "Algy." Poor "Algy" and her followers were continually



"... Snakes would have added greatly to the interests of this reptiliary..."

## ANNUAL REPORT OF THE ZOOLOGICAL SOCIETY

The recent publication of the annual report of the Council of the Zoological Society of London makes disquieting reading for the reader, and the aquarist in particular. The aquarium, which was closed down at the outbreak of war, is apparently to remain closed, the fear of the damage likely to be caused by flying glass in the event of an air raid. Some of the most valuable fishes are housed in the Tortoise House, while all the others have been disposed of. How many years it will take the

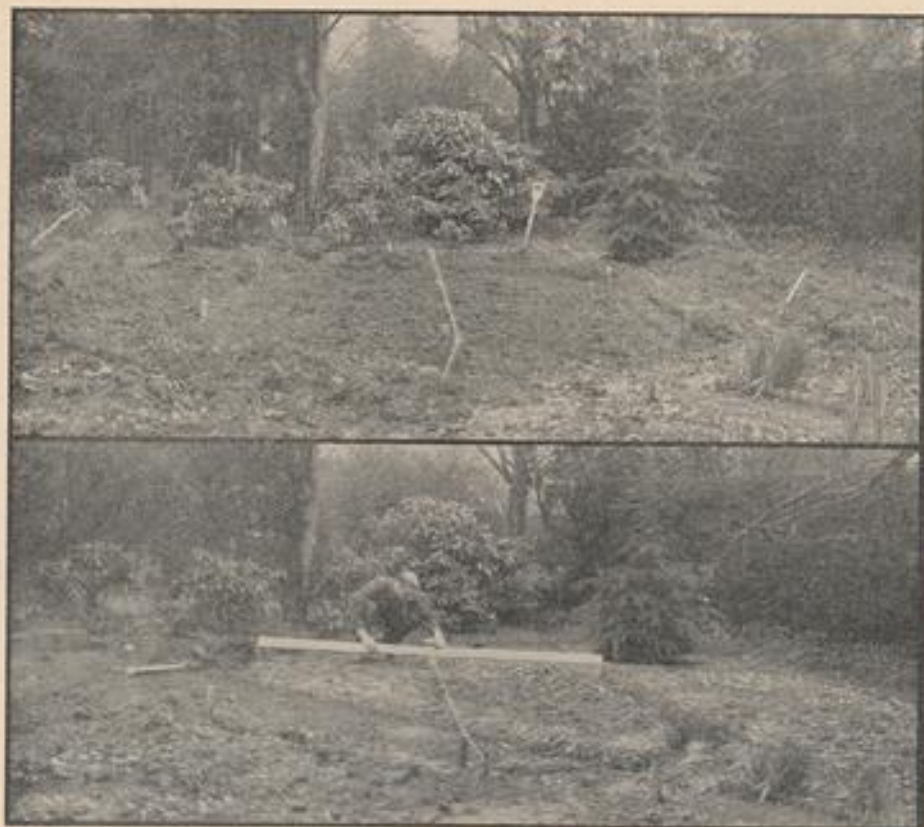
aquarium to get thoroughly established again when the war is over is a matter for some thought.

An interesting fact revealed in the report is that the Mosquito Fish, *Heterandria formosa*, is listed as being new to the collection during 1939. And this is one of the commonest of the aquarist's fishes! Only two other species shared this distinction, *Chaetodon auriga* and *C. chrysaureus*, Butterfly Fishes from the Red Sea.

Receipts and number of visitors have dropped tremendously, as was only to be expected in view of the outbreak of war.

# The Creation of a Garden Pool

*(Continued from page 62, last issue)*



**C**OMPARISON of the above photographs with those in the last issue will show that already the site has been vastly improved in appearance. Clearance of the ground, and the judicious arrangement of deodars and rhododendrons, has effected a great improvement, and indicates the foresight of the builder and an eye for beauty.

The upper photograph shows also the actual commencement of the pool—the marking out and measuring up by means of pegs and cords. Such pegs should always be of sound timber, preferably painted white, so that they can be easily seen, and will stand a certain amount of knocking about, for the pegs are used throughout the proceedings. If of flimsy workmanship they will be broken up and lost sight of long before their usefulness has ended.

The lower photograph shows Mr. Blyth levelling up. Level pegs are placed round the site, and with a long piece of three by one timber, used with a spirit level as a straight edge, each peg is levelled with the other. At least eighteen inches of the peg should be hammered into the ground to ensure its firmness. The second peg is levelled with the first, and the third with the first and then the second, and so on. Thus, bit by bit, the whole collection of pegs is levelled up, and if care is taken to keep them just clear of the actual digging site, they can remain as safeguards for checking throughout the work. Water is the most revealing element, and the exhibition of inaccuracies when the pool is filled to the brim is likewise an exhibition of careless construction.

At the bottom of this column will be seen a photograph of the tools required for the carrying-out of the task of creating a garden pool, the creation of beauty where there was none before.

The strange-looking article on the left is a home-made "punner" or rammer. This is an essential, for the soil must be well rammed before laying down the foundations. In the next issue an illustration of the "punner" in use will be published, and its value and construction will then be more easily appreciated.

In front are some of the levelling pegs. In front of the wheelbarrow, an essential if the carrying away of the surplus soil is to be a much easier job than carting away a shovelful at a time, is a collection of small tools, hammers, trowel, float, mallet, etc. The two T-pieces at the back are for use in levelling, while no one who has ever attempted the construction of a pool will have any doubt as to the use of the spade and fork shown at the right-hand side! The straight edge completes the group of tools, and for the completion of such a task, giving such pleasure and permanent beauty, it can safely be said that it is a very small one.

At the top of the right-hand column on this page is illustrated a "brain-wave" which will prove of great value to the amateur constructor. Cement is messy and awkward to handle, particularly when the sack is half empty. The simple device illustrated is made out of an old orange box and a few bits of wood and nails.



The bag "stays put" because it impales itself on long nails driven through from the underside of the tilting board. The sack inside acts as a counterpoise.

The cement can thus be poured fast or slowly, as required, and without struggling with the sack. It appears to be rather an exacting process, judging from the expression on Mr. Blyth's face, but then the majority of the little details regarding pool construction give ample room for thought!

Considerable space has already been occupied with preliminary details, but anyone who has ever constructed a garden pool will appreciate how necessary those preliminaries are. Careful attention to them ensures a job which proceeds logically and methodically to the desired goal. Scamp them, and trouble crops up at almost every turn, making the task infinitely harder, and leading to such discouragement that long before it is completed a feeling of "fedupness" pervades the whole business.

# Those Skink Lizards!

By WINIFRED BAKER

BY the "breakfast" post there arrived for me—about two years ago—a very interesting-looking little box, which appeared to contain "live stock."

The accompanying note informed me that the occupants were Skink Lizards and I was warned to open the lid very carefully. Knowing the terrific speed at which these lizards can move themselves, I was quite prepared to take every precaution.

In passing, I may remark that the skinks proved to be specimens of the "Ocellated Skink" (*Gongylus ocellatus*) or (*Chalcides ocellatus*), one of the prettiest of the skink family, to my mind. They hail from Southern Europe and Palestine, Persia, Arabia and Abyssinia and are slenderly built, with longer tails than the "common" and one or two other species, which, with their heavier bodies and stumpy tails are rather "top heavy" in appearance and, I think, less graceful than the pretty "Ocellated."

The sender did not inform me of the number of lizards enclosed. I was hurrying off for a short journey that morning so, much to my regret, could not linger to enjoy the sight of my new arrivals.

I hastily bundled the whole box, bodily, into a handy vivarium, stocked with sand, cork bark and dry moss, and left the lizards to sort themselves out. They were fairly thickly packed in moss and I just had time to see a couple hurrying out into their new quarters. The rest elected to remain hidden.

On my return in the afternoon I placed the vivarium right out in the garden in the sunshine and sat close to it, anxious to see of how many skinks I was the proud possessor.

By now I have forgotten the exact number (if I ever really knew!), but believe it to be about half-a-dozen, well grown, fine-looking specimens.

The next day I transferred the lizards to a vivarium of lighter make—one of those tin

affairs with sloping back, glass fronts (double size and quite roomy).

There did not seem to be a corner where a flea could hide in that make of vivarium. But, in the evening, I found a skink missing. I turned all the moss and cork bark over—but in vain. The remainder I put back in their heated cage for the night.

The next day, I put out the five skinks in the portable vivarium again, to get all the available sunshine. They could be moved about in this and so "follow the sun."

Then, suddenly, I discovered there were six skinks again! I rubbed my eyes and began to feel really unhappy. It reminded me of the episode of Tom Sawyer and Aunt Sally and the silver spoons! I wondered if I had really developed that complaint where people see scarlet spiders and green snakes on the wall—or the bed!

Where *could* the odd one have been all night? I had not put it into the "night" cage and had certainly raked the "day" one all over!

Believe it or not, those skinks appeared and disappeared until I really could stand it no longer and gave up the battle. Counting seemed useless.

I wrote to the sender of those skinks giving him an exact account of their appearances and disappearances and he told me afterwards that he and his wife nearly rolled on the floor with laughter when they read my letter. I wanted to know the exact number so that I might pay the correct money for them.

I cannot attempt to explain it—four grew to five or six, dwindled to four again. Eventually they all disappeared or died. One remained with me longer than the rest and I grew very fond of it. They make very delightful pets and will feed upon small insects, mealworms, flies, etc.

I trust that if readers of this article should care to "try their luck" with some specimens of the Ocellated Skink, these exceedingly brisk little creatures will not attempt "the disappearing trick" as mine did with me!

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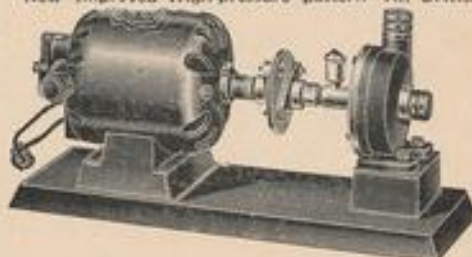
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