

The AQUARIST AND PONDKEEPER

Founded in 1924 as "The Amateur Aquarist"



THE BUTTS, HALF ACRE, BRENTFORD
MIDDLESEX

Telephone: HOUnslow 9301

PUBLISHED MONTHLY

Editor: ANTHONY EVANS

Advisory Editor: A. FRASER-BRUNNER

SUBSCRIPTION RATES

The *Aquarist* will be sent post free for one year to any address for 19/6. Half-yearly 9/9. Canada and U.S.A. \$3.00 yearly; \$1.75 half-yearly.

QUERIES

Postal replies are made to all specialised queries accompanied by a stamped, addressed envelope. This privilege is afforded only to registered readers and direct subscribers. Subscription forms can be obtained on application. In all cases letters should be addressed to the Editor.

Correspondence with intending contributors is welcomed.

MSS. or prints unaccompanied by a stamped, addressed envelope cannot be returned, and no responsibility is accepted for contributions submitted.

The Editor accepts no responsibility for views expressed by contributors.



Photo: N.Y. Zoological Society (S. Dunson)
Pair of albino swordtails (female above, male below). Their genetical origin and the results of crossing them with golden swordtails are described in Dr. Myron Gordon's article on page 10.

VOL XVIII No. 1

1953

Editorial

IF an example were ever needed to show how incomplete is our knowledge of our aquarium fishes the announcement last month of the findings of Dr. Helen Spurway, of University College, London, would supply it. The guppy is certainly the most commonly kept and one of the longest-domesticated tropical fishes, and it cannot be denied that many aquarists would pooh-pooh the idea of any important new information about this species coming to light. But it has happened, and the new facts discovered will be of special interest to guppy breeders.

Dr. Spurway has found that some female guppies are capable of spontaneous parthenogenesis. That is, they can produce living young from eggs which have never been fertilised by a male. These virgin births in the guppy were first observed in a female separated from adult males 12 days after her birth and from the rest of her brothers and sisters 27 days later. At 216 days from birth she bore one female offspring which lived for 304 days. She was found to be capable of normal motherhood as well, for after mating to a male guppy she produced four litters, in one of which seven females and one male appeared.

One of the females of this litter was isolated four days after birth and kept alone in an aquarium. It was impossible that a male could have fertilised the eggs within her yet when 193 days old she produced three young. Six more fatherless fishes were produced by this female in three further litters. As would be expected from the possession by the female guppy of an unpaired sex chromosome (single X chromosome) all the young arising parthenogenetically have developed into females. It remains to be seen with what frequency this parthenogenetic behaviour occurs in aquarium guppies, but if it is at all common this would offer one explanation for the superabundance of females which aquarists find in their stocks. The question also arises—do other livebearers ever indulge in virgin births?

April, 1953

1

Tropical Loaches of the Genus *Botia*

by JACK HEMS

THE *Botia* belong to the family Cobitidae (loaches), which is represented by several genera and a fairly large number of species distributed over Europe and Asia. As a rule, loaches inhabit crystal clear, fast-running streams with a stony bottom, but a few species as, for instance, the so-called weather fish (*Misgurnus fossilis*) of northern Europe, are sometimes found in still lakes and marshy backwaters. Most species favour shallow waters. Some tropical species are found in mountain streams at high altitudes.

In Britain, we have two native loaches, the spiny loach (*Cobitis taenia*), which seems to be becoming increasingly rare, and the stone loach (*Nemachilus* or *Cobitis barbatus*), which may often be seen lurking close by flat stones in mill ponds or tumbling rock-strewn streams in many parts of the country.

The loaches are closely related to the Cyprinidae (carps), and, like carps, they have pharyngeal teeth and soft fin rays. But they differ from the cyprinids in several other respects. For one thing, the majority of species have eel-like bodies; for another, by the rudimentary or entire absence of scales. As for barbels, some species have as many as 12 bristling around the mouth.

Tropical *Botia*

Most loaches known to the aquarium keeper appear to use the intestine as a supplementary breathing organ, and, every little while, streak—yes, positively streak—to the top of the water for a gulp of air. Used air is expelled in the form of a small bubble from the vent.

Botia modesta, *B. hymenophysa* and *B. macracantha* were introduced into England between 1936 and 1938. Unfortunately, though quite naturally, they were lost sight of during the difficult war years. Now, however, fresh stocks have come into this country from abroad. The fish are not, and never have been, cheap.

The body shape of the *Botia* differs from that of the typical loach in that it is deeper and more laterally compressed. Moreover, the caudal fin is forked. Most loaches have rounded or blunt-ended caudal fins. The snout is rather long and terminates in a small mouth with thick lips and six whiskers or barbels. There is an erectile forked spine in front of each eye. Another distinction, though an internal one, is the singular construction of the air-bladder, which is divided into two portions; the anterior half being enclosed in a bony capsule, the posterior half floating freely in the abdominal cavity. In the wild, *Botia* reach a length of about 12 inches, but young specimens placed in the aquarium seldom grow to more than about six inches.

B. macracantha from Siam, the Malay Peninsula and Java is the most handsomely coloured of the three species known to the tropical aquarium keeper. At a quick glance, it might be taken for a rather attenuated tiger barb. There is an underglow of pink to orange over the entire body. A blue-black band extends from the crown of the head through the eyes to the underjaw. Two broader bands cross the side; one in front of the dorsal fin; the other covering a goodly portion of the body where it tapers to the tail. All the fins have some orange to red in them, the pectorals, the ventrals

and the lobes of the caudal being particularly vivid in coloration.

B. macracantha is unusual for a loach in that it swims quite a lot in the middle of the water, a habit shared by the tiny *Corydoras* with the trivial name of *hastatus*. But whereas *C. hastatus* keeps on the move, *B. macracantha* often stays in one position for minutes on end. Most loaches, as the majority of aquarists already know, keep right on the bottom, where, every now and then, they dig their fleshy barbels into the sand and extract anything edible from it.

The *Botia* will eat any food normally taken by a fish, but, as may be expected, keep in better condition when fed with finely minced raw or cooked lean meat or small live food such as whiteworms, chopped *Tubifex* and chopped earthworms.

Botia modesta and *B. hymenophysa*

B. modesta, with the same geographical range as *B. macracantha*, is light, rather shining green, with a single black spot on the root of the tail. The fins are reddish-brown or orange, deeper in colour at the edges.

B. hymenophysa which abounds over the same regions of Asia as the preceding species, is seen quite a lot these days in the stock tanks of the larger dealers. It is a pearly-white fish darkening to a pale green as it attains full aquarium size. The body is adorned with about a dozen or more narrow bands or bars, the exact colour of which is difficult to describe, as they take on different tints of grey-brown or red according to the quality and direction of the light. But each band is boldly outlined with black like the eyes of many a demure young miss.

These bars extend from the snout to the caudal peduncle, and are arranged in a rather novel manner, being almost horizontal on the head, oblique as far as the dorsal region, then more and more vertical as they crowd on to the tail. Faint, reddish-brown bands decorate the dorsal, anal and caudal fin. The eye is noticeably large and brightly gold.

This fish keeps close to the bottom in typical loach fashion, and is rather shy in a new aquarium. Several of these fish together will soon select some place as a retiring place or home, and burrow and burrow and burrow until they have cleared all plant life away and made for themselves a saucer-shaped depression.

Shade Lovers

Botia like to take their rest in partial shade and do appreciate a flat stone raised on several pebbles to lie under. But, like catfish, they soon learn to know the vibrations and shadows which indicate their owner's approach with food, and swim out with their barbels all a-twitch with excitement.

So far as I know, the *Botia* have not been bred in aquaria; in fact very few loaches have been bred in captivity, which is one of the reasons why they remain fairly expensive fish to buy even though modern equipment makes their collection and transportation over the seas much easier than it was before the war.

Botia can be placed in a community aquarium populated with peaceful fishes, but the aquarist must keep careful watch that they get a proper share of food, for they will not scramble for it after the manner of zebra fish, mollies and other popular favourites. As they grow to a good size, the fish are quite long-lived; and, from all accounts, not easily killed by a drop in the temperature, though it is advisable to keep them within a range of 72° to 80° F.

Observations on Tench

by N. E. PERKINS

TO most anglers the thought of tench will bring to mind scenes of placid pools and pits, of weed-covered ponds and summer weather. It is a strange fish, for although one of the most cautious and difficult to catch there are days when tench may be caught in fair numbers. Of course, in small ponds where the fish have over-bred due to the density of the weed growth, their reactions are different, for they may be continually hungry; but in large stretches of water they cannot be relied upon no matter what variety of bait be used.

I fished a large gravel pit at Staines for several years and was unaware that it contained tench until one day, whilst perch-fishing, I started to land tench of two to three pounds weight. A long time passed before I caught any further specimens from that pit although I fished there frequently and I might have reasonably inferred from this that they were few in numbers. One early morning in June, however, I happened to be fishing that pit when I heard a noise of splashing further along the bank.

Excitement in the Shallows

I rested my rod and went along to investigate, remaining quietly at the spot where I thought the disturbance had occurred. I was rewarded by a remarkable spectacle: tench, hundreds of them, from one to five or more pounds in weight were in the act of spawning and were so excited that at times some were almost lying on the bank. The tench is, of course, one of the latest spawners of British freshwater fish, continuing, at intervals, right into August. These fish, although very excited, were nevertheless extremely alert and, at the slightest sound or movement, all were gone to return only after the space of 10 to 15 minutes providing there was no further disturbance.

It appeared that there were at least two males to each female and in the clear water of the gravel pit the sex differences were easily seen. The ventral fins on the male tench are very strong and spoon-shaped, those of the female being comparatively normal with much weaker fin-rays.

The tench is a bottom-feeder as the two small barbels at



Photos:

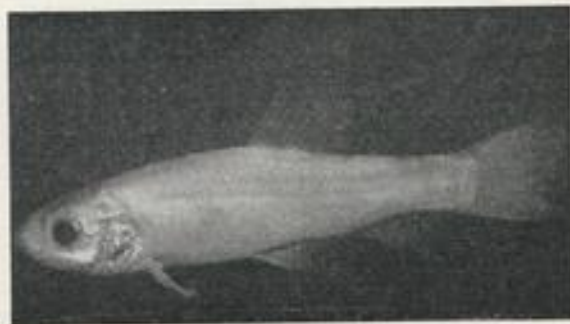
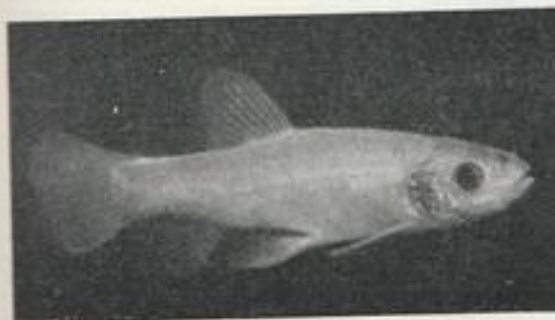
Laurence E. Perkins

Adult specimen of the common tench

the corners of the mouth indicate and, whilst it is fond of worms and slugs, it is even more fond of water-snails, especially the ramshorn or *Planorbis* species. Large tench are not averse to small fish as I found to my cost: on one occasion I allowed some expensive fancy goldfish of the veiltail variety to pass from a protected part of my pond into the larger area which contained a tench of some 2½ lbs. weight. Although these goldfish were some 2½ ins. in total length (half of this tail) one was immediately seized by the tench and, proving too large for it to swallow, was later regurgitated minus its fins.

All fish will, of course, eat other fish, including their own young. It is just a question of size, and since newly hatched fry are so very small, millions disappear in this way yearly even in one lake. A large amount of dense weed does protect them to some extent at this stage and is beneficial in many other ways, members of the carp family, Cyprinidae, being largely vegetarian feeders when they are not avidly devouring small crustacea and fly larvae also to be found amongst the weed. I have at times, when angling, known by the action of the float that I was fishing over submerged weed but usually have continued for some time to explore that area of weed, for although the bait is probably concealed amongst the dense foliage, if tench are on the feed a

(Continued at foot of next page)



The two photographs of golden tench (approximately life size) above show the rarely illustrated distinguishing sex features of this species. The thickened leading rays of the male's ventral fins (left) and the broken body line is contrasted with the thin-rayed ventral fin and continuous body line of the female (right)

Aquaria for Seashore Animals

by E. M. ATKINS

IN *The Aquarist*, dated October, 1948 (Vol. XIII, page 230), appeared an article by me on marine aquaria. After four years' further experience I still hold the same views on most aspects of this subject. I have, however, come to a different conclusion with regard to the effect of cold in winter, and I have noticed a few things which may be of interest to keepers of marine aquaria.

The principal item of interest concerns the part of the seashore from which animals should be taken. Animals which move only short distances, taken from the shore and put into an aquarium are subjected to more unnatural conditions than animals taken from freshwater or from sub-tidal waters. They are taken from an environment where they are submerged for part of the time and exposed to the air and rapid changes of temperature for the rest of the time, and subjected to perpetual submergence. This is much more detrimental to an animal that has been submerged for only a short time each day than for one that has been submerged for a long daily period. Animals can often stand a short period under conditions to which they are not acclimatised but cannot stand long periods.

There are often decided differences between similar animals only covered at high tide and those within a short distance of low-tide limits. For some, such as winkles, limpets, barnacles, etc., there are actually different species in different zones of the shore, varying with the time during which they are usually submerged by tidal action. In any case, if there is no difference in species, the animal which lives near the low-tide limit is more acclimatised to submergence than one that has lived higher up the beach, and it would therefore appear that aquarists should collect from as near the low-tide limit as possible.

Coastal Temperatures

There is another aspect to be considered. The average temperature of the sea near the English coast varies from about 45° F. in winter to about 60° F. in summer, and the temperature changes very slowly. Animals which live near the low-tide limits are subjected to rapid variations of temperature for most of the time, and often experience extreme variations. They have, however, become acclimatised to such conditions.

The part of the shore from which animals should be taken would therefore appear to depend on the position of the aquarium in which they are to be placed. If it is indoors there is no doubt that they should be taken from as near the low-tide limit as possible, but if the aquarium is out of doors or in a cold greenhouse the aquarist has to decide whether he shall collect animals that are to be subjected to unnatural permanent submergence or animals that will be subjected to unnatural variations of temperature.

All this applies to animals that can only move short distances or can only move slowly, such as barnacles, limpets, mussels, anemones, etc. Even with these unnatural permanent submergence is to some extent avoided. Winkles come out of the water when they want to, limpets usually come to the top and remain half in and half out of

the water most of the time and seem to live quite well in that position. Beadlet anemones appear to be indifferent to whether they are exposed to the air for part of the time or not. (The opalet anemone is not accustomed to exposure and although often living above low-tide limits is nearly always found in rock pools.) I think that the ordinary barnacles of the shore will not stand submergence for more than a week or two, and that some sort of tidal arrangement is necessary for them. This is rather unfortunate as they could be very useful in keeping the water clear. It is not difficult to arrange a small movement of water similar to tides, as described in my earlier article, but unless one wishes to specialise in barnacles I do not think it is of much advantage.

Marine Fishes

As regards fishes and other animals that move about freely it is necessary to avoid great variations of temperature. These are often subjected to high temperatures in rock pools but only for comparatively short periods, as the incoming tide brings colder water to them. But they are not subjected to extremes of cold, as nearly all retreat to sub-tidal waters for the winter. If they come in with the tides they do not remain in rock pools as they do in summer. Therefore it is necessary to keep the aquarium at a minimum temperature of about 45° F. if possible. Below 40° F. some of the animals seem to become torpid, and I now think that some of the deaths that I attributed to other causes were due mainly to cold.

I kept two young bass for several months. When the temperature in winter fell to about 40° F. they turned on their backs and floated to the top of the water; when the water became a few degrees warmer during the day they recovered, and swam about normally. This went on for two or three weeks, but they were eventually found dead at the water surface. I think there is no doubt that they were killed by the cold. In view of this experience, and the fact that the mobile animals leave the shore in winter, I conclude that cold is detrimental to them. I imagine that it is not very much appreciated by the stationary animals either.

Great heat has, of course, also to be avoided, though it is astonishing what some of the animals living on the rocks will stand. About 70° F. should be a maximum, and that for only a short time, but shannies (*Bleinnius pholis*) will stand more if they have rocks to climb on to leave the water. These fishes often spend hours out of water, and they seem to stay all night exposed on rocks in aquaria in warm weather. They very seldom come out of the water when it is cold. The shanny is very common and very hardy, and is certainly the most suitable fish for an aquarium. When transporting these fishes carry them in wet seaweed, not in water.

Observations on Tench

(Continued from the preceding page)

large worm in such a position will be taken without hesitation, and I have landed several sizeable specimens in this manner before the disturbance has finally scared the others away.

There is a variety of tench which is yellow or orange like goldfish and I have often thought what a pity it is that some effort has not been made to stock some of our natural waters with these lovely fish. They would, of course, soon fall a prey to pike or perch if not confined to areas of water free from these types.

A Pond with a Window

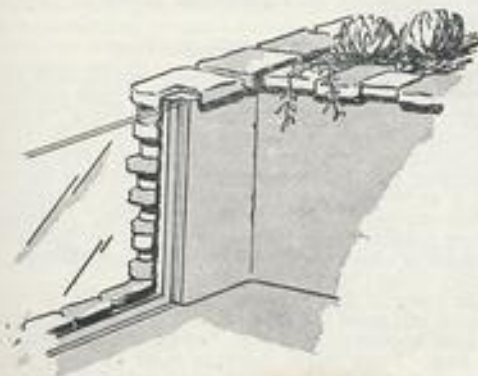
by H. J. JONES

SOME years ago I hit upon the idea of constructing a pond above the path level of my garden with a glazed panel in one side through which the plant life of the pond and the fish could be observed. It was a great success, and admired by all, and the actual cost was negligible.

At the end of my garden was a boundary wall, against which I built up a raised flower bed about two feet high across the entire width of the garden, allowing some three feet of growing space between the dwarf wall in the front and the boundary wall at the back. The dwarf wall was constructed from odd pieces of stone, with earth joints into which the usual rock plants would be tucked. Eventually a normal rockery-enclosed pond was built by scooping out about a square yard of the flower bed, lining the sides and bottom with stone and floating over the interior with cement mortar to which had been added a waterproofing compound.

Making the Window

The first stage of the pond had been completed and as such comprised the four solid sides, but at the time even this seemed to be an improvement on the sunken pond, as at least the water surface had been brought some two feet above the path level, enabling one to view the contents from above without so much crouching. The pond was maintained in this way for some months, until one day I happened to come across an old plate-glass mirror, the size of which was 24 ins. by 18 ins., and the thought suddenly crossed my mind—would it be possible to insert a glass panel in the front of the rockery and so make it possible to enjoy watching the movement of the fish from the house without disturbing the pond's natural setting in the rockery?



A view of the window from the interior of the pond showing the method used in fitting the glass



I set to work removing the silvering from the old mirror and transferred the contents of the rockery pond into an old bath to await the transformation of their abode. Fortunately the side of the pond into which the glass panel was to fit faced the north, thus ensuring that only the minimum amount of direct sunlight would penetrate the glass. This is a point which should be studied carefully when deciding upon the aspect of this type of pond as the unnatural side glare from the sun can be very disturbing to the fish. The silvering removed from the glass, I then proceeded carefully to hack away a hole in the side of the rockery to take the glass panel.

Sealing the Glass

I found that allowing the opening to follow the somewhat broken course of the stones made the appearance more in keeping with the rockery setting than had a geometrically straight sided opening been achieved. The stonework bordering the opening was of lesser thickness than the rest of the walls of the pond to enable a cement rebate to be formed around the inside of the opening into which the glass was to fit. This ensured that the glass had a solid seating against which to press when the pond was filled. The glass panel was bedded into position with red lead putty, making sure that as little putty surface as possible was left exposed inside the pond to come into contact with the water.

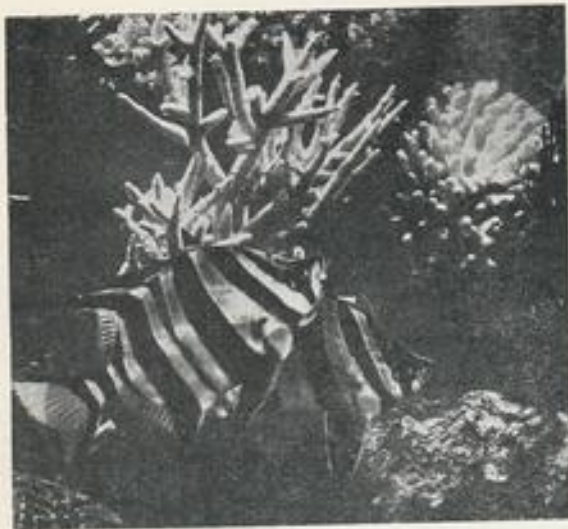
Polished Edges

I then filled the pond and allowed it to stand for some days, finally emptying it and refilling with a fresh supply of water. When finally satisfied that the water was taking up no more impurities from the new work I introduced the water plants into the pond together with a few snails, followed later by the fish themselves. When the rockery plants eventually became established, some of them trailing over the edge into the water, the picture was completed.

The pane of glass used had all edges polished, enabling the top exposed edge to remain uncovered, but should it be found necessary to use glass with rough edges the top exposed edge should be protected by means of an angle iron; this can quite easily be let into the top of the stonework and cemented into position. Naturally the size of the glazed panel will depend upon any odd piece of plate glass that is available, and the rockery setting can be formed anywhere in the garden quite independently of existing walls.

Taronga Park Zoo Aquarium, Sydney

by EDWARD LEE



Australian "old wife" fish—a marine tropical species

ORIGINALLY opened in 1880 at Moore Park, Sydney, this zoo by the turn of the century was forced to move to a larger site. In 1916 the new site, Taronga Park, was opened and is now run by a voluntary trust on a self-supporting basis. The present site is a wooded hillside, coming right down to the northern shore of Port Jackson—Sydney Harbour.

The aquarium contains the very poor tropical section and, in contrast, the magnificent marine collection. With the warm Australian coastal climate along with the nearby Pacific and East Indies, the marine aquarium has to be seen to be believed.

Probably the most beautiful tank was one of four feet, containing a large amount of live coral, gleaming white as snow. This formed a playground for 30 or 40 sea-anemone fish which were vigorously playing "follow-my-leader," swooping down at high speed into the coral to appear at the opposite side ready for the climb to the surface. A sight one could watch for hours.

Judging by the unusual lozenge body shape and means of locomotion, the painted trigger fish, toad fish, and file fish were related. All from Hawaiian waters, the painted trigger fish takes the honours for odd marking and colours. The forward half and rear lower half are creamy white with a faint suggestion of pink. Upper rear half is white. A blue bar over the mouth, the four narrow bands from the eyes to the centre line, and the eight bands from the centre line to the middle of the belly, contrasted sharply with the jet black, irregular, fore-and-aft band of the rear half of the body, with its upward offshoots. A short black bar at the base of the tail and a black dorsal fin complete the odd appearance. Of the same odd shape, the toad fish is of an uninteresting slate colour.

The file fish is sometimes known as the fool fish; it certainly looks a fool. Body shape as for the toad and trigger fishes, its colour is a base of even dark olive with fine bright orange lines all over. The appearance is similar to the graining of wood, such as may be seen in a door panel.

These three fishes have a very smooth motion, without apparent use of the tail; it is more of a glide and is obtained by an exceedingly fast vibration of the adipose fin.

A fearful-looking creature was a printed lobster, *Panulirus ornatus*, and ornate he was. Having a body length of 18 inches and feelers some three-and-a-half feet long, the colouring was blue with small reddish-brown blotches. In spite of his size, his claws were very tiny, about one-and-a-quarter inches long.

Three species of demoiselles of brilliant colours made an attractive show. Scats were numerous; some, from New Guinea and North Australia, were 10 inches long. A peculiar fish is the old wife, from the bays and inlets of the Australian coast. Nine inches long, it resembles two angel fish joined together, head to tail, with black and gold stripes. Among some normally coloured sea horses was an albino, cream with pink eyes.

From the Pacific was a number of batfish, very like a gramophone record on edge. Mainly black but relieved with some silvery gold they measured up to 14 inches across. Australian rock cod presented an open-mouthed spectacle. Carplike and slate-grey in colour, these fish have a habit of stacking themselves under an overhanging rock or in a crevice head to head, and with mouths gaping. In such a position they will keep motionless for hours. Their length is 12 to 14 inches.

Writhing arms of six octopuses could be vaguely distinguished in one tank. This creepy tank was stocked with specimens caught on the foreshore of Taronga Park, only a few yards from the aquarium. Hardly a tank was without sea-anemones or starfish. Amongst these were some bright blue starfish. A few blind sharks, *Brachaelurus waddi*, were two feet long. These sharks have a habit of closing their eyes when taken from the water. This led early naturalists to believe that they were actually blind. Only comparatively recently it was found that the eyes open again immediately on replacement in water. The old name has clung.

Thirty Feet Circular Pool

Under a big glass dome providing natural light is the exhibit which, of all the collection, is the most publicised. Rightly so, for very few aquaria can boast a "Monster Man-eating Shark." This is a grey-nurse shark, 12 feet long, which was caught in Sydney Harbour. It is certainly a terrifying spectacle and whether this specimen has eaten men is an open question. Its present diet, owing to the limited number of men available, is fish. A vengeful Sydney resident suggested tempting the shark with a man convicted of a series of vicious crimes against children, but the diet remains solely fish.

The home of this "monster" is a pool about 30 feet in diameter and seven feet deep. Other occupants of the tank are four leopard-spotted Port Jackson sharks about four feet long. From North Australia come 10 to 20 turtles, from one to five feet long. For variety there are two unnamed rays. Supplied as food were 50 or more fish of

(Please turn to page 8)

The Zebra Fish

(*Brachydanio rerio*)

(ZEBRA, ZEBRA DANIO, or DANIO)

ORDER:—Ostariophysi, from Greek *ostarion*—a little bone, and Greek *physis*—a bladder.

FAMILY:—Cyprinidae, from Greek *kyprinos*—a kind of carp.

SPECIES:—*Brachydanio rerio*—from Greek *brachys*—short, and a native name.

It would be interesting to know how the popular name of this delightful little fish originated, because all stripes on the body of a real zebra are vertical, and either dark brown or black, whereas those of the fish are horizontal and appear blue. Inaccurate though it may be, however, it is so deeply engraved upon the hearts and minds of aquarists generally that it is extremely unlikely to be changed.

Originally hailing from the rivers of Central and Eastern India it has been bred in such numbers that for many years fresh importations have been unnecessary. It has been an established favourite ever since it was first introduced into this country. Nor is this surprising—it is good-natured, easy to feed, fairly easy to breed, and of singular beauty. A long, slim, streamlined fish, its body depth about a quarter its overall length, it seldom exceeds an inch and a half in size.

The head, the dorsal, pectoral and anal fins, are yellowish, but the rest of the body and fins are horizontally striped in alternate bands of gleaming silver and blue. Usually the body stripes are continued into the caudal fin, but I have seen some specimens where the tail carries a mosaic pattern. A pair of hair-like barbels grows from just behind the lower part of the mouth. Sexes are fairly easy to distinguish. The female is noticeably more silver than the male, and her body becomes very round as she fills with roe.

Zebras are always lively and unless out of condition swim rapidly about their aquarium. When a spawning drive commences, however, their speed is so great that it is extremely difficult, if not absolutely impossible, to follow their movements. They are great jumpers, too, and many an aquarist has found them on the floor of his fishhouse after he has forgotten to replace the cover on their tank.

Before attempting to spawn your zebras, separate the sexes, and feed them well on live foods for a week or 10 days. In the meantime, prepare a breeding tank for the spawning. There are several ways of doing this. The fishes are avid egg eaters, and their eggs are heavier than water, and non-adhesive. Whatever method is adopted the principle is the same—the eggs will lie on the bottom of the spawning tank, and must be protected. Some aquarists cover the bottom of the aquarium with a double layer of marbles or pebbles, the idea being that the eggs will roll down and be safe in the interstices of the stones or marbles. Sometimes, however, the fishes wriggle their way down and become wedged, and no-one likes to lose good breeding fishes.

A method I devised and used extensively proved a great success. A piece of ordinary perforated zinc was made into a lidless box, capable of being suspended in the spawning tank. The holes in the zinc were slightly enlarged all over the bottom of the trap. In case the zinc might have a toxic effect upon the fishes or eggs it was suspended in the tank only for the duration of the spawning drive.

About two inches of water was placed in the aquarium, and the box hung so that about one inch of water entered it. After isolation, the zebras were fighting fit, and began



Zebra fish: male above, female below

spawning immediately they were placed in the trap. Every egg thrown rolled through the holes and fell to the bottom of the tank—safe from the attention of the breeders. Spawning completed, it was a simple matter to lift the trap out of the tank with the fishes still in it, let them swim out of it into their own tank, and put the trap away for future use.

Zebra eggs are quite small—about one-sixteenth of an inch in diameter, and extremely hyaline. Anyone interested in fish embryology and equipped with a microscope has here an excellent opportunity of adding to his knowledge. A well-grown female will throw anything up to 500 eggs at a spawning and will be ready to oblige again in about a fortnight. At a temperature of 77° F. the eggs will hatch in about 54 hours.

The new-hatched fry will scarcely move at all until they have absorbed the nourishment remaining in their egg sacs. This usually takes about 48 hours—less in high temperatures than low—after which they will be dependent upon their owner for sustenance. Have ready an Infusoria culture and an algae culture. These supply live foods, which encourage rapid and robust growth. They can be dispensed with, but the babies reared without them are extremely slow growing and often deformed.

When introducing Infusoria, remember it does not follow because you tip a jar full of culture into the rearing tank that you are giving the fry more to eat. The ideal is to get the Infusorians into the tank in the minimum amount of culture water, which is often fairly putrid. Fortunately, in most cultures the Infusorians are present in the greatest numbers at or near the surface of the water. Procure a fountain pen filler, insert it just below the surface, and release the pressure on the bulb so that it draws the thickest part of the culture into the glass tube. Then expel it gently beneath the surface of the rearing tank. Feed often, and follow the Infusorians with new-hatched nauplii of *Cyclops*, tiny *Daphnia*, brine-shrimps, micro-worm, and mosquito larvae.

No matter how much food is fed, however, growth will still be slow if the fry are overcrowded. If it is desired to raise large numbers, fresh aquaria will have to be pressed into service at frequent intervals. If you are unable to do this, the most humane thing to do is to sort out the best of the spawning and keep these growing, and dispose of the balance of the fry at the earliest opportunity.

Zebras seldom fade out their colours to any marked degree, even under most adverse conditions, and for this reason are one of the most satisfactory exhibition fishes! A brilliantly illuminated and furnished aquarium containing a small school of these living gems is a breath-taking sight.

(Continued at foot of next page)

Aquarium and Pond Goldfish Varieties

4. The Bristol Shubunkin

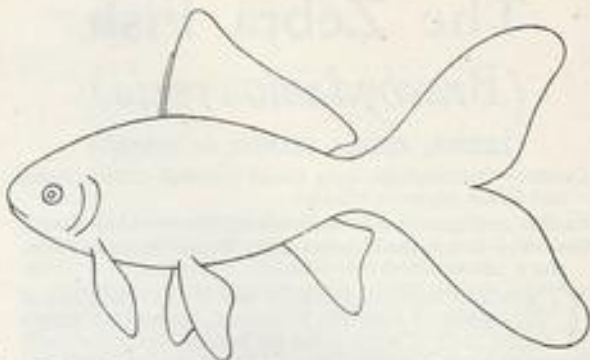
ALTHOUGH this variety of the goldfish is quite popular with many aquarists it is surprising how little appears to be known about it. Few people seem to know what the colour should be, and of all the types of fancy goldfish less is apparently known of the show points of this fish than any other. Even at shows I am frequently asked by aquarists "what is meant by soft gill plates?" and "what is a Bristol blue?" I will try to describe the main features of the fish first and will then give a few particulars which must be noted by those who wish to breed and exhibit this type.

The Bristol shubunkin is a fancy variety suitable for the tank or pond. In very cold areas it would be better to take these fishes from an open pond before winter; their extra finnage makes them a little more susceptible to fin congestion and fin-rot in very cold weather. In a large pond they stand a better chance of going through the winter safely. The Bristol shubunkin is sometimes referred to as a calico fish, a name given because of the fine appearance of the mottled skin—the scales are so small that they are almost invisible.

The colour is the most important feature and gets the most points when judged. The ground colour is a rich blue with a speckling of black over most of the body and fins. There should also be patches of red, brown, yellow and violet, and the more broken the markings the better will the fish be as far as colour is concerned. The frequent references to a Bristol blue should not be allowed to give the impression that a fish is a good one if it is all blue. This is not so, as there should be the other colours as well.

The body of the fish should be rather streamlined with a clean gradual rise of curve from the nose over the back with no sign of a hump or snout. The lower curve should correspond with the upper. The fish should have a narrow waist and a fairly large tail. This tail must be broad and well carried and in this feature many fish fail at shows. It must not be pointed and flowing, and should be three-fifths the length of the body with rounded tips. The rear contours of the tail are rather different from the ordinary fish tail as from the tips the line curves in slightly at first, swells out and then in again to the centre with a similar curve below this point. The dorsal fin is broad and erect and in height three-quarters the depth of the body. The other fins should be well developed with rounded tips.

It is noticeable at even the biggest shows how few really good Bristol shubunkins are seen. I mentioned before



Outline features of exhibition specimen Bristol shubunkin. From "Show Standards for Cultivated Fishes" (F.B.A.S. 2s. 6d.)

about the soft gill plates. Ordinary goldfish have gill plates which are hard and shiny like the scales, but the gill plates of the shubunkin look almost transparent and show no brassy metallic shine. Hard gill plates do not disqualify, but lose five points. Also, if any hard scales are on the body of the fish, points are deducted. Some of the best coloured fish seen have a few visible scales but providing a fish is otherwise good it can win. Some judges appear to put too much importance on the body shape and not enough on colour. As there are only 15 points for body against 35 for colour it is difficult to follow this reasoning. However well shaped a body a fish should not be able to win if it has not the required colours in a class where other fish have that colour. If preference is not to be given to the desired colour one might as well show a fish with no colour at all with a chance of winning.

There are some strange ideas about concerning the best method of obtaining the desired fish. One is that a colourless almost transparent fish should be one of the parents and the other a dark-coloured fish. This pairing is not likely to produce the best coloured youngsters; a good deep-coloured pair is more likely to give good results. As shubunkins are very quick to change colour one does not have to wait so long for results as with the visibly scaled types. Some aquarists suggest that you should concentrate on the shape first and get the colour later; I disagree with this and consider that the colour is the main thing to aim at, the other will come later on.

The Zebra Fish

(Continued from preceding page)

Many years ago, when I first saw one in a well-known London store, I stood rooted to the spot, unable to tear myself away. You may be sure I did not return home without purchasing a few for my collection.

Do not keep them in a community tank which is constantly maintained at or around 80° F. They are not lovers of such a high temperature, being infinitely happier in from 70° to 75° F. They can stand as low as 60° F., but tend to become sluggish if subjected to it for long. Breeding seems to be most successful at 77° F.

It has frequently been stated that zebras and white cloud mountain minnows (*Tanichthys albonubes*) should not be kept together in the same tank, as death of one or other of the species always follows within a short time. It might be well to heed this warning, although I cannot draw upon my own experience to support or deny the contention.

Taronga Park Zoo Aquarium

(Continued from page 6)

various sizes. In spite of the presence of the monster shark the pool remained peaceful. Life was placid as that of a lone goldfish in a bowl. Only occasionally would a fish disappear for ever with a quick snap of the shark's jaws.

Taronga Park claims to have had the most success in keeping sharks in captivity. This, and the healthy state of the marine tanks and stock, is probably due to the abundance of clean sea water so near at hand. Water is continually circulated, being pumped directly from the shore into the tanks and shark pool, and overflowing back into the harbour. By this means aeration is dispensed with.

All the tanks are clearly labelled with the name and details of the specimens. Each label has a coloured drawing, and gives the popular name and habitat. Unfortunately the scientific name is absent from all but a few tanks—hence the use of popular names only in this description.

AQUARIST'S Notebook



by

RAYMOND YATES

SIX months ago I obtained four adult albino swordtails of the red-eyed red variety. These were good stock consisting of one male and three females, the latter not having been previously bred.

Week followed week but no young resulted, although one of the females constantly appeared to be on the point of delivering a brood. Albinos are not as hardy as the normal varieties and have a tendency to prove sterile. In addition, albino young seem to be even more tasty than most young fish so that the parents make every effort to devour the lot if given half a chance. With these thoughts in mind I realised that my chances were small but still I hoped to obtain a few young red-eyed reds.

The appearance of the female gave the lie to the possibility that the male was sterile but, although I tried every trick I knew I was quite unable to get the fish to drop her young. There are few references to this variety in aquarium literature and I approached *The Aquarist* for advice. I was advised that in such a position the best thing to do would be to introduce an ordinary red or green male swordtail and see what followed. Accordingly, I put in a large London swordtail but still nothing happened. Five weeks went by and I feared the embryos were rotting and the female would die. However, as good luck would have it I happened to be present when the female finally decided to throw her young, and this enabled me to remove her and thus prevent the inevitable cannibalism.

What had I got? The result was certainly very surprising. There were 35 red-eyed red albinos and 35 London swordtails, the latter being twice the size of the albinos and swimming around in a very healthy way. On the other hand the albinos were all flat on the bottom, each with egg-sac attached, and it was obvious that this was a premature birth as far as they were concerned. Fish born in this way rarely survive long and I had little hope, but I salted the water and provided constant aeration. Four days later the first albinos became free-swimming and within another 48 hours all were quite normal. They are now a month old and in excellent condition, the only casualty being one of the London swords which died for no obvious reason.

From this experience it would seem that the female was unable to deliver her original brood and that in some way the second mating (to a stronger breed) did the trick, even although the albinos were born prematurely. In normal circumstances albinos should not be mated with other varieties because the first generation will always have black eyes and lack the albino characteristics.

THE aquarist in general is very interested in reports of successful chemical treatments of pests and diseases but some are put off from trying out these cures for themselves because of doubts about the measurement of the quantities involved and the cost.

References to "fluid ounces," "grains," "per cent. solutions" and the like confuse the hobbyist who is not technically minded, even although full information is provided in aquarium literature on these topics. Chemists generally will be glad to help, particularly if the full requirements of the aquarist are explained to them, and it is easier and safer for the doubtful fishkeeper to get the chemist to make up whatever is needed. No charge is made for these services and the cost of most "per cent. solutions" is very small.

The following is a list of the approximate retail prices for most of the chemicals used in defeating or preventing the commoner fish diseases.

Methylene Blue, per half ounce	1s. 7d.
Permanganate of Potash, per half ounce ..	4d.

Mercurochrome, per ounce	10s.
4 fluid ounces of 2 per cent. solution ..	2s.
Malachite Green, per half ounce	1s. 9d.
Quinine Sulphate, per half ounce	4s.
Quinine Hydrochloride, per half ounce ..	5s. 2d.
Mepacrine Hydrochloride, 100 tablets ..	5s.
Acridiflavine, 25 tablets	3s. 6d.
Peroxide of Hydrogen (20 vols.) 16 fluid ounces	1s. 6d.
Aluminium Sulphate (Alum), per pound ..	5d.
Glacial Acetic Acid, 4 fluid ounces	10d.
Formalin (39 per cent.), 16 fluid ounces ..	1s. 6d.
Digitalis (Tincture), 4 fluid ounces	2s. 6d.
Phenoxetol, 100 ml.	12s. 6d.

Some reduction in expense can be made by certain chemicals being bought in quantity by a club. This applies particularly to those where relatively small amounts are likely to be required by individual members, as, for example, phenoxetol, mepacrine, digitalis, and mercurochrome.

MOST neons which are on sale are very small specimens and the would-be purchaser is somewhat put off by this fact, because he reasons, quite rightly that such small fish would soon be eaten by his larger community tank inmates. The cost of this attractive fish is still high, and consequently he delays his purchase, hoping one day to find some full grown neons reasonably cheap.

Neons are really unsuitable for the community tank and rarely look their best with much larger fish, or in the bright glare of the average tank of this type. It should be remembered that they are small fish with small mouths and in common with other small-mouthed varieties (e.g. *Nannostomus*) do much better in a tank of their own. In a community tank they rarely get a square meal (the other fish see to that) and so they grow very slowly or, worse still, remain stunted.

In a tank of their own with similar small varieties they show up better, and before long "boss" their small community. They should be fed three or four meals daily of brine shrimp, micro worm, chopped *Tubifex* or garden worm, and *Daphnia*. In these circumstances their growth is amazingly rapid and in four months they will have developed into fine adult fish, the envy of all visitors.

Any fish which appears to be suffering from the so far incurable "neon tetra disease" should be isolated at once. With such heavy feeding the chances of passing the disease on to other neons is considerably increased.

Post-Mortem Examination of Fishes:

W. Harold Cotton, F.R.M.S., F.Z.S., 39, Brook Lane, King's Heath, Birmingham, 14. (Phone: Highbury 1693)

Specimens should be sent direct to Mr. Cotton with full particulars of circumstances, and a fee of 3s.

It is important that the following method of packing fish be adopted:—Wrap fish, very wet, and loosely in grease proof paper and then in wet cloth. Re-wrap in greaseproof or wax paper and pack around with cotton wool in tin box. Despatch as soon as possible after death, with brief history of aquarium or pond conditions.

Back to their Ancestors

Inheritance of "gold" and albinism in swordtails



Photo:

N.Y. Zoological Society (S. Dunson)

Pair of wild swordtails

CHARLES DARWIN observed that if a number of different fancy breeds of an animal be turned loose, and they reproduce at random, most of their offspring of the mixed population will eventually resemble the common ancestral type. Darwin saw this phenomenon in the pigeons living freely in the parks of London and described it in his *The Variation of Animals and Plants under Domestication*. Any person in any park may see the same, if he will observe closely the variously coloured pigeons that come fluttering down to pick up crumbs thrown to them. They are usually a conglomeric stock, made up of escaped birds from many private pigeon lofts. A few birds, most likely, are mixtures of black and white, or red and white; some are predominantly red, others blue, but the majority have their ancestral coloration, like that of the wild blue rock pigeon, *Columba livia*.

In the days before Gregor Johann Mendel, plant and animal breeders were puzzled by the phenomenon of "reversion" or the appearance of "throwbacks" to the ancestral type. Now reversion or throwbacks are explained in terms of ordinary Mendelian inheritance. The re-appearance of ancestral traits in an animal or plant is usually brought about by the reunion of distinct hereditary characters which had become separated during the period and the process of domestication.

Examples of Reversions in Plants and Animals

The original type of the sweet pea with purple flowers that is found wild in Sicily may be re-created by crossing the cultivated bush and cupid varieties. By crossing two different sweet peas, each having white flowers, the horticulturist may re-create plants having the wild type which has purple flowers. The corn breeder, by mating two different stocks of dwarf varieties, can produce a plant normal in height. A rabbit fancier, by crossing the yellow rabbit with the Himalayan breed, may re-establish the agouti colouring that is characteristic of the wild animal.

Reversion to the wild type is commonly seen in the goldfish. According to Shisan C. Chen, the wild goldfish (*Carassius auratus*) was first domesticated in China during the Sung Dynasty (A.D. 960-1278). To-day, goldfish revert to their ancestral olive-green colour so persistently that commercial breeders of the fancier colour types find small pickings in any given brood. However, the case for reversion

by Dr. MYRON GORDON

(Geneticist, New York Aquarium)

in the goldfish is not complete, for some in a brood that are olive-green when young, if kept alive sufficiently long, eventually display some of the fancy colours of their breed.

A clear-cut example of complete colour reversion in a tropical fish appeared at the Genetics Laboratory of the New York Aquarium when a bright golden swordtail was mated with an almost white, pink-eyed albino. The mating of these two light-coloured domesticated swordtails produced one with the dark, olive-green colouring which is similar to the colour pattern of the swordtails found in the jungle streams of southern Mexico and Central America.

A study of the history of domestication of the swordtail reveals the fact that wild swordtails were imported into Europe for the first time in 1909. During the relatively short period of domestication a remarkably large number of colour varieties were developed either through mutational changes or through hybridisation with the platyfish. The golden and the albino are but two of a dozen or more strains of the aquarium-bred swordtails now known.

The Golden Swordtail

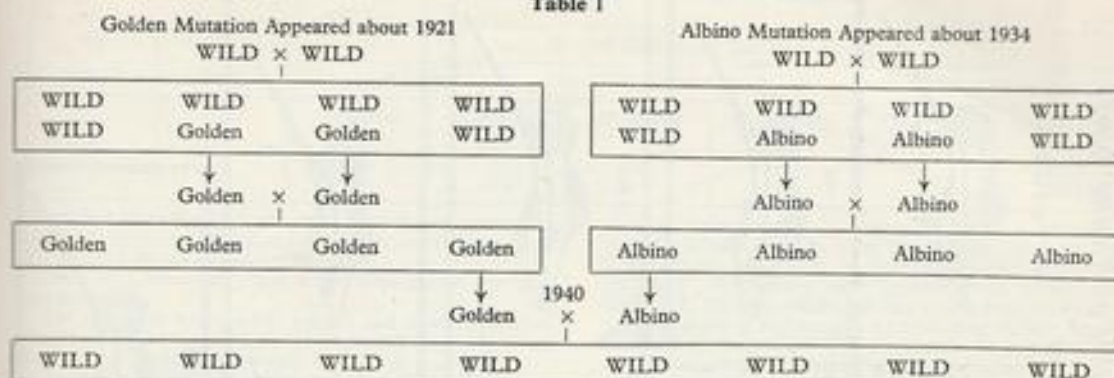
The ancestral olive-green colouring of the wild swordtail is really a mosaic pattern of two kinds of tiny pigment-carrying cells, the blacks and the yellows. There are thousands of them in the fish's skin; in fact, the area occupied by half of a single scale may have 20 black cells and almost an equal number of yellow ones. The golden swordtail by a mutational change in its hereditary constitution lost all but a few of the black cells, but retains its yellow ones. Its eyes are just as black as those of wild fish. Some aquarists call the golden variety a *xanthic* type, owing to its conspicuous yellow pigment cells (xanthophores).

The change in the swordtail from the wild to the golden, from a full complement of many tiny black pigment cells to a rare few, may be expressed in this way: the hereditary factor *G* representing the small black cells in the normal wild swordtail mutated from the dominant phase, *G*, to the recessive, *g*. The colouring of the swordtail changed from olive-green to golden. It is like the quick-change artist in an old-time vaudeville show, who sheds one coat to reveal a more brilliant one beneath.

This mutational change which transformed the wild swordtail into the golden must have taken place prior to 1921 for, in that year, Krasper, a German aquarist, first described the golden sport. Later, another aquarist, Hildebrand, claimed that the colouring of the wild swordtail was dominant over the golden. In 1934, I showed, in a series of genetic tests, that the golden coloration of the swordtail was definitely recessive and was typically Mendelian.

Chemically, the golden gene may control the swordtail's ability to produce black pigment at a normal rate. What this failure is, we do not know for certain. We do know that the machinery for black pigment formation does not break down completely because the golden swordtail has black eyes and a few black cells along its back, but these are so few that they do not diminish its vivid yellow colour. It may be that the golden swordtail fails to produce sufficient raw material in

Table 1



the black colour cells for normal pigmentation to develop. It may also be that the chemical constitution of the cell is different, so that the melanin reactions are not carried to completion. On the other hand, the situation here may be the same as Dr. H. B. Goodrich demonstrated for the guppy, as we shall see in the next section.

Pink-eyed Albinos

The albino swordtail with its white body and pink eyes appeared suddenly about 1934. A few of them were dis-

golden, $g A$; and four that are albinos, $G a$ or $g a$. One out of every four albinos must be a double recessive, $g g a a$, but the $g g a a$ form is not distinguishable from the other three albinos which are $G G a a$ or $G g a a$. The history of the independent origin of the golden and the albino swordtail and the results obtained when these mutations were crossed may be expressed diagrammatically as shown in Table 1 above.

When I mated four pairs of F_1 wild-coloured swordtails brother-to-sister ($G g A a \times G g A a$), I obtained the following results in the second generation:

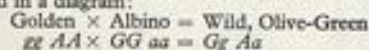
Table 2

F ₁ Female	F ₂ Total	Second Generation Swordtail Young					
		Wild ($G A$)		Golden ($g A$)		Albino ($G a$ or $g a$)	
		Observed	(Expected)	Observed	(Expected)	Observed	(Expected)
1	57	37	(32)	12	(11)	8	(14)
2	57	38	(32)	13	(11)	6	(14)
3	85	50	(48)	15	(16)	20	(21)
4	135	77	(76)	25	(25)	33	(34)

covered in aquaria containing the ordinary, black-eyed, olive-green swordtails. Curiously, these mutants appeared almost simultaneously in American and in European aquaria. Dr. Curt Kosswig, now of the University of Istanbul, was the first to show that albinism in the swordtail is a recessive hereditary trait. His discovery was confirmed by experiments conducted independently in the Genetics Laboratory of the New York Aquarium.

The albino mutation brought about the almost complete elimination of the black pigment normally present in the skin, in the retina of the eyes, and in all other areas of the body. The albino's eyes appear pink in the swordtail not because of any special red pigment, but because, as in the pink-eyed albino amphibians, reptiles, birds and mammals, the transparent iris of the eye transmits the colour of the many fine blood-vessels in the retina.

When I mated a golden swordtail with an albino, the wild, fully pigmented swordtail was re-created. Each of the two parental varieties brought to its offspring one of the essential dominant factors which the other lacked. This may be expressed in a diagram:



Wild, Golden and Albino

The wild-coloured offspring of the golden and albino parents, after being mated brother to sister, produce, out of every 16 born, nine that are typically wild, $G A$; three that are

Ordinarily when two dominant and two recessive factors are involved in a genetic test one expects four visibly different types in the members of the second generation. This was

(Continued on page 13)

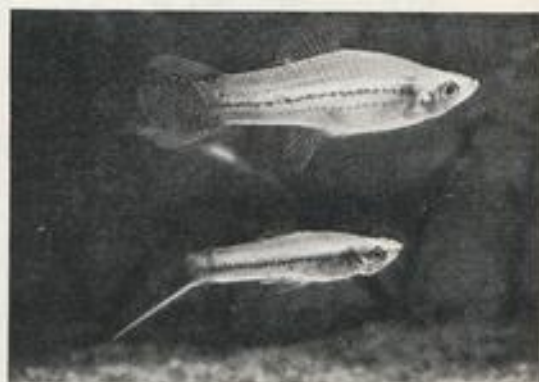


Photo:

N.Y. Zoological Society (S. Duncan)

Pair of golden swordtails

Back to Their Ancestors (Genetic explanation given in table on facing page)

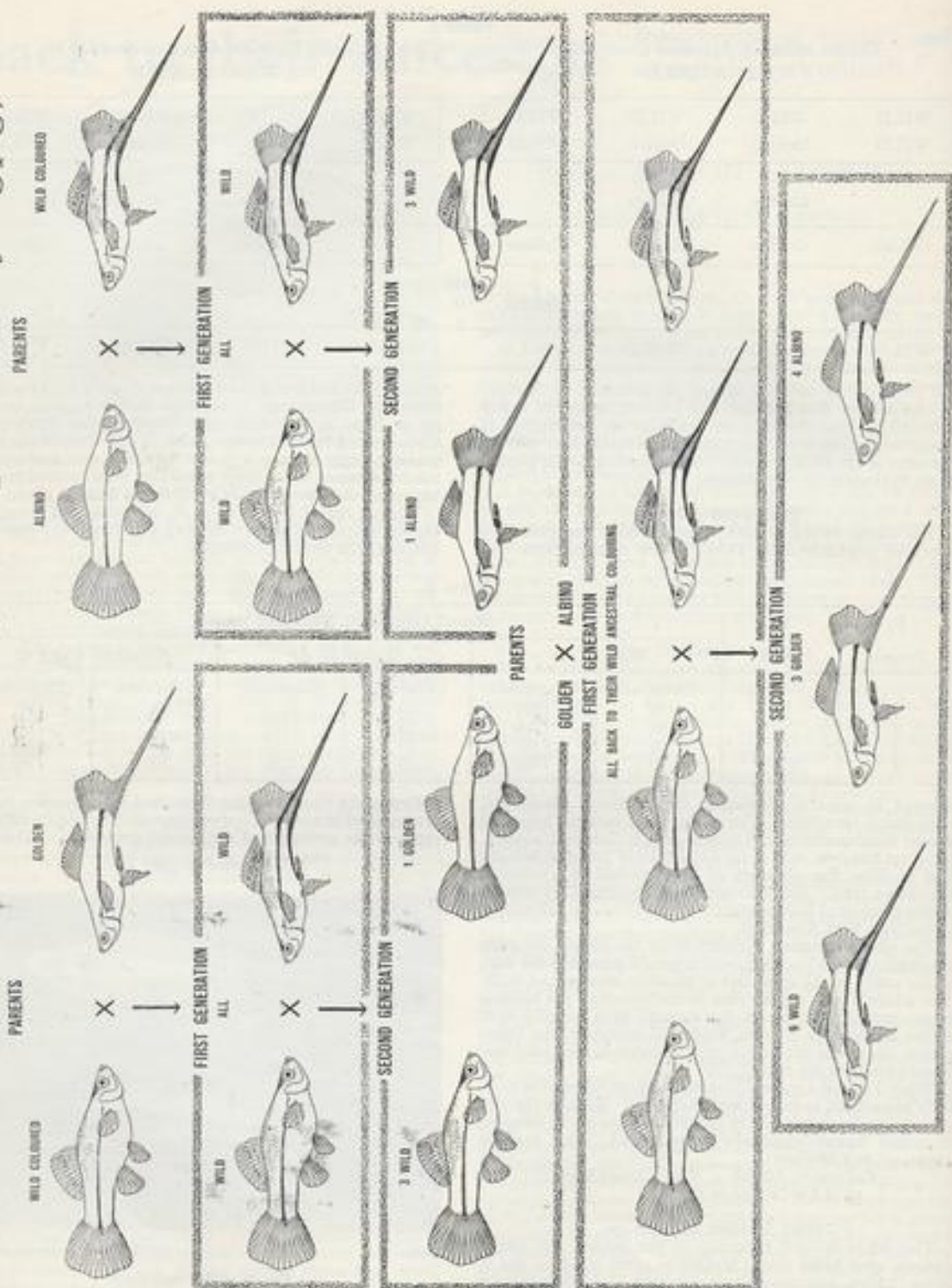


Table 3

F ₁ Female	F ₁ Total	Second Generation Swordtail Young					
		Wild (<i>G A</i>)		Golden (<i>g A</i>)		Albino (<i>G a</i> or <i>g a</i>)	
		Observed	(Expected)	Observed	(Expected)	Observed	(Expected)
5	51	38	(29)	11	(10)	2	(13)
6	56	45	(32)	10	(10)	1	(14)
7	77	58	(43)	18	(14)	1	(19)

illustrated when the wild, one-spot platyfish was mated with the gold platy; they produced four phenotypes in the ratio of 9 : 3 : 3 : 1 in the second generation:

Nine wild, one-spot; three wild; three golden one-spot; one golden.

On the other hand, when golden and albino genes are involved, as illustrated by F₁ *Gg Aa* swordtails, we obtained just three phenotypes in the ratio of 9 : 3 : 4:

Nine wild *G A*; three golden *g A*; four albino *G a* or *g a*.

The reason for this is that when the albino gene is homozygous, it makes no difference whether golden gene is dominant *G* or recessive *g*. The swordtails of the constitution *G a* and *g a* are albinos. Thus, instead of having four categories in the F₂ swordtail there are only three. Because of this the ratio is 9 : 3 : 3+1 or 4.

Now if the reader will go back and read the numbers of the three varieties of swordtails obtained in the F₂, he will be aware of the fact that two females, number 3 and 4, produced albino young in the expected frequencies. There

were 20 of the possible 21 albinos for female 3, and 33 out of 34 for female 4. The other two females, numbers 1 and 2, were quite deficient in the number of albino young they produced. Apparently some females could, while others could not, produce all the albino young they should. A question arose in my mind. At what time did the females lose their albino young? Did the albinos die just at birth or at some time during their embryonic development?

The only way that part of the problem could be solved was to sacrifice a number of gravid females and then examine the condition of their embryos. I had three additional F₁ wild-coloured females which I mated to their wild-coloured male siblings (*Gg Aa*CE*Gg Aa*). See Table 3 above.

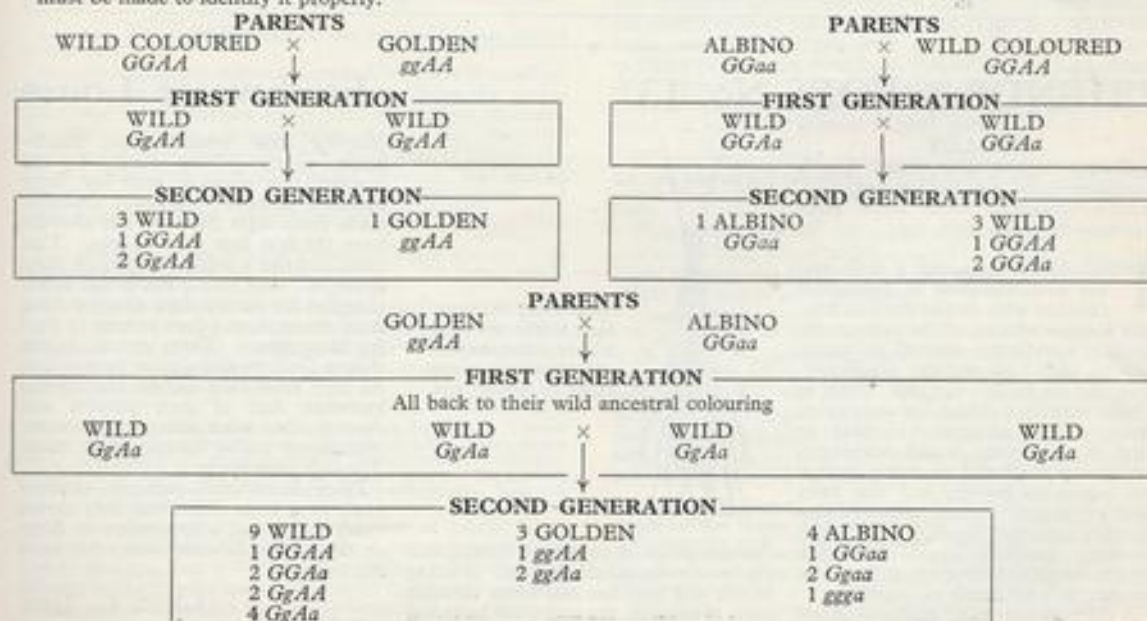
Females 5, 6 and 7, as you may see, were even more deficient in their ability to produce albino young than the first and second. In order to determine what was going on inside these females I waited 21 days after each produced their broods and then I sacrificed the three gravid swordtails by immersing them in a quick-killing fluid devised by

Genetic Explanation of Chart Illustrating the Reversion of Swordtails to Wild Colouring

(Opposite page)

The explanation for the chart is based upon the following determined facts: The golden gene *gg* is recessive to the wild colouring gene *GG*. So is the albino gene *aa* with reference to another wild colouring gene *AA*. Thus wild colouring requires the presence of at least two dominant genes *G* and *A*. The golden swordtail, although it is recessive for one colour gene (golden) *gg*, is dominant with respect to the albino gene *AA*. The albino swordtail is just the reverse; it is recessive for the albino gene *aa* but it is dominant with respect to the golden gene *GG*.

The double recessive albino *gg aa* may be found only among the second generation offspring of the golden and albino mating. Because the double recessive albino *gg aa* is indistinguishable from the ordinary albino, special breeding tests must be made to identify it properly.



Bouin. The liquid contained formalin, picric acid and acetic acid. To ensure the preservation of the embryos, I cut open the body wall of the gravid females, which permitted the fixing fluid to penetrate to all areas of the body cavity.

With a pair of fine scissors and forceps, I carefully dissected the three female wild-coloured swordtails and removed the single ovary from each of them. The embryos were tightly coiled within their eggs and the eggs were packed in a solid cluster within each single ovary about three-sixteenths of an inch in diameter. I placed each egg cluster in a separate glass dish. With the aid of a microscope I teased the coiled embryos apart and was able to see that there were three representative colour types among the embryos. The most numerous of the embryos had many tiny pigment cells over their heads and bodies. The rest were yellowish and among these I noticed some had black colouring in the pupils of their eyes while others did not.

Those with many black pigment cells on their skins would have developed into wild-coloured swordtails; the black-eyed yellows would have been golden swordtails; while the plain yellow ones had been on their way to being albinos. As I teased each embryo apart I pushed it towards one of three groups which I formed in my dish, each group containing one colour variety. When I had separated the embryos from each of the three F_1 wild-coloured females, I counted the number of individuals of each colour type. These are the results:

LECTURE TOUR BY DR. MYRON GORDON

Attention of readers is drawn to the announcement on page 22 concerning the lecture tour of Britain this year which is being planned by Dr. Myron Gordon in conjunction with *The Aquarist*.

When the counting was over and the observed counts were compared with the theoretical expectancies on the basis of the 9 : 3 : 4 ratio, I was amazed to find how closely the figures matched. Yet if one looks closer at the individual pairs of figures, one must conclude, there is still a small deficiency in the number of golden and albino embryos. It may be that the lethal process, whatever it may be, begins about the time I killed the embryos by immersing them in Bouin's fluid.

I wanted to study this process further. This could have been done by preparing microscopically thin slices of the albino embryos and comparing them, region for region, with those of wild-coloured embryos. Perhaps a thorough microscopic study would have revealed some fault in the nervous system or some other vital defect in the albino to account for their inability to survive the process of parturition. Unfortunately other problems were pressing; the time needed for this laborious operation could not be spared. Perhaps some day in the future we may again repeat the mating of the albino and the golden and study the embryos of the second generation. I am sure the results will justify the labour.

Table 4

F_1 Female	F_2 Total	Second Generation Swordtail Embryos					
		Wild ($G A$)		Golden ($g A$)		Albino ($G a$ or $g a$)	
		Observed	(Expected)	Observed	(Expected)	Observed	(Expected)
5	58	35	(33)	10	(11)	13	(14)
6	61	40	(35)	9	(11)	12	(15)
7	69	40	(39)	12	(13)	17	(17)
Grand Totals	188	115	(107)	31	(35)	42	(46)

FRIENDS & FOES No. 13

ASELLUS

PHYLUM:—Arthropoda, from Greek *arthron*—joint, and *podos*—foot.

CLASS:—Crustacea, from Latin *crustaceus*—having a shell.

THE *Asellus* (meaning a little ass) has been classified an Isopod—a creature with similar or equal feet. It is a close relative of the universally familiar woodlouse—indeed it might well be called an aquatic woodlouse. It is one of those creatures which is neither entirely a friend nor entirely an enemy of the aquarist. In tank or pond it is a very useful scavenger, consuming dead and decaying animal and vegetable matter, and the baby aselli are eagerly hunted out and eaten by many aquarium fishes. But if when searching for food *Asellus* finds fish eggs, it breakfasts off them with relish, whether they are fertile or infertile.

A fully grown male *Asellus* is about



Specimen of the water louse *Asellus* seen from above, magnified approximately three times its natural size

three-quarters of an inch in length, and the female about half-an-inch. During spring and summer and often through most of autumn, the males can be found

Freshwater Louse

carrying their wives around underneath them. When fertilised, the females are released and lay large numbers of eggs in a brood chamber made from eight flattened out-growths from the first four pairs of legs. This looks just like a whitish blister on their thoraces. The young live in this brood chamber for several days after hatching from the eggs, and then emerge to fend for themselves. They are no bigger than a *Cyclops*, and almost pure white. As they grow they assume the normal brownish hue of their parents and develop the same ability to conceal themselves under leaves or in mud. They are most active at night.

Once introduced into an outdoor pool, or a large aquarium they thrive exceedingly, and a few escape to carry on the species however many fish hunt them down.

C. E. C. Cole

THE AQUARIST

OUR EXPERTS' ANSWERS TO READERS' QUERIES

I have two thermometers in my aquarium. One is fixed to the glass near the surface of the water; the other is anchored to the bottom. The thermometer near the surface invariably registers a temperature eight degrees higher than the one at the bottom. Is this difference in temperature harmful to the fish?

A difference of eight degrees between the top and bottom of the water is not good for the fish. Perhaps your heater is not deep enough in the water. The best place for a heater is just above the compost, and in a horizontal position. There is no need to have two thermometers. One fixed to the glass about midway in the water should give you a fairly accurate reading.

Is it true that coldwater fish need more space than tropical species? And if so, how many tropical species could I keep in a 24 ins. by 12 ins. by 12 ins. aquarium?

It is perfectly true that coldwater species need more room than tropical species. In a tank the size you mention, you could keep about two dozen small tropicals without artificial aeration. But do not forget that you will need plenty of healthy plant life to help to maintain a proper balance.

An electrician has told me that an un-earthed aquarium could result in a fatal accident. Is this true?

Most people, we fancy, are aware of the danger they expose themselves to if they handle live electrical equipment with damp or wet hands. Before making any adjustments or connections to heaters and the like, it is always advisable to switch off the current. To earth an aquarium, run a stout wire from the metal frame to the earth terminal on a three-pin socket, or direct to a metal spike driven into the ground.

I am setting up a large tropical aquarium, and I estimate that the compost will average about six or seven inches in depth along the back and ends. Will this depth cause the formation of poisonous gases, and bring about fouling of the water?

So long as the plant life remains healthy, and no uneaten food is left to pollute the bottom, the compost should keep quite wholesome. As a matter of fact, most plants do very well in a deep compost, especially those species with widely spreading root-systems.

Are there any cichlids which do not have an intense dislike of plant life?

Cichlids which are tolerant of plant life are few in number. Among those which, generally speaking, leave the plants alone, we must mention angel fish, *Cichlasoma festivum*, *Etophus maculatus*, *Symphysodon discus*, the Egyptian mouthbreeder (*Haplochromis multicolor*), and, of course, the dwarf species such as *Apistogramma ramirezi*. But during courtship and breeding, most cichlids will uproot and damage the foliage of underwater plants.

Can you tell me how to treat a raw spot which appears to be eating into the head of one of my mollies? The fish, I might add, is eating well.

We suggest that you net the fish and swab the sore place with a piece of cotton wool dipped in salt water. It might be a good idea to keep the fish in slightly salted water for a week or two. Use about a teaspoonful of common household salt to every gallon of water.

I have a tank measuring 30 ins. by 15 ins. by 12 ins. I have two 40-watt bulbs burning over it for about eight hours every day. Yet I cannot grow *Cabomba*, *Myriophyllum*, *Vallisneria*, *Ludwigia* or hair grass, to mention only a few species I have tried. In every case the plants die down within a week or two. Can you tell me what is wrong?

All the plants you mention are lovers of bright light, natural or artificial. We think that if you use bulbs of a higher wattage, you will have more success. Try burning 60-watt bulbs for the same number of hours and you will soon notice a difference in the appearance of the plants.

Many queries from readers of "The Aquarist" are answered by post each month, all aspects of fish-keeping being covered. Not all queries and answers can be published, and a stamped self-addressed envelope should be sent so that a direct reply can be given.

My angel fish have spawned several times during the last six months, but on every occasion the eggs have developed fungus disease, and not one of them has hatched out. What should I do to ensure a successful spawning?

Generally speaking, the eggs of angel fish stand a better chance of hatching out in acid water than in alkaline water. They also hatch better in partial shade. Bright light on them always seems to encourage fungus. Before you spawn the adult fish again, we suggest you find out the pH value of the aquarium water, and cut down some of the light with a carpet of floating vegetation. It is advisable, too, to keep the bottom of the aquarium scrupulously clean.

I have been told that as *Tubifex* worms abound where sewage empties into a river, it is bad policy to feed these aquatic worms to aquarium fish.

It is possible that disease may be introduced into an aquarium with *Tubifex* collected from unwholesome surroundings. But most aquarists, we think, wash the worms under running water before feeding them to fish. If this cleansing precaution is taken, we do not think that *Tubifex* can be any more dangerous to the occupants of an aquarium than *Daphnia*, glassworms or any other live food taken from the wild.

I have two angel fish in my community aquarium, and I am interested to know why the black stripes on their sides come and go in a matter of seconds. Can these colour changes be taken as an indication of sex?

Many species of fish alter their colours, or change the pattern on their bodies according to the background they are swimming against, the texture and colour of the bottom, the temperature of the water, the time of the day, or through some emotional reaction such as fear, the excitement of catching or pursuing their food, and, of course, the presence of the opposite sex. Angel fish are well known for the habit they have of increasing or subduing the dark stripes on their sides. It is a habit general to both sexes.

We have a fine aquarium well stocked with a variety of colourful fish, but we are wondering whether we should turn the light out at night. At the present time, we keep the light burning all night.

Fish need some rest for a part of every 24 hours. It is unkind to keep them under a bright light all night long. Eight to ten hours bright light a day is enough to keep both plants and fish in good condition.

How much dried food should I feed to my 13 tropical fish?

As dried food swells on contact with water, it is unwise to introduce too much at a time. For 13 small fish, we think about as much as will cover a shilling piece—not heaped—will suffice. Feed the fish twice or thrice every day. But an all-dry diet is not ideal for fish. Try and vary their diet with some live food, or with such nourishing things as scraped raw meat, chopped earthworms and the like.

Some time ago I made a wooden aquarium and painted the inside of the frame with liquid lino. Soon after setting the aquarium up and introducing some fish, I had trouble. The fish started to die off every other day, and I had to remove the others to an all-glass tank for safety. Can you give me any idea what went wrong?

We think you went wrong in painting the inside of your

aquarium with liquid lino. It is a risky business to paint the inside of a wooden aquarium and set it up for fish before it has been given a very good soaking. As a rule, wooden aquariums are left unpainted, but stained or wax polished on the outside. Even so, it is advisable to let the wood soak for several weeks before introducing any plants or fish.

I am a beginner in the fascinating hobby of tropical fishkeeping and should like to know how often I should clean the gravel and renew the water?

Once a tropical aquarium has been set up it should be

COLDWATER FISHKEEPING QUERIES *answered by* A. BOARDER

I have a fountain in the centre of my pond which plays into a basin. The basin is about 18 inches above the water. Is there a plant which I could use in the basin which would hang down and flower?

I think that the plant which we know as creeping jenny would suit admirably. Its correct name is *Lysimachia nummularia* and it can be used in water. If planted in the basin it will hang down over the sides and it has a small yellow flower. The fact that it will actually live in water makes it an ideal subject for your purpose.

My pond gets full sun and I should like to get some plants to shade it. Water lilies have such large leaves; can you suggest something else?

I agree that some lily leaves are very large and in a fair-sized pond they can soon completely cover the surface of the water. There are, however, several types of lilies which have small leaves. The following are small leaved types—*Nymphaea laydeckeri purpurata*, *N. odorata alba*, and *N. rose nymphae*. These types are suitable for a pond with a depth of about 18 inches, but it is always possible to raise the lily pot to this depth in a deeper pond. A very good plant for your purpose is *Pontederia cordata* (pickerel weed). This plant has heart-shaped leaves, is a strong grower and has blue spiked flowers. You could also try a plant of *Sagittaria japonica alba flor pleno*. The leaves of this plant grow above the surface but would give some shade. The flowers are very attractive, borne on a tall stem with flowers like small carnations.

I have a fountain working in my pond and I want to insert the foot valve and strainer in the pond. Should I place this in the bottom of the pond to remove the bad water or have it just below the surface?

Do not place the strainer at the bottom of the pond as it will probably get stopped up with thick mud and dead leaves. Put it fairly well down in the water but well away from the bottom. It is well to be able to just see the strainer so that it can be inspected now and then in case of clogging.

You say that you have a copper pipe under the pond which feeds the fountain but that the pipe is not in contact with the water. I cannot see how this happens as the water running through the pipe must come in contact with it. If this copper pipe is fairly new it may harm the fishes in the pond. Even a very small quantity of copper can be fatal. If on the other hand the pipe has become partly coated on the inside it may not be as harmful. I suppose that it would be very difficult to remove it now, but I can assure you that copper can be very poisonous to fish.

When we moved here there was a pond in the garden which I would like to improve. It is very foul and filled with dead leaves. Can I add some frogs, toads and newts around and in the pond?

You could of course add the above to your pond but I do not see that they will do much good. In any case I expect that some, if not all of these animals, will come to the pond to breed in the spring. They do not normally live in water but come there to breed. Some frogs may remain near or in the pond for most of the summer. The tadpoles are very good scavengers indeed and will do a great deal towards

interfered with as little as possible. So long as the aquarium is not overstocked with fish, and the fish are not overfed, the water should remain wholesome for a very long time, perhaps for several years. Of course, excreta and decaying plant life should be siphoned from the bottom every now and again, and any dead fish or snails removed the moment they are seen. Water lost through evaporation should be replaced with previously boiled tap or well water allowed to cool to the same temperature as the aquarium.

clearing the pond but I do not think they can manage this without your aid. I advise that as many of the dead leaves as possible should be pulled out of the pond with the aid of a long handled drag. Put these on the compost heap and they will come in handy for the garden. A few tench and goldfish could be added to the pond and if they are not fed too much they will do a lot towards keeping the pond clean. These fish would eat the tadpoles of the frogs and newts but would probably leave the toad tadpoles alone.

I have an old tank 24 ins. by 12 ins. by 12 ins. which leaks at one end. Could you give me full particulars of how to repair it; is slate good for the base and what do I glaze it with?

The best method is to remove all the glass and clean off all the old putty. Clean and repaint the frame. Use linseed oil putty and start with the base first. Slate is quite good for this purpose. Then put the side glasses in, finishing with the ends. When pressing the glass down on the putty see that pressure is only applied to the edges, or you may break it. Clean away all surplus putty and then fill with water and leave for a few days to set. The weight of the water will press the glass into position. Wash out well before use.

Please can you tell me how long goldfish must be before they can breed. I have been told that they must be eight inches long but mine are only two inches.

It is quite possible to breed with two-inch (body length) goldfish. I have often done this and when the fish are only one year old. The fish of course must be in good condition.

I have kept goldfish for some years and would now like to breed them. How can I tell the male from the female and how do I go about breeding them?

I am being frequently asked how to tell the male from the female in goldfish varieties. Some males show distinct small white tubercles on the gill plates and pectoral fins when in breeding condition. This is a fairly safe sign, but all fish do not show these marks. I have had plenty of males which have never shown the white spots. If you had a dozen fish with say five showing the spots, this may signify that they are males but it does not mean that the others without spots are females. The eggs in a female take up much more room than does the milt in a male and therefore it will be noticed that when near the breeding season the female will appear more plump than the male. This is often more apparent if the fishes are examined from above. Of course, once the fish start chasing you can tell the males all right, they push the females around constantly, forcing them through the water plants and nudging them to encourage the laying of eggs. The whole procedure for breeding goldfish of all varieties is dealt with in my book, *Coldwater Fishkeeping*, 2s. 8d. post paid from *The Aquarist*, and I advise you to get and study this book.

In the December issue of *The Aquarist*, you mention a paint which can be applied over rust. Can you tell me its name and where I can get it, as my dealer has no information?

The paint in question is called "Rustanode," and is made by G. Curtis Holt Ltd., Lady Lane, Leeds, 2. I have not tried this paint myself as yet but it sounds very good and worth a trial.

I have just bought a small black moor which has one pectoral fin smaller than the other and it appears withered. What can I do about curing it?

I do not think that you can do anything about curing the mis-shaped fin. The fin may have been damaged but I expect that it was malformed at birth. If any fin becomes damaged it will heal and providing the damage was small the fin may not show any signs of damage later on. If on the other hand the fin was badly damaged, like a tail eaten almost away, although the fin can grow again, the mark of the new growth may always show up as a thickened part. By the way, there is no need to call the fish a black moor; unless it is black it is not a moor.

I have a small veiltail goldfish which has a small bubble form under the lip, about an eighth of an inch across. How can I cure this?

I do not think that you can do much about this. It appears that the under chin is not properly developed. I have had a fish develop a small transparent blister on its nose which I have pricked. This has then gone down, but the fish you mention must have a very thin skin under the chin. This may get all right as the fish grows, in any case it is not worth worrying over as the fish can be in no pain with it.

I bought a yellow goldfish in December, and in January it started to go brown on the body and black on the dorsal fin. It is now mostly black with gold and the only yellow is on the head. Do you think this will be its final colour?

I would have been in a better position to explain the ultimate colours if I knew the size and age of the fish. The fish may have rather a lot of shubunkin strain in it, when it can get and retain the colours you describe. With ordinary goldfish, they are bronze when young and as they change colour the under-parts go pale gold and the upper parts get quite black. As the gold turns to red so the black gradually disappears, leaving the dorsal and caudal fins last of all. Occasionally if a fish is damaged in any way the damaged part may turn black at first but this often clears later on.

On reading through books on fish keeping I find two schools of thought about breaking the ice which may form on a pond. Some say leave it alone and others say break it. What do you think about it?

I have found over many years of fishkeeping that it pays to have at least one open space in the ice on a pond. If the pond was made with concrete the pressure of the water under the ice can be harmful. Also any foul gases caused by decomposition of dead leaves etc., cannot escape. The water cannot obtain any fresh oxygen from the air and although the fishes may be fairly dormant during this period I am sure that the provision of fresh air is all to the good. The easiest way to make a hole in the ice is to place a water can of boiling water on the ice, when a neat round hole will soon be formed. On no account break the ice by hitting it as you may stun the fish.

I have a pond of 600 gallons and despite care in buying plants I have introduced blanket weed. How does this occur and how can I get rid of it?

You may not have introduced the blanket weed with the plants. It is surprising where it does come from. It is a form of algae and it is possible that some spores may be air-borne to the pond. As this is just another plant you will find that the more other types of healthy growing plants you have in the pond the more will the algae become crowded or forced out. You can help matters a lot by removing as much of the blanket weed as possible with a rake or broken stick. I have also found that this algae appears to thrive in ponds where there is a good deal of carbon dioxide. This can be encouraged by decomposing uneaten food. In an outdoor pond it is advisable to feed the goldfish as little as possible when there is an excess of algae. Hungry fish will eat blanket weed.

I have a pond 8 ft. by 6 ft. by 3 ft. deep, which I stocked with two rudd, two roach and a carp which I caught in a local sand pit.

I added some goldfish and shubunkins. In early January I found the rudd and roach looking half dead at the surface with a kind of slime hanging from them. I treated them with a teaspoonful of Epsom Salts to four gallons of water but they both died. The goldfish look all right but can you tell me what the disease is, and is it still in the pond?

The disease is commonly known as fungus, and its correct name is *Saprolegnia*. It is a disease which often attacks an ailing or a damaged fish. The spores are almost sure to be present in most ponds but the healthy fish have a covering of mucus which acts as a protection against the fungus. It is when this mucus is removed by damage or becomes weakened by the internal maladies of a fish that the fungus gets a hold.

Aponogeton Propagation



Daughter plants growing from an *Aponogeton undulatum* rhizome split from an old plant. (Photograph by Dr. F. N. Ghadially, Sheffield Aquarists' Society)

HAVING obtained a young specimen of *Aponogeton undulatum* in the early months of 1952 I planted it in one of my community tanks (38 ins. by 15 ins. by 15 ins.). It was bedded in ordinary coarse aquarium gravel without any added enrichment. The plant thrived, developed about 26 leaves, some of them approximately 20 inches long, and I began to look around for a way to propagate it.

The plant flowered five times last year and attempts were made to produce seeds by pollinating with a brush. The resulting product was planted in a bakelite tray and kept in a tank free of snails and fish. No germination was obtained and the attempt was abandoned after three months.

It was now decided (November, 1952) to split the plant vertically into four equal parts. This was carried out with a sharp knife and the four resultant pieces, bearing about six to seven leaves, were replanted in the same aquarium. One of the pieces perished but three survived. About two months later it was seen that young plants were arising at the side of two of the three surviving plants. The accompanying photograph, taken about six weeks later, shows two daughter plants springing from a rhizome produced by the mother plant.

Dr. F. N. Ghadially

IN THE Water Garden— by Dr. W. E. SHEWELL-COOPER



FOR some months now we have been wondering about the garden as it were, choosing bulbs, and alpine plants which we felt would be of value in the garden, and either be a foile or an addition to the pools. The articles have naturally led to a number of questions and I would like to say that I am always glad to hear from readers. One of the problems which seem to have worried some of you was the use of the word scree. How could a scree fit in with the stream or with the moraine?

I will agree that many books seem to treat scree and moraines as if they were one and the same thing. I prefer to regard the scree as the great mass of rock debris and stones which have been brought down by the glacier and which are left behind when the ice melts. I have seen these scree in Switzerland and in Northern Italy and very fascinating they are too. The moraine on the other hand may be made in a similar way, but it has far more water down below. If you want to make a moraine in the garden for instance you have to bury three feet or so below it a punctured water pipe, so that an underground stream of water can be provided as well.

If you want to grow choice alpine plants to thrive on ordinary rock garden compost or soil, there is a lot to be said for putting down a scree. The choicest plants must have perfect drainage, and they only flower at their best when they have very little soil in which to grow. Do not make a scree and then try and grow in it the common plants which will be perfectly happy under other conditions; make it so that you can have a number of really lovely specimens which you would not be able to cope with in the normal way.

Scree gardens are quite easy to construct and they are very cheap to maintain. No weeds will ever grow in them

and so hoeing is cut down to a minimum. Make them on a slight slope or on a flat. If it has to be on a flat, then the beds should always be raised four or five inches above the general level of the ground. The material used for the scree consists of broken pieces of rock and plenty of chippings. Any kind of stone can be used with great effect. Granite chippings for instance, millstone grit, small sandstones and even flint. Dig out about two feet of soil and put into the hole thus excavated a large number of big stones to provide the drainage. On top of the big stones put the smaller stones, and then towards the top, the finest ones you have. With the millstone grit or granite chippings, use a certain amount of sedge peat, and a very little loamy soil. You want actually about 15 parts of fine chippings to one of loam and sedge peat mixed together in equal parts. It is only with the smaller stones which form the top two inches of the surface of the scree on to which you must mix the small quantity of soil and sedge peat.

Planting the Scree

Of course, it is nice if you can have a sunny, slightly sloping site, between two bold rocks, so that the effect appears quite natural. The scree should then slope very gradually towards the stream or pool down below. As the scree is being made, saturate it well with water and tread it thoroughly. As it is made largely with stones you cannot possibly make it too firm. When it comes to planting time you should always shake the bulk of the soil from the roots of the plants you use, so that they may be spread out thoroughly into the fine scree material. The planting is always followed by a good watering, so as to help the alpine plants to settle down. This is quite a good time of the year to make a scree and to carry out the planting. There are plants, of course, which are lime lovers, and therefore prefer a surface of limestone chippings. There are others which hate lime and so need granite and sandstone chippings. Naturally in a small rock garden it is not possible to make a couple of scree to suit the various types, and so the plan is just to have a small pocket at one end or the other for the lime lovers.

Where the scree has to be small, it is usual to give a little variation of surface so as to prevent it looking monotonous and flat. Do not worry when watering that the bulk of the soil at the surface will be washed away—this is all to the good. Do not worry either if you have to have a large stone in the middle of the scree because this often produces quite a natural effect. In fact in the case of the larger scree it is a good idea to have some stepping stones in the bed so that you can get about among the plants in the summer.

Buy plants with a really good root system and a small top, rather than plants that are all top with few roots. Do not plant in straight lines: have a little group here, a stray plant there, a drift of glistening silver leaf plants towards the edge and so on. Most scree lovers want to include a widely representative collection and so they choose types which flower at different periods of the year.

It is impossible to give lists of all the plants that are suitable but here are a few of my favourites: *Acantholimon glumaceum*, with light rose flowers; *Aethionema*, deep rose, pink and white flowers; *Ajuga crispa* which has blue flowers; *Arabis sturri*, with white flowers; *Arenaria purpurascens* with lilac flowers; *Arenaria tetragoneta* which has blue flowers; *Calandrinia umbellata* has magenta flowers; *Dianthus allwoodii alpinus apollo*—pink—flowering June to September; *Dianthus callizonus*—pink—flowering in June; *Iris cristata*—blue and gold—flowering April to May, and *Hypericum empetrifolium* which has yellow flowers from June to September.



A page for
the beginner
contributed
by
A. BOARDER

HAVING set up and stocked the tank with plants and fish, it will be necessary to consider the feeding question. Apart from providing sufficient space, correct feeding is the most important point towards successful fish-keeping. I will deal with foods for goldfish and their varieties as I am sure that most beginners start with these. As more experience is gained and other species of fish are kept the aquarist will have obtained much more knowledge of proper feeding.

In the first place it must be realised that goldfish are omnivorous, which means that they eat both animal and vegetable matter. Also, they have no fairly large stomach like pike and perch, and so are unable to make a huge meal at a time and then rest and digest that meal over long periods. This is a very important point to remember when considering the amount of food which must be given at a time.

Although a goldfish will not over-eat, as it can only take a small quantity of food at a time, what is left uneaten soon turns foul and pollutes the water. This fouling has the results that the fish do not feel like feeding in such water and so if more food is added it will not be eaten and will tend to make the condition of the water worse. There is no doubt that the majority of beginners feed too much at a time and then wonder why the water goes foul and the fish are always gasping at the surface. If a tank is set up and stocked correctly and the fish are not fed for some days, it will be noticed that the water will keep clear and the fish will appear healthy. However, as soon as over-feeding begins, the water goes foul and the fish are in trouble. The water then has to be changed (much to the surprise of the owner, who has been told that it is not necessary to change the water in a tank for years if correctly treated).

I have mentioned that goldfish eat some vegetable matter and it must be realised that they will obtain much of this from the water plants in the tank, and extra may not have to be given. Some aquarists are quite perturbed when they see their fishes eating the water plants, but I consider that it is a very good sign and suggest that instead of trying to stop this practice it would be a good idea to provide more green food, such as small watercress leaves or chopped spinach. A healthy goldfish is almost always browsing about around the water plants or mouthing over the compost at the bottom of the tank. The small plant known as duckweed (*Lemna*), is a useful green food as it will grow and keep healthy on the water surface and be always available food.

Before dealing with other types of food I must make mention of a very important feature with regard to feeding. This is that the amount of food required by a fish depends almost entirely on the temperature of the water. When the water is as cold as, say, 40° F., goldfish are very quiet and do not want to feed. As the temperature rises so the fish start to eat more until they feed to the maximum in good oxygenated water at a temperature of 65° to 70° F. Therefore, aquarists must take particular note of the warmth of the

water when considering how often they should feed the fish.

I consider that the earthworm is the best food for goldfish, and I have never known it refused by healthy fish. Whether fish are large or small, worms are an ideal food. They may be shredded for fry, minced for youngsters or cut in half for older fish. Fishes which have frequent feeds of earthworms are generally in the best of health and this food assists to bring goldfish into breeding condition better than any food I know. Another good food is Bemax. Most of our aquarium fish are very fond of this food, and it is very beneficial for them. If fresh horse liver can be obtained this will make a splendid change of diet.

There are few foods which will not be eaten by goldfish; the mixtures of foods sold by most good firms are very good stand-bys. I am often amused when I see a food advertised and it is stated that "This food contains no biscuit"—as if biscuit was a certain poison to fish! I consider that biscuits are liked by fish as much as they are by me, and I have yet to find out why they are not good food. After all, they are mainly made of wheat flour and there is nothing harmful surely in wheat? I remember about 50 years ago when fishing for roach in Tring reservoirs boiled wheat was the only bait for the big chaps.

Most cereals, such as barley flakes, oatmeal and shredded wheat make an excellent diet. Dried shrimps are also very good in small quantities occasionally. Too many starchy foods should not be given as they can be too fattening for some fish, but if a fair amount of live food is added it will counteract the effect of the cereal types. If only a small amount of live food could be given each day during warm weather the fish would keep in splendid health. Apart from earthworms, the following can be fed:—white worms, *Tubifex*, mosquito larvae, frog tadpoles and water fleas (*Daphnia*).

It is quite impossible to be able to state exactly how much food should be given each day, but the best way to feed the fish is to offer a very small amount at first. If this is taken eagerly, a little more can be given. Goldfish are greedy feeders in that they always go for the larger pieces of food first, and any that are very small may be missed by the fish. If no more food is given the fish will go over the bottom and clear up all that is left over.

Most of the above hints are applicable mainly to fish kept in tanks, but when in an open pond much less food may be needed. If a pond is well established there will be quite a fair amount of food there most of the time, and so it is most important to avoid giving too much additional food. In my own pond where I keep my breeding fantails the only food I ever add is an old brown bread crust and a few garden worms. While on the subject of feeding I should like to give some advice on the treatment of the fish before you go away on holiday. Do not give any more food than usual and then the water will remain sweet; the fish will be able to last for a fortnight or more with no more food than that which they can find on the water plants. If a lot of food is put in the tank it will surely go bad and turn the water foul.

OUR READERS

Write—

Readers are invited to express their views and opinions on subjects of interest to aquarists. The Editor reserves the right to shorten letters when considered necessary and is not responsible for the opinions expressed by correspondents.



February Floods

THE F.B.A.S. Council have unanimously agreed that an appeal be sent to all federated societies asking for donations towards the relief of aquarists in the United Kingdom and abroad who have lost their fish and apparatus through the floods.

Donations from the smallest amount to the largest possible will be most welcome and I feel sure that the majority of aquarists will already have responded to the National Flood Appeal.

R. O. B. LIST, *Secretary*,
Federation of British Aquatic Societies,
1, Coronation Court, 31, Willesden Lane,
London, N.W.6.

WITH reference to the letter on the floods from Mr. S. W. Bull, in your March issue, I am just one of the struggling breeders who make my efforts pay but I feel very deeply for other aquarists who have lost fish in the flood areas.

I know the heartbreaks of uncontrolled loss. If any fellow aquarist breeders would care to write to me I am prepared to share my stock fish (tropicals) free of charge and carriage to help them start again. I haven't a lot but if 50 fish would help the pleasure would be mine.

GEORGE BARRATT,
24, Meeching Road,
Newhaven, Sussex.

Coal in Aquaria

FOR the last 12 months I have been experimenting with the use of coal in aquaria, using gravel to cover it over. I fixed up two 24 ins. by 12 ins. by 12 ins. tanks—one using gravel alone and the other with both coal and gravel. In both were placed plants and young fishes. In the coal and gravel aquarium the plants and fish grew very fast and were healthier than those in the gravel tank.

I am secretary of the British Railways Aquarists' Society and we had two tanks at our canteen at Granby Terrace but these did not do well owing to the fumes from the engines. Since setting these up again with coal and gravel they are doing very well and I do not think you will see any other tanks in this atmosphere. I have had many fish-keepers visiting me who cannot understand why my plants and fish do so well—tropical and coldwater. I can assure any fish-keeper that he will not have any more trouble with poor plants or cloudy water using coal and gravel.

C. NEWTON,
Herne Hill.

Cheap Breeding Trap

AN alternative method which I have found satisfactory for making the breeding trap float is to make a rectangle with some white polythene tubing—obtainable at wireless shops at 9d. a length. Join the ends by inserting one within the other and attach to the breeding trap by plastic cement.

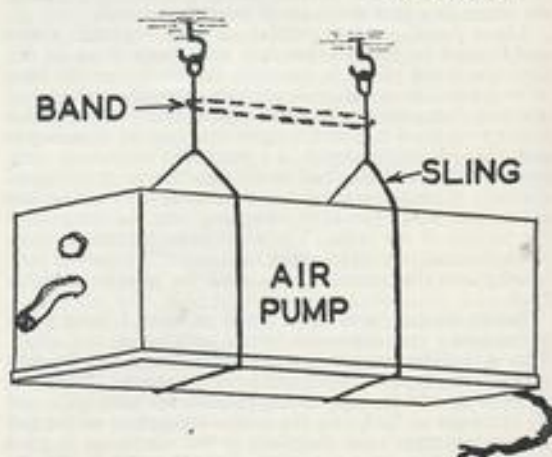
C. E. DOWER,
Southend-on-Sea, Essex.

Eliminating Aerator Noise

FOR some time I have been trying to eliminate the "hum" from electric air pumps. Finally I suspended the unit by means of two string slings from two small hooks fixed to the underside of the aquarium shelf. This was quite successful but some noise was still to be heard.

Quite by accident I touched the two slings and the noise ceased. I therefore passed a rubber band round the string slings between the hooks and the unit (see diagram) and all noise immediately stopped. The unit has now been running for some weeks and the only way one can tell if it is switched on or not is to look for the air bubbles. If the noise does restart it will be apparent that a new rubber band is required.

E. W. BROMIGE,
Peterborough.



Method of eliminating aerator noise—see letter above

Wooden Aquaria

WITH reference to Mr. H. R. R. Odam's article on wooden aquaria (*The Aquarist*, December, 1951), I should like to inform you that I have made one of these which has been in use since last January. It is unusual in that it is triangular and is built to fit a corner shelf about three feet above the ground.

The dimensions are as follows:—Depth 15 ins., sides 2 ft. 6 ins., front 3 ft. 6 ins. It has a capacity of 22 gallons and takes half cwt of gravel. I have introduced the "built-in" effect by fixing a sliding false front of hardboard which slides down to floor level, thus giving easy access to the tank. The total cost? Just over £3, including heating apparatus, gravel, plants, etc.

MICHAEL ANTHERS,
Enfield, Middlesex.

Zebras in Trouble

WITH reference to Mr. Raymond Yates' paragraph headed "Zebras in Trouble," in the February issue of *The Aquarist*, I would like to say that I purchase five zebras and four white cloud mountain minnows, all of which were about half an inch long and kept them in the same aquarium successfully. All nine fishes were placed in a 36 ins. by 16 ins. by 16 ins. aquarium in which there were already some 20 fishes of different species. Both zebras and mountain minnows have done very well, and I have recently spawned two pairs of zebras. In view of this I would suggest that actual conditions within the aquarium may influence the production of the substance Mr. Yates suspects the mountain minnows of exuding.

J. J. THOMAS,
Leighton Buzzard, Beds.

ON reading the article by Mr. Raymond Yates in *The Aquarist* for February, I realised that I have kept zebras and mountain minnows together for about a year in a community tank but it was the mountain minnows which were the victims. The first pair of mountain minnows was purchased last March and one was soon in trouble and died about 10 days after purchase. However, I have still the other in the tank with zebras; I kept purchasing single mountain minnows but each one died. During this time I lost one female zebra which was three years old. The dimensions of the aquarium were 45 ins. by 15 ins. by 10 ins. and in it were kept all sorts of other fish—danios, barbs, angels, *Rasbora*, labyrinthis and livebearers.

W. B. SHERWOOD,
Bengeo, Hertford.

Fighting Fit

I HAVE often read that aquarists are disappointed because their fighting fish do not show their fins and colour to best advantage. I think I have the answer to this problem: I stuck a small mirror to one end of my aquarium and when the fighters see themselves in this they spread their fins and colour up. Even when they are not looking in the mirror they still retain all their colour and fin display.

J. CALDWELL, Glasgow.

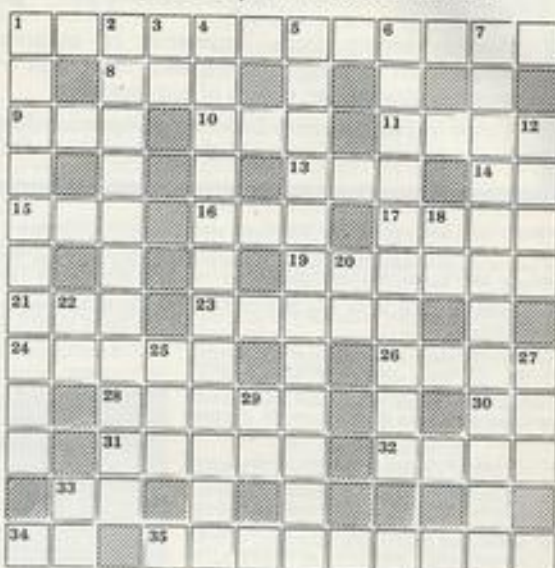
White Spot Treatment

IN his letter in the February issue of *The Aquarist*, Mr. C. J. Grant asks if my suspected neon fry turned out to be zebra danios and wonders whether I had already written to inform you that the fry were not neons. He is, of course, right on both counts. Shortly after writing my original account to you I wrote again in some perplexity and you were good enough to confirm that the fry were either zebras or white cloud mountain minnows. Time has shown them to be zebras. Gone then is any hope that mercurochrome might have some strange effect on neon breeding. It remains, though, I am convinced, a reliable cure for white spot, without, it appears, any effect on the breeding of zebras.

R. S. MILLARD,
Burnham, Bucks.

The AQUARIST Crossword

Compiled by J. LAUGHLAND



CLUES ACROSS

- One, two and five down, for instance (7-5)
- The toadfish (3)
- Main limb of water boatman (3)
- A fish or the spine of a fin (3)
- Without feeling; not a likely condition of the tropical fan's fingers (4)
- Earthenware vessel (3)
- Up from pupa to parent (2)
- Grampus (3)
- Devour (3)
- Aquatic plants are only a part of this fellow's studies (1, 1, 1, 1)
- Outsize *ivir* for Egyptian god (6)
- British fish born in Sargasso (3)
- Scottish inland waters (5)
- Jewelled head dress (5)
- Tropicals need greater degree of this (4)
- Less common (5)
- Roe from the *resis* gives old royal cypher (1, 1)
- How the coldwater fan speaks? Not! (3)
- Tops return for fish disease if white (4)
- Old-fashioned ejaculation (2)
- Great Chinese or Indian river (2)
- Perfect fish? Well — (5, 4)

CLUES DOWN

- Pan gone, too (anagram) (10)
- Bladderwort (11)
- Motoring body (1-1)
- Planarian (12)
- Tyne crop cry O! (anagram) (12)
- Dipnoi (10)
- Producing pupae (12)
- Morone labrax* (4)
- Fine motor car (1, 1)
- Quiet part of the fish (2)
- East Indies (1, 1)
- Similar body to 3 down (1, 1, 1)
- Bird much less than titanic (3)
- The Spanish (2)
- Look for this (2)

PICK YOUR ANSWER

- The swimming-bladder of the sturgeon (in America the cod and hake) is used in the preparation of: (a) Gelatine. (b) Glue. (c) Jam-jelly. (d) Varnish.
- The scientific name of the banana plant is: (a) *Mnium undulatum*. (b) *Nymphaea cordatum*. (c) *Ottelia alismoides*. (d) *Samoela floribunda*.
- Gold-striped characin is the popular name of: (a) *Corynopoma vittata*. (b) *Crenopoma bent.* (c) *Crenochanna affinis*. (d) *Crenochanna spilurus*.
- Corimotopus saladensis* is native to: (a) Argentine Republic. (b) Colombia. (c) Honduras. (d) Mexico.
- The family Daphniidae is represented in British freshwaters by: (a) 9 species. (b) 19 species. (c) 29 species. (d) 39 species.
- Barbus nigrofasciatus* (the nigger barb) was named by: (a) Boulenger. (b) Day. (c) Gunther. (d) Hamilton-Buchanan.

(Solutions on page 24)

G. F. H.

Monthly reports from Secretaries of aquarists' societies for inclusion on this page should reach the Editor by the 5th of the month preceding the month of publication.

A copy of *The Aquarist's Directory of Aquarium Societies* will be sent free to any reader on receipt of a stamped, self-addressed envelope.

FIRST two meetings of the **Sheffield and District Aquarists Society** this year had talks as part of the proceedings, the first being on pH speaker Mr. L. Gubby, and the second on tropical fish breeding by Mr. A. Tingle who also introduced members to his own formula for a dried food.

AT the February table show of the newly-formed **Feltham and District Aquarist Society** judging was carried out by Mr. D. J. Taylor. The judge commented on the fish exhibited and gave a short talk on the showing of fish.

WHEN Mr. R. Legge gave some reminiscences of fish-keeping experiences before members of the **Accrington and District Aquarist Society** in February he enlivened proceedings by producing living specimens of reptiles from his pockets and he also gave a demonstration of hypnosis using a sand lizard as subject. The society now meets at the Liberal Club, Willow Street, Accrington on the second Wednesday of each month.

AFTER business preliminaries at the inaugural meeting of the **Altrincham Aquarist Association** a talk on the furnished aquarium in the home was given by Mr. T. E. Honeybill. Future meetings will be held at Hollybank, Grove Lane, Hale, on the second Tuesday of each month at 8 p.m.

CHIEF officers of the **Aquarium Club** were re-elected to office at the annual general meeting held a short time ago.

A TABLE show for any variety of fish at the monthly meeting of the **Ashton-under-Lyne and District Aquarist Society** was well supported and first place was gained by a pair of *Panchar lineatus* (Mr. T. Williamson).

AYLESBURY **Aqualife Association** is now producing a monthly news sheet giving reports of their meetings and notes on fishes and other aquarium items. Last month the Association staged a show of coldwater fishes.

AT the February meeting of the **Bexhill and District Aquatic Society** Mr. R. Baylis spoke about aquarium technique in setting up; in March a table show of barbs was held and the fishes were judged by Mr. A. Walker. At the society's annual general meeting the secretary, Mr. D. Joliffe, was re-elected.

North Bucks Show

THE show held by the **North Bucks Aquarist Society** in conjunction with the **Wolverton Cage Bird Society** was the first effort of this kind by the society and was very well received. Part of the line of aquaria exhibited is shown in the photograph on the right and the aquaria contained a very wide range of tropical species. Coldwater fishes were also represented by some first-quality fishes. All the aquaria were fully furnished and members of the society were present to answer the many questions put by visitors.

FEBRUARY was a busy month for the **Blackpool and Pylde Aquatic Society**. Two evening meetings were held at the new headquarters over the Co-operative Hall, Shepherd Street, Blackpool and the society also staged two shows at hobbies exhibitions in their locality. The shows created great interest and brought the society new members.

SKETCHES illustrating artistic work in aquaria were used by Mr. J. H. Gloyn when he talked to the **Forest Gate Aquarist Society** on this subject recently.

Important Announcement LECTURE TOUR

THE **AQUARIST** is proud to announce that by special arrangement, Dr. Myron Gordon, geneticist to the **New York Aquarium**, our distinguished American contributor and the world's foremost authority on fish genetics, will be visiting Britain this September to give a series of illustrated talks on the selective breeding of tropical fishes. A schedule of places and dates for the talks is being prepared by *The Aquarist* and details will be given in a coming issue. The Editor welcomes letters from secretaries of societies in provincial centres (where there are large halls available) who wish to take advantage of this special opportunity to hear these authoritative lectures.

FIRST in a table show of fighters held by the **Friends Aquarist Society** in London in February was obtained by Mr. P. B. Salter and, at the same show, first in the danios class was obtained by Mr. D. Bellringer.

SPECIAL efforts are being made by the **Glasgow Northern Aquarium Society** to install aquaria in local hospitals during Coronation year. Mr. J. Wilson showed members some ingenious aquarium gadgets made from scrap materials when he visited the society to give a demonstration of tank glazing.

SPEAKING about livebearers at a meeting of the **Burton-on-Trent and District Aquarists' Society** Mr. C. Diggins expressed concern at the poor types of these fish in the district, particularly red swordtails. He appealed for discriminate and selective breeding and the speakers remarks led to the formation of a breeders' section of the society which will report at each monthly meeting.

LABYRINTH and coldwater fishes were the subjects for the table show of the **Bury and District Aquarist Society** when in the class for fighters Mr. L. Wardle took first and the following firsts were secured in other classes by Mr. J. Taylor (three-spot and leeri gourami); Mr. A. Wardle (A.O.V. labyrinth); Mr. N. Atkinson (coldwater).

SNAGS arising during aquarium glazing were effectively demonstrated and dealt with during a practical illustration of this procedure given by Mr. C. Richards, chairman of the **Chelsea Aquarium Society**, at a recent meeting. Mr. J. Phillips has given a talk to the society on breeding dwarf gouramis. A visit of members to the **London Zoo Aquarium** is planned.

MR. E. WEATHERLEY described some experiments he had performed to determine the effects of vitamin deficiency on goldfishes in a talk given to the **East London Aquarists and Pondkeepers Association**. Two teams of young goldfishes were studied over a period of 17 weeks. Some fishes were subjected to ultra-violet irradiation and preserved specimens were used to show the differences in development which had occurred in the presence and in the absence of this treatment.

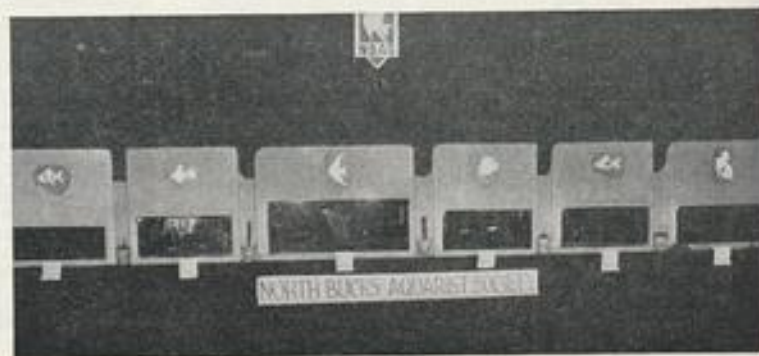
WINNER of the **Ackroyd Points Trophy** for the highest number of points scored at table shows held by the **Halifax and District Aquarists' Society** in 1952 was Mr. E. Priestley. Last month Mr. E. Chapman gave a talk to the society on furnished aquaria and lay-out. The society plans to have an aquaria display at a local hobbies exhibition this month.

AT the February meeting of the **Haslingden Aquarium Society** a lecture on setting up a furnished aquarium, its cost and judging points, was given by Mr. D. Baldry, himself a winner of many prizes for furnished aquaria. The society is planning a two days open show in June this year.

AFTER lecturing on the guppy to the **Hornchurch and District Aquarium Society** Mr. H. S. White, president of the **Federation of Guppy Breeders' Societies**, judged a table show of these fishes at the meeting. A fish belonging to Mr. B. Ashman was awarded first prize.

EACH member present at a recent meeting of the **Lyons Club Aquarist Section** gave a three minutes' talk on some aquarium-keeping experience, and this procedure developed some interesting discussions.

(Continued on page 24)



THIRD BRITISH AQUARISTS' FESTIVAL
Grand Manchester Event
 6th to 10th May, 1953

SPECIAL features are planned to make this year's British Aquarists' Festival at Manchester an event worthy of Coronation Year. As in previous years the Festival will be staged in the commodious Exhibition Hall of Belle Vue Zoological Gardens but the area allotted to the display of furnished aquaria, fishes, aquatic plants, reptiles, amphibia, biological exhibits, traders' stands and water gardens will be half as large again as that used for last year's B.A.F.

The Federation of Northern Aquarium Societies, who are organisers of the B.A.F. in collaboration with *The Aquarist*, report that entries of exhibits are promising to exceed in numbers and range the record figures secured at the 1952 event. Details for obtaining show schedules and making entries are given at the foot of this page, and as usual the excellent arrangements for reception and handling of fishes sent for exhibition ensure that distance will be no deterrent for entrants from any part of Britain. Manchester's Ringway Airport will also be used to receive fishes.

As an example of the novelties planned among exhibits may be cited the "radar fish"—the tropical catfish—which emits electrical impulses from its tail region to permit accurate and rapid reversals of direction; this fish will demonstrate its powers in a specially fitted aquarium by ringing a bell as it moves into certain regions of the tank. Lectures and film shows will take place during the B.A.F. in an annexe to the Exhibition Hall, and all visitors will have an opportunity of attending these.

The very large display of furnished aquaria which is a feature of this year's B.A.F. as in 1951 and 1952 provides an excellent chance for the aquarist planning to set up a decorative home aquarium to see first-class examples of how this should be done, and expert aquarists will be present in the Exhibition Hall at the information stand of the F.N.A.S. and at *The Aquarist's* display stand to answer any questions.

Some of the trophies to be awarded at the B.A.F. are pictured here, including the "Daily Dispatch" Challenge Trophy for the best fish of the show (centre) and the Cussons' Challenge Trophy (left centre)



HOURS OF OPENING

Wednesday, 6th May: 12 noon-9 p.m.
 Thursday, 7th May: 10 a.m.—9 p.m.
 Friday, 8th May: 10 a.m.—9 p.m.
 Saturday, 9th May 10 a.m.—10 p.m.
 Sunday, 10th May 10 a.m.—7 p.m.

Admission by ticket to B.A.F. and to the Belle Vue Zoological Gardens and Aquarium (2s. adults; 1s. children). Advance bookings for parties of 25 or over at special rates (1s. 3d. adults; 6d. children) can be made on application to the Secretary, Belle Vue Zoological Gardens, Manchester 12.

Spring Assembly of members of the Federation of Northern Aquarium Societies will take place on Sunday, 10th May and special tickets for members and guests to include luncheon and tea are obtainable, 10s. 6d. each, from Mr. C. Graham, 171, Thornes Road, Lupset, Wakefield, Yorkshire.

Belle Vue can be reached by bus from Manchester London Road railway station, and British Railways will supply full details of times of trains to and from Manchester to enquirers from any part of the country. There are ample restaurant facilities at Belle Vue close to the Exhibition Hall, so that a visit to the B.A.F. can make an ideal day's outing for the society and aquarist's family alike.

An event not to be missed! —

BRITISH AQUARISTS' FESTIVAL-1953

(Sponsored by the Federation of Northern Aquarium Societies in collaboration with "The Aquarist")

at BELLE VUE, MANCHESTER
 6th—10th MAY, ————— 1953

Society and individual entries invited NOW { Schedules obtainable from G. W. COOKE, SPRING GROVE, FIELD HILL, BATLEY, YORKS.



MR. T. O'NEIL, who lectured to the Kingston and District Aquarist Society recently expressed the wish that more aquarists kept out native fishes. He pointed out that young specimens can most easily be caught from rivers, these small fishes requiring less tank space, and also said that these species offer the aquarist a chance to find out something about their breeding habits. He described the various types commonly available and emphasised the aquarium decorative value of a shoal of minnows.

A SECOND aquarium is to be installed in the children's ward of a local hospital by members of the Leyton Aquaria Society. A course of lectures is at present being given to the society covering subjects such as glass-cutting and aquarium glazing and advancing to fish-house construction. First open show of the society is planned for September.

THE Midlands Aquarium and Pool Society has been in existence since 1935 and to place on record its early history a small 16 page booklet has been written by Mr. T. L. Dodge and published by the Society. It is obtainable from the secretary, Mr. T. L. Dodge, price 6d. (Address: 46, Dunsmore Road, Hall Green, Birmingham 28.)

MR. H. ANNESS told members of the Nelson and District Aquarists' Society that he believed it is possible to hybridise tropical egg-laying fishes of similar types when he was evening lecturer at a recent meeting. He described some of his experiments in hybridising during his talk.

SINCE last year's annual show held in June the North Herts Aquarists' and Pondkeepers' Club is in a satisfactory financial position reported the treasurer at the recent annual general meeting. Meetings of the Club are held monthly on the last Wednesday in each month.

IN recognition of past services, Mr. B. J. Upchurch, a well-known breeder of coldwater fish, was voted the first honorary life member of the North Herts Aquarists' Society on the occasion of his retirement from the vice-chairmanship. The society holds its meetings on the fourth Wednesday of each month in the Hitchin Library.

THREE short talks entitled Fishkeeping for Beginners (by Mr. T. Roe), Traders' views on fishkeeping (by Mr. R. Albrighton) and The Goldfish Society of Great Britain (by Mr. A. Mathews) were given at the meeting of the Nuneston Pool and Aquarium Society held in February. These were followed by a table show of tropical fishes at which first was awarded to a pearl gourami owned by Mr. A. Cluley.

Notts. "Bulletin"

ANNOUNCEMENT of arrangements for the annual outing of the Nottingham and District Aquarists' Society on 7th June are given in the January issue of the society's "Bulletin." The outing will be to London where after a coach tour of the Coronation route members will visit the London Zoo Aquarium. A note by Mr. D. Pullon warns of the dangers of using faulty condensers to overcome electrical interference—if these short the thermostat function may be interfered with so that aquarium temperatures may reach excessive heights. Articles on the mosquito fish, breeding brine shrimps and earthworm culture are included in the February issue of the "Bulletin." A home-made worm shredder is described, made from a curved 1½ ins square curved piece of wood 18 inches long bearing six short lengths of old hack-saw blade hammered into slots cut across it at one end.

Guppy Breeders' Bulletin

A REVIEW of activities in guppy breeding in the U.S.A. is included in the Bulletin of the Federation of Guppy Breeders' Societies for February. Reports are included from branches of the Federation all over the country.

U. of London Courses

ENQUIRIES are invited by the University of London for details of week-end residential study courses to be held during the summer: 8th-10th May—Pond Life, with special reference to a freshwater lake (at Battle of Britain House, Northwood); 3rd-5th July—Aquatic vegetation (at Haslemere Educational Museum, Surrey). Fee for the first course is £1 10s. and for the second course 10s. plus £1 10s. for residence. Mark enquiries "University Extension Courses" and address to the Director of the Department of Extra-Mural Studies, University of London, Senate House, London, W.C.1.

Secretary Changes

CHANGES of secretaries and addresses have been reported from the following societies: City of Salford Aquarist Society (Mr. A. Gregory, 5, Park Place, Salford 5, Lancs);



The Aquarist's Badge

PRODUCED in response to numerous requests from readers, this attractive silver, red and blue substantial metal emblem for the aquarist can now be obtained at cost price by all readers of *The Aquarist*. The design is pictured above (actual size). Two forms of the badge, one fitting the lapel button-hole and the other having a brooch-type fastening, are available.

To obtain your badge send a postal order for 1s. 9d. together with the Aquarist's Badge Token cut from page xv, to Aquarist's Badge, *The Aquarist*, The Butts, Half Acre, Brentford, Middlesex, and please specify which type of fitting you require.

Chester and District Aquarist Society (Mr. G. P. Phelan, 20a, Handbridge, Chester, Cheshire); Croydon Tropical Breeders' Circle (Mr. J. Seymour, 10, Braemar Gardens, West Wickham, Kent); East Midlands Guppy Breeders' Society (Mr. J. Rudkin, 8, Tetuan Road, Leicester); Harrow Aquarists Club (Mr. W. J. Humphries, 63, Capthorne Avenue, Harrow, Middlesex); Mid-Somerset Aquarist Society (Mr. D. Day, 3, Elmside Road, Sunnybank, Bridgwater, Somerset); North Bucks Aquarist Society (Mr. T. W. Batch, 33, Stanton Avenue, New Brodwell, Wolverton, Bucks); Rochdale and District Aquarist Society (Mr. B. Whitworth, 20, Alexander Street, Castleton, Rochdale, Lancs); Ryde Aquarist Society (Mr. C. G. Peaty, 27, Arundel Road, Elmfield, Ryde, I.O.W.); Southall Aquarist Society (Mr. A. Hastings, 35, Clarence Street, Southall, Middlesex); Usbridge and District Aquarist Society (Mr. H. S. March, 27, Pinewood Avenue, Hillingdon, Middlesex); Watford Aquarists' Society (Mr. C. F. Foy, 2, Minerva Drive, Watford, Herts).

New Societies

Lytham St. Annes Aquarist Society: Secretary: W. Robinson, 3, Denwood Bank, Warton, Preston, Lancs. Meetings: At Beech Cafe, Dicconson Terrace, Lytham, Lancs.

Merthyr Aquarist Society: Secretary: C. G. Rush, 36, Fifth Avenue, Galon Uchaf, Merthyr Tydfil, Glamorgan, S. Wales.
Stretford Aquarists' Society: Secretary: H. Hindley, 35, Westwood Road, Stretford, Lancs.

Aquarist's Calendar

7th-11th April: Torquay and District Aquatic and Pondkeepers' Society second annual show at the Tor Parish Rooms, Torquay.

11th-12th April: Bury and District Aquarists' Society open show of furnished aquaria, tropical and coldwater fishes at the Y.M.C.A., Bury. Show schedules available from Mr. G. D. Grimshaw, 1, Garston Street, Bury, Lancs.

18th April: Federation of Men's Institutes Aquaria Sections and South London Guppy Breeders' Society amalgamated annual show at the Childeric Road School, New Cross, London, S.E. Open 2 p.m., reached by buses 36, 36a, 69, 172, 163 or New Cross and New Cross Gate underground stations.

6th-10th May: British Aquarists' Festival. Open show of furnished aquaria, tropical and coldwater fishes, reptiles, water gardens, etc., at the Exhibition Hall, Belle Vue Zoological Gardens, Manchester. (See special notice over-page.)

16th-17th May: Rochdale and District Aquarist Society. Second annual open show of furnished aquaria, tropical and coldwater fishes. Full particulars from show secretary Mr. J. Dodsworth, 251, Rooley Moor Road, Rochdale, Lancs.

18th-23rd May: Ulster Aquarist Society. Coronation open show of aquaria and fishes. Schedules available from Mr. J. Lutson, Rannoch, Antrim Road, Glengormley, N. Ireland.

28th-30th May: Kettering and District Aquarist Society annual show open to entries from members of societies in the area. At the Co-op and Labour Institute, Kettering. Show secretary: Mr. S. D. Simons, 52, Church Street, Burton Latimer, Kettering, Northants.

6th-7th June: Chelmsford and District Aquarist Society. Open aquaria show in conjunction with Chelmsford Coronation celebrations. Details from Mr. R. A. Gray, 2, Norfolk Drive, Chelmsford, Essex. Entry closing date, 25th May.

27th-28th June: Burnley Aquarists' Society second annual Roses Show (Lancashire v. Yorkshire) with furnished aquaria and individual fish classes. Show secretary: Mr. F. Taylor, 21, Hogarth Avenue, Rosehill, Burnley, Lancs.

Early notification of dates of coming aquarists' events for free insertion under the above heading is requested to ensure inclusion in good time.

Crossword Solution

A	Q	U	A	T	I	C	P	L	A	N	T
P	T	A	U	R	U	Y					
O	A	R	R	A	Y	N	U	M	B		
N	I	B	P	I	G	P	A				
O	R	C	E	A	T	F	R	H	S		
G	U	L	O	S	I	R	I	S			
E	E	L	L	O	C	H	S	P			
T	I	A	R	A	O	H	E	A	T		
O	R	A	R	E	R	E	R	I			
N	I	C	I	L	Y	S	P	O	T		
L	A	A	N								
P	O	A	N	G	E	L	F	I	S	H	

PICK YOUR ANSWER (Solution)

1 (c). 2 (b). 3 (b). 4 (a). 5 (b). 6 (c).

