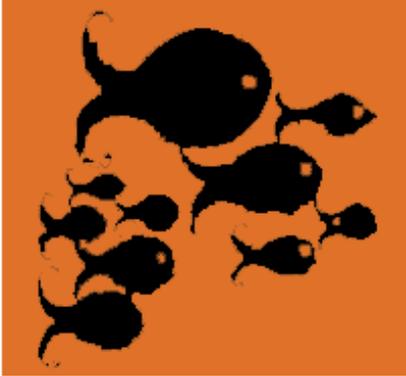




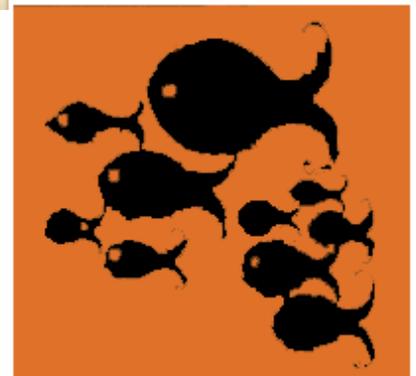
The Aquarist's Notebook



Volume 1



*Editor,
Albert J. Klee*



The Aquarist's Notebook



The Aquarist's Notebook

INTRODUCTION

In the late spring of 1967 I conceived the idea of a brand new monthly publication, unique to the aquarium world. Physically, it would consist of a single sheet of heavy stock, printed on both sides, with spot color on the first page and punched (5 holes) so that it could be saved in a looseleaf binder. Although no photographs would be used, there would be an abundance of black and white illustrations to accompany the text.

The publication, to be named THE AQUARIST'S NOTEBOOK, would be sold in bulk to pet shops (but mostly targeted at fish stores) and distributed free to their customers, the idea being that it would encourage return business for the shops and also provide useful and interesting material to their customers. The material would be written mainly for beginners, and would have articles on fishes and plants, maintenance, decoration, puzzles, cartoons, and answers to questions likely to be asked by beginners. Space was provided at the bottom of the first page for the dealer to stamp the name, address, and telephone number of the establishment distributing the publication.

During this time I was, along with my two partners Barry E. Franz and Samuel F. Wineberg, publishing AQUARIUM ILLUSTRATED. It should be noted that Barry Franz was listed as Managing Editor from the January-February 1966 issue to the March-April 1967 issue. Starting with the September-October 1966 issue and continuing to the July-August 1967 issue (the last issue), Sam Wineberg was listed as its Executive Editor. Note that for the last two issues, Barry Franz was not listed on the editorial staff. The reason for this simply was that Barry had lost interest in the publication and so by the end of 1966 most of his duties

had fallen upon my shoulders, leaving Sam and myself essentially co-producing the publication. For those of you not familiar with Sam Wineberg, he was a pilot during World War II and was interested primarily in killifishes, having written for the JOURNAL OF THE AMERICAN KILLIFISH ASSOCIATION as far back as 1965, and one of the author's closest aquarium hobby friends.

In March of 1967 I broached the idea of THE AQUARIST'S NOTEBOOK to Sam and Barry with the view that it might be distributed by AQUARIUM ILLUSTRATED as a subsidiary publication. There was an agreement among the three partners, however, that major decisions would be taken only when all three voted to adopt them. Barry demurred, wanting nothing to do with another publication but Sam was enthusiastic about the idea. Accordingly, we asked Barry if he had any objection to Sam and I publishing THE AQUARIST'S NOTEBOOK on our own. He had none so the two of us proceeded with the project and the first issue appeared in June 1967.

It was distributed to over 300 stores and ceased publication in December 1975, a run of eight years and 7 months for a total of 103 issues. Putting it together was a labor of love, and Sam and I never had a cross word between us during its publication (or ever, for that matter). Since the material in THE AQUARIST'S NOTEBOOK is un-attributed (nor was it ever meant to be), it should be noted that I wrote and drew about 75% of the material, much of it taken from short articles I had written for sundry British publications. Counting the material in THE AQUARIST'S NOTEBOOK, this has brought my total of published aquarium articles at this writing close to the 600 mark .

The publication history is as follows, with certain numbering errors noted:

Volume I (1967): 7 issues

Volume II (1968): 12 issues. It is in this volume that No. 10 (the one with the yellow spot color and lead article titled, "Two Easy Tetras To Breed" on the front, is mislabeled as No. 9.

Volume III (1969): 12 issues.

Volume IV (1970): 12 issues. No. 1 and No. 2 are mislabeled as published in 1969. Along with the other in this Volume they were published in 1970.

Volume V (1971): 12 issues.

Volume VI (1972): 12 issues.

Volume VII (1973): 12 issues.

Volume VIII (1974): 12 issues.

Volume IX (1975): 12 issues. This is the volume that contains the other *lapsus calami* regarding the numbering of the first two issues as "Volume VIX" instead of "Volume IX."

Doing an Optical Character Recognition (OCR) scan of THE AQUARIST'S NOTEBOOK and still maintaining the original format would have been difficult and tedious, so I scanned each page as an image, excepting the text in boxes that contained a background tint. These were scanned as OCR text to make them readable. The above numbering errors were also corrected as were some minor errors involving the "THIS COPY OF THE AQUARIST'S NOTEBOOK COMPLIMENTS OF" legend that was supposed to appear on the first page of each issue but was mistakenly omitted in a few. Since scanning text as an image does not always produce the best possible results, I therefore scanned each page to produce relatively large images, e.g., typically the front page produced a 10 MB image, the second (not being scanned in color) a 3.4 MB image. Since the PDF files were created using the High Quality Print Option they are large, so I opted to produce one file for each year of publication - nine files in all. It should be noted that when the PDF files are printed

the best results are obtained when printing at high laser printer resolutions, i.e., 1000 or 1200 dpi.

Written over thirty years ago, some of the scientific references may be outdated. However, the material was aimed at beginners and the information and recommendations are as valid today as they were then. The French have a disconsolate saying – *Plus ça change, plus c'est la même chose* – which translates "the more it changes, the more it is the same thing," implying that as hard as we try, things never improve. However, when the fundamentals are sound, change must seek other avenues for its employment.

Finally, *à coeur ouvert*, I dedicate these issues of THE AQUARIST'S NOTEBOOK to a dear friend and colleague, Samuel F. Wineberg.

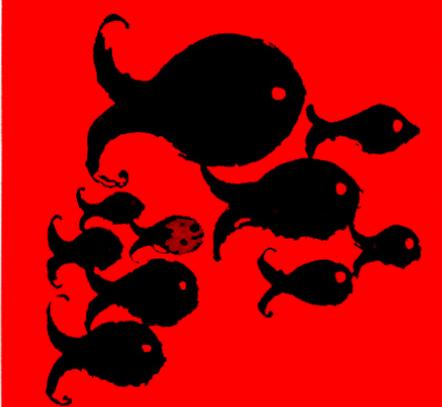
Albert J. Klee

April 5, 2006





The Aquarist's Notebook



Using The Aquarium In Home Decoration

OFTEN OVERLOOKED BUT nevertheless there for the taking, is the value of the aquarium in home decoration. In a sense the aquarium is timeless, seeming to fit in with almost any decor or decorating theme.

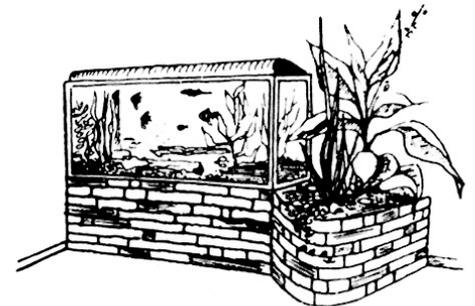


FIGURE 2: A free-standing aquarium supported on brickwork, incorporating a planter besides.

Let's Breed Some Zebras!

THE ZEBRA DANIO is one of the most popular of aquarium fishes and understandably so for it is colorful and active, breeds readily in the aquarium, eats almost anything, and is hardy enough to withstand a temperature range of from 60 to 110 °F.



Before breeding your fish you must make sure that you have a pair. Fortunately, there is little difficulty in telling the male from the female, provided your fish are adult and well-conditioned. The female is deeper-bodied (see sketch), while the male is of a deeper blue coloration.

Two young but mature males and one female (size 1¼ to 1½ inches) should be chosen and conditioned for
(continued on next page)

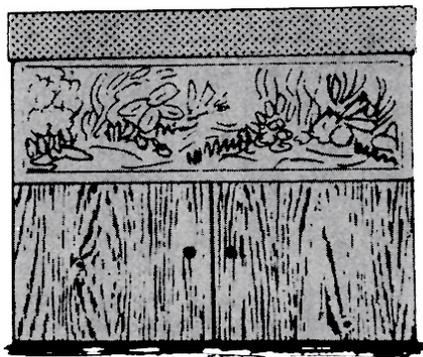


FIGURE 1: A free-standing aquarium with its stand paneled.

Aquaria can be used decoratively in two basic types of installation: the free-standing, and the built-in. A very simple (and easily constructed) example of a free-standing aquarium used as part and parcel of home decor is shown in *Figure 1*. Here, a standard 26-gallon aquarium and stand forms the basis for the installation. The stand, however, has been covered with an inexpensive wood paneling, the front portion being provided with doors. Thus, not only is the final result beautiful, but a great deal of aquarium paraphernalia can be concealed within the cabinet so created. Remember, however, to seal the wood paneling with an exterior-type sealer, to protect

against water spillage.

If one likes to do masonry work, then the free-standing installation of *Figure 2* is dramatic and stunning. Here, a 50-gallon tank and a planter combine to compliment each other to the fullest that each has to offer. Better make sure, however, that the floor is either of slab construction, or else reinforced sufficiently from below. Water and bricks are heavy!

An interesting and quickly-accomplished trick of installing a free-stand-
(continued on next page)

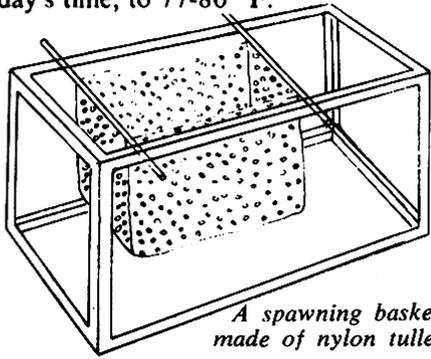
QUICKIE QUIZ

- The electric eel can produce a voltage of (a) 100 volts, (b) 600 volts, (c) 500 volts.
- The tiger barb comes from: (a) Asia, (b) Africa, (c) S. America
- Sagittaria means: (a) "star", (b) "archer", (c) "sword."
- Catfish are very seldom bothered by skin parasites: (a) True, (b) False

(Answers on next page)

Zebra Danio continued

a week or two on a good quality dry food, supplemented with frozen adult brine shrimp, chopped earthworms and such other live foods as may be available. One can save space by dividing a tank with a glass or plastic partition (these are available from your dealer) and placing the males on one side, the female on the other. During this "conditioning" time, the water temperature should be brought up, over one or two day's time, to 77-80 °F.



A spawning basket made of nylon tulle.

The breeding tank should be at least 12 inches long, the water not more than 6 inches deep. About three days before spawning your fish (the most important deciding factor is that the females must be nice and plump, in fact, full of eggs), fill the breeding tank with fresh tap water. Bring its temperature up to that of the conditioning tank, and set in an airstone as well. Since danios will eat their eggs if they get the chance, a sort of basket (see sketch) must be made of nylon mesh (easily available tulle is fine, but soak it in water first to remove excess dye if it is colored) of a hole size of 1/16 to 1/8 inch, and suspended in the aquarium by means of two sticks to which the basket is stapled.

Now place the fish in the basket. The fresh water, aeration and increased temperature will induce them to spawn. Danios like to spawn in the early morning sun so don't be impatient . . . wait at least a day or two before removing them. If your fish have spawned (and if not, repeat the process, perhaps with different fish), the eggs will be found lying on the bottom of the tank, having dropped through the spawning basket. At this point, keep the tank well-shaded against bright light, and return the parent fish to their own tank.

The eggs, perhaps 100 to 400 of them, are transparent and the size of

a pinhead. At 80 °F they will hatch in about 48 hours. Two days later, the fry are free swimming and are ready to take a dust-fine prepared food, or a liquid fry food available from your dealer. Growth is fairly rapid and the young fish must be given plenty of room in which to develop (remove them to larger quarters as needed). They are quite easy to rear on brine shrimp, dry foods, frozen daphnia, mosquito larvae, etc. It's fun! Why don't you try it today?

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Aquarium Decor continued

ing tank so that it looks built-in, is that of making it an integral part of your bookshelves. In *Figure 3* the bookshelf supports are of the starkly-modern, slotted channel and cantilever arm style. The aquarium is simply placed on one of the shelves. Narrow aquaria are best for this purpose since they weigh less (less water) and all equipment (pumps, etc.) can be concealed behind them.

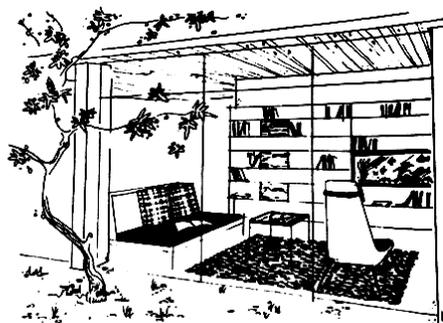


FIGURE 3: A wall of books containing an aquarium on one of its shelves.

Built-in aquaria are also dramatic, especially at night when they are illuminated and the remainder of the room is darkened. They require more work, however, since one must cut into a wall to install them. Generally, one picks a

ANSWERS TO QUICKIE QUIZ

- 1. 600 volts
- 2. Asia
- 3. "Archer"
- 4. True



FIGURE 4: A built-in wall aquarium.

wall behind which is a closet or some other non-critical exposure since the aquarium, although flush with the wall on one side, has to project somewhere on the other side (see *FIGURE 4*).

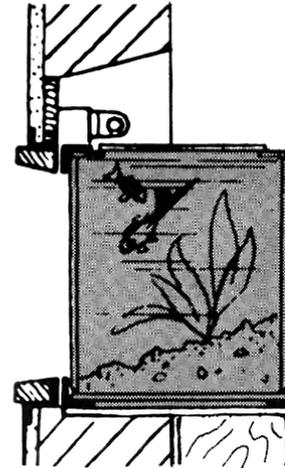


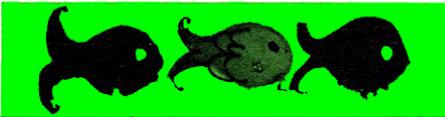
FIGURE 5: A cutaway view, showing details of a wall installation. The front of the aquarium is framed using an ordinary picture frame; the rear projects into a closet, and is supported by several 2 x 4 lumber pieces from the floor.

Figure 5 shows some details of construction for built-ins. The face side is most easily finished off with a picture frame; the rear of the aquarium requires a support (a shelf if the aquarium is small, lumber columns from the floor if it is large). The beauty of built-ins is that everything is concealed; lighting, airlines, pumps, heaters, etc. The extra work is well repaid.

There is no reason why, with a little imagination, you cannot make your aquarium do double duty for you . . . as a fascinating world of living creatures itself, and as a decided brilliant and dramatic addition to your home decor.

THE AQUARIST'S NOTEBOOK
Vol. 1 No. 1

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The Aquarist's Notebook
P.O. Box 139
Fairfield, Ohio 45014



The Aquarist's Notebook



Let's Gamble On A Pair!

OFTEN AN AQUARIST is faced with the problem of choosing one or more pairs of fish from a tank containing fish that are too young, or for which there are no known methods, to sex. Actually, when we select a "pair" of baby angels or small neons we are, in effect, "taking a chance" or gambling. One thing we like to know when we "take a chance" is the odds involved.

Consider an aquarium containing a large number of small black angelfish, too young to be sexed. Just how many of these young fish should we buy to insure that we obtain a pair? Table I shows the probabilities for obtaining at least one pair for various quantities of fish purchased.

TABLE I	
No. of fish purchased	Probability of obtaining at least one pair
2	50%
3	75%
4	88%
5	94%
6	97%
7	98%

(continued on next page)

How Many Fish Can

I Put In A Tank?

HA VE YOU EVER noticed how stuffy a small room full of people can be? To a fish, its room is the aquarium in which it lives. Unlike a human who can leave the room when he becomes uncomfortable, the fish must remain in its aquarium. When too many fish are placed in an aquarium, they may not only be uncomfortable but even in

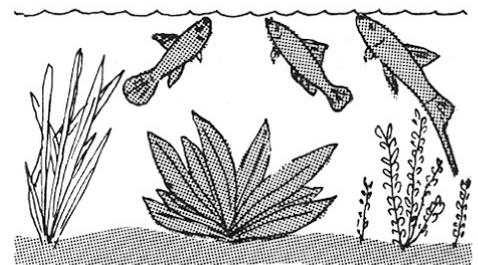
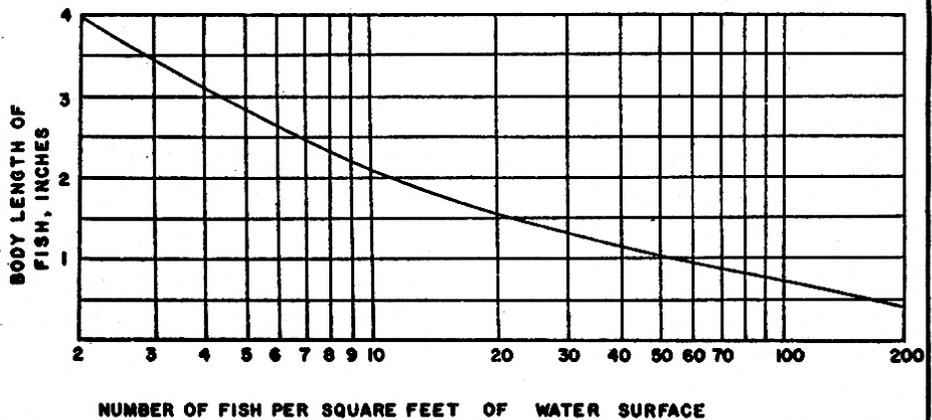


FIGURE 1

FIGURE 2: This graph enables you to calculate the safe number of fishes for your aquarium.



danger. In short, many fish die from overcrowding.

One of the danger signs of overcrowding is shown in Figure 1. The fish are all at the water's surface gulping air. Although there is a possibility that something else may be wrong, fish hanging at the surface is a good indication of overcrowding. For many years, aquarists controlled the number of fish they placed into an aquarium by a simple rule of thumb: Place no

(continued on next page)

QUICKIE QUIZ

(Answers on next page)

- The angelfish comes from Africa.
(a) True, (b) False
- The Congo cichlid (sometimes known as the "zebra cichlid") comes from Africa.
(a) True, (b) False
- Zebra danios have vertical stripes.
(a) True, (b) False
- Zebra cichlids have vertical stripes.
(a) True, (b) False

more than two inches of fish in a gallon of water. In other words, a 10-gallon aquarium could support 20 inches of fish which may be made up of 20 one-inch fish, 10 two-inch fish, etc.

This rule of thumb can be replaced by a better guide, however, i.e., the graph shown in *Figure 2*. Here the basis for the number of fish permitted in an aquarium is not the number of gallons the tank holds but rather the surface area of the tank. A 15-gallon standard tank, for instance, is two feet long and one foot wide. This aquarium has a water surface area of two square feet. The graph then tells us that, for a two-inch fish, 12 of them may be placed in an aquarium for every square foot of water surface, a total of 24 two-inch fish for the 15-gallon tank with two square feet of water surface.

Some air-breathing fishes such as bettas, gouramis and *Corydoras* do not need as much space as other fishes. For these, double the number of fishes indicated by the graph as safe in an aquarium. On the other hand, cold-water fishes such as goldfish need twice as much space as indicated by the graph.

Probability continued.

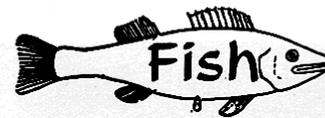
The table holds for all fish, of course, not just angels. For average-cost fishes, a minimum probability of 90-95% is suggested; for expensive fishes, 85-90%.

If we buy more than 3 fish there is, incidentally, a chance that we will obtain more than one pair. For example, if we buy 4 fish the two-pair probability is 38%; if we buy 6 fish it is 78% and if we buy 8 fish it is 93%. If we buy 8 fish the three-pair probability is 27%!

Of course the tank from which we purchase our fish may not contain a 50-50 ratio of males-to-females. This decreases our chances of obtaining a pair as Table I illustrates (The percentages given are the probabilities of obtaining at least one pair; the sex ratios are either male-to-female or female-to-male . . . it makes no difference).

You may not be able to sex fishes using this article but at least you will now know what your chances are!

The Color Of A



IN THE MAJORITY of cases it is the coloration of our fishes that makes them so popular with the average aquarist. This coloration is due to the presence of special cells that carry pigments of two basic types . . . liquid and granular. The liquid pigments produce the yellow-to-red colors, while the granular pigments produce the blacks, blue-blacks and dark-browns.

The surprise is that although we see such colors, there are actually *no* blue

These shine through the embedded layers of fat in the fish's skin in such a manner as to *appear* colored.

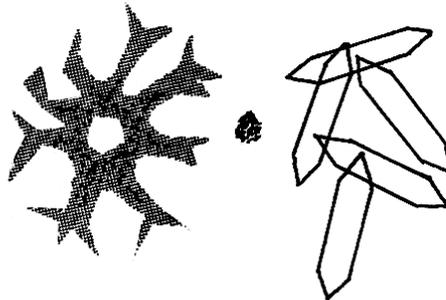
Pigment cells have the ability to contract or expand very quickly, the process being controlled by the central nervous system. For example, if the fish is frightened, the cells close (see diagram) and the coloring of the fish will appear to fade. This is very noticeable, for instance, in the case of the angelfish. Important to note is that permanent fading indicates illness or discomfort in fishes.

Of course there are many other reasons for intensification of color in fishes. Intensification is very common at breeding time when it is caused by a natural increase in the output of sex hormones. Another stimulus to color intensification is the fear of attack by another fish. In this case the fish presents extreme colors to bluff the enemy into thinking twice before taking a chance!

Fishes can not only make a change in intensity but they also can change in pattern. Camouflage is achieved in this manner, particularly by fishes that live in dense vegetation. Others are known to change their color patterns from thin, daytime horizontal stripes, to thick, dark vertical ones at night!

Guanine crystals play an important role in the brilliance of the colors of a fish. These crystals possess a strong refractive action to light, i.e., they deflect the light, producing the impression of the brilliant colors so well known to all who keep fishes. Top lighting affects the guanine crystals to show the fish to their best advantage.

The delicate hues shown by some fishes are caused by the guanine crystals being very near the surface of the skin, and when the crystals are covered by the pigment cells, the result is a luminous effect that has made, for example, the neon tetra one of the most brilliant of all tropical fishes.



From left to right: A pigment cell expanded; a pigment cell in its contracted state; guanine crystals.

or green pigments in the pigment cells of fishes. Such colors are caused by the presence of other colors, particularly black, in conjunction with a special crystalline material called guanine.

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TABLE II

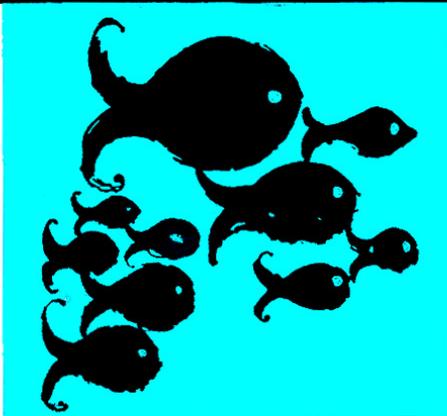
Sex Ratio	No. of fish purchased	
	4	6
50-50	88%	97%
60-40	85%	95%
70-30	75%	88%
80-20	59%	74%
90-10	35%	47%
95-5	19%	27%

ANSWERS TO QUICKIE QUIZ
 1. False (South America)
 2. False (South America)
 3. False (horizontal)
 4. True

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The Aquarist's Notebook



SUMMER CARE OF FISHES

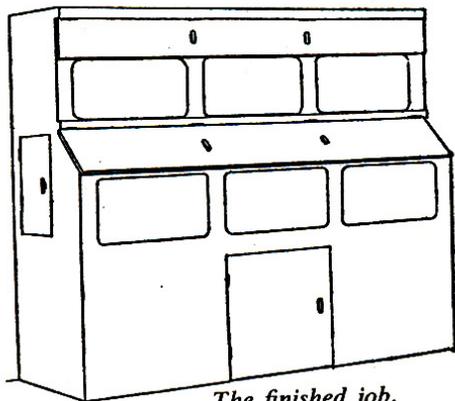
WHEN HIGH TEMPERATURES appear with the onset of the summer months, two courses are open to the hobbyist for the protection of his fishes. The first course attempts to keep summer heat from reaching the aquarium;

countered.

One of the first steps is to make sure that the fish are not overcrowded, for the greater the temperature, the fewer fish an aquarium can accommodate. It is a good practice to reduce the fish popu-

Enclose Those Tanks!

NOT EVERYONE HAS a spare room in which to house his tanks . . . therefore, let's discuss the next best thing—the use of one wall in a room used for other purposes. We will suppose that you have six 24-inch tanks (standard 15-gallon aquaria), though the following scheme can be adapted to any even number of tanks.



The finished job.

If you have an old table you can start with that. If not, get some lumber, not necessarily new nor of fancy

Continued overleaf.



"But you told me to keep them cool!"

several methods are used to accomplish this objective. The aquarist may avoid placing aquaria in the warmer parts of the house or apartment . . . the attic or south and west sides of the building, for example. On the other hand, if a basement is available, it can provide a naturally cooled area for the summer disposition of tropical fishes.

But unless the aquarist plans to locate his fishes permanently in the basement (or is fortunate enough to possess house-wide air conditioning), moving aquaria twice a year is not a very practical solution. Therefore, the second course is the easiest and is used most frequently. This method aims at preparing the aquarium in every way possible so that its occupants can safely undergo the higher temperatures en-

lating of each aquarium during the summer months to one-half or one-third of its former number. Since the evaporation of water from an aquarium is a cooling process, the cover glass of the tank may be replaced with a wooden frame covered with plastic

Continued overleaf.

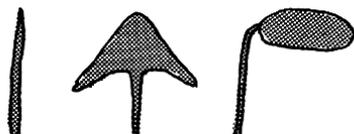
QUICKIE QUIZ

1. The knife fish, *Gymnotus carapo*, has no tail fin. (a) True, (b) False
2. Rasboras come from South America. (a) True, (b) False
3. The eggs of most *Corydoras* species are milk-white. (a) True, (b) False.
4. The adipose fin is on the belly of the fish. (a) True, (b) False

(Answers on next page)

the aquatic leaf

TO AN AQUARIST, the most distinctive part of a water plant is its leaf. Aquatic plants seldom possess the broad, flat leaf of the land plant. There are exceptions, of course, and these exceptions provide aquarists with their so-called "center" plants. But for the most part, they are threadlike (e.g., ambulia) or narrow (vallisneria). It is not difficult to imagine the increased buffeting a broad leaf would receive compared to a narrow leaf, as a result of the strong currents which are present in rivers and streams. In a strong current, the former would be torn to pieces while the latter, by virtue of its smaller resistance or surface area, would remain intact.



The leaves of *Sagittaria*: from left to right, underwater, above-water, floating.

The center plant exceptions serve to strengthen this idea, for such plants are inhabitants of ponds or streams whose water motion is negligible. Thus, the variations in the shape of the sagittarias are easily explained. *Sagittaria* is a genus of plants which possess three leaf forms; an underwater leaf, a floating leaf and an above-water leaf (see sketch). The floating leaf is broad, characteristic of most floating leaves. This form provides the buoyancy necessary to keep the leaf on the water's surface. The underwater leaf is the narrowest, for the lowest resistance, and the above-water form is intermediate in width.

It is important to note that many aquarium plants possess two or three leaf forms which, at one time or another, may be seen by the hobbyist. Water sprite, for example, has a far different shape when planted in the gravel, than it has when it is left floating. The planted form is much narrower.

ANSWERS TO QUICKIE QUIZ

1. True
2. False—Asia
3. True
4. False - back near the tail.

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BUILD YOUR OWN *Continued*

finish. Construct a strong framework of about ordinary table-height, 6 ft. 4 in. long and 18 in. wide (see sketch). Now make four rectangular frames 4 ft. high and 1 ft. wide, to stand on the table against the wall; fix across them bars of 2 x 1 in. wood, the upper edge of which will be at a height of 2 ft. from the table top; the two outer frames should have these bars on the inner sides only, the middle two on both sides.

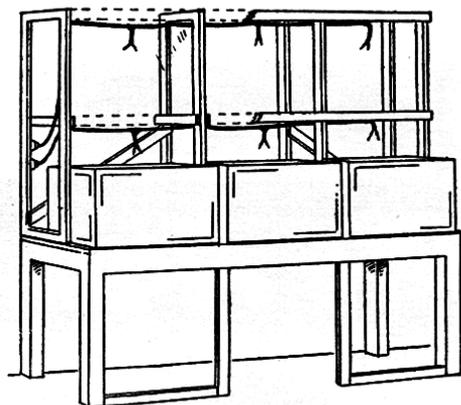
Now set three tanks in a row on the table, their fronts flush with the front edge of it, and with the frames set upright between them and outside them (see sketch). Unite the upright frames by fixing 6 ft. 4 in. lengths of wood across the top at back and front, and one across the front at the level of the cross-bars. It will then be seen that the upper row of three tanks can be slid into place on the cross-bars.

Remove the lower three tanks temporarily in order to attach additional cross-pieces to the uprights behind them, preferably diagonally. You will now see that you have an upper row of tanks against the wall, with a 12-inch space between it and the lower

SUMMER CARE *Continued* screening. This serves to implement evaporation.

Actually, evaporation during the summertime is slower than during winter, mainly because of the higher humidity at this time. If the aquarist has access to artificial aeration, a brisk stream of air bubbles is invaluable in circulating the aquarium water. This provides both an escape for carbon dioxide (a product of respiration which, when in large quantities, is dangerous to fish) and increases evaporation.

If the temperatures in the aquarium are approaching dangerous levels, a current of air from an electric fan



Halfway stage in the construction of a "battery" of aquaria.

row, which is set farther backward. The space behind the lower ones can be utilized for all kinds of odds and ends, nets, siphons, a pump and so forth, and the electric wiring. Lighting can be suspended from the cross-pieces above the tanks.

All that remains is for the whole thing to be given a presentable finish. Two lids are made, 6 ft. 4 in long, one 10 in. wide for the top row, the other 12 in. wide to span the distance between the two rows of tanks. These are hinged on cross-pieces so that they can be raised to service the tanks. They can be constructed of a light wooden frame, covered with wall-board.

Finally, the sides are filled in with wall-board and the front of the table can have a door fitted, so that it serves as a cupboard for jars, buckets, spare tanks, etc. The whole rack nicely rubbed down, filled and painted to tone with the furnishings, should look quite attractive.

may be directed across the surface of the water to hasten evaporation and cool the water. In a real crisis, ice-cubes may be placed in a plastic bag and floated in the water. However, such emergency measures will rarely be needed. If the other simple precautions are followed, there is no reason why freshwater aquarium fishes cannot endure temperatures of 90 degrees F and even more in the case of certain species.

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The Aquarist's Notebook



Plant Layout

THE PLACING OF PLANTS in the aquarium will depend upon what layout you favor, but it should always be contrived that the corner uprights at the back of the tank be hidden as they usually detract from the decor. If the back is of clear glass, it may be desirable to put a screen of plants across to hide whatever may be seen through it. If opaque, however, it is better to leave a part of it visible, and to group your plants in a nice composition. Some of the possible ways of arranging tanks are shown in the accompanying figures.

Notice that in one of them a piece of rock has been placed, like a pinnacle, to obscure one of the back uprights. If this is done, make sure that your piece of rock is a kind without strata. or it will look wrong; granite or quartz are suggestions.

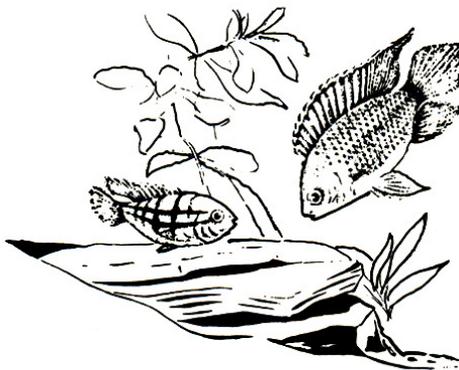
Each clump of plants should consist of only one species. A mixture not only looks unnatural, but after a time one is sure to be overcome by the other, so you finish up with only one anyway. The "center plant" is, of

Continued overleaf, second column.

LET'S SPAWN A

DWARF CICHLID!

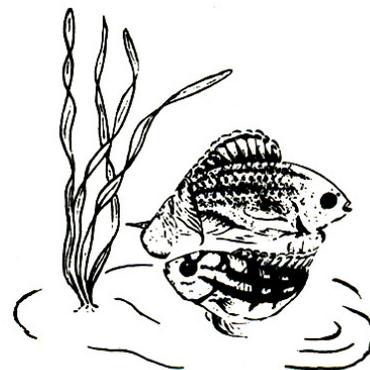
ONE OF THE DWARF CICHLIDS most commonly found in dealers' tanks these days is *Nannacara anomala* (pronounced NAN-AH-KAR'-AH AH-NOM'-AH-LA). This small (1½ to 2 inches) fish is quite suited for the community tank, unlike many of its larger, rougher cousins. Although not flashy in appearance, its breeding behavior is fascinating and it makes an excellent subject for the beginner interested in breeding cichlids.



The male (right) and female (left) start to clean the spawning site, in this case a flat rock.

The first step is to select a pair. The males are larger and show less of the barred pattern so striking in the female. This is clearly seen in our sketches. If the fish are very young, however, both males and females will show the barred pattern equally but with maturity the males replace their bars with rows of small, dark spots. If excited, however, the bars may return

temporarily. When not breeding, the male is not very colorful, but during spawning, he takes on a rich, chocolate-purplish color which is breathtaking. A 5-gallon tank is sufficient.



The spawning "dance" . . . male and female circling around each other.

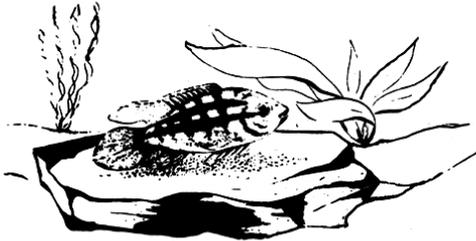
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QUICKIE QUIZ

1. Cichlids have spines in their dorsal fins. (a) True, (b) False
2. The primary purpose of aeration is to force oxygen into the water via the air bubbles. (a) True, (b) False
3. Catfishes are more closely related to killifishes than they are to rasboras. (a) True, (b) False
4. The swordtail comes from Mexico. (a) True, (b) False

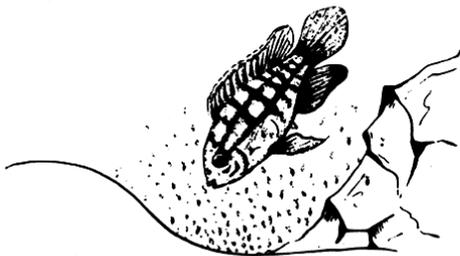
(Answers on next page)

Along with the usual gravel bottom, plants, heater and filter, a flat rock should be supplied (see sketch). It is on this rock that the fish will usually spawn, although don't be surprised if they decide to spawn on the filter or in a corner! In any event, the tank should be located away from traffic, in a quiet area devoid of bright lights.



The female, guarding her eggs.

The "secret" to breeding is in conditioning. The fish should be fed well. Frozen adult brine shrimp, live mosquito larvae, flake dry food . . . all are excellent. A variety of foods is best. While the pair is being conditioned in the tank together, slowly raise the temperature of the water over a period of a week to about 80-82° F. If all goes well, the fish should indulge in their typical nuptial circling, and ultimately spawn on the flat rock (see sketch). A breeder's trick is to stimulate spawning by a sudden addition of cool tap water, just enough to lower the temperature a degree or two at the most.



The female once again, this time with a swarm of her young relocated in a pit she has dug.

After spawning, the female guards the eggs. Carefully, so as not to disturb the eggs, the male should be removed. (If the female eats her eggs, leave the male in the tank the next time around). In 2 or 3 days the eggs will hatch, resulting in a quivering, jelly-like mass of about 30 or 40 fry. The mother fish will start to move her

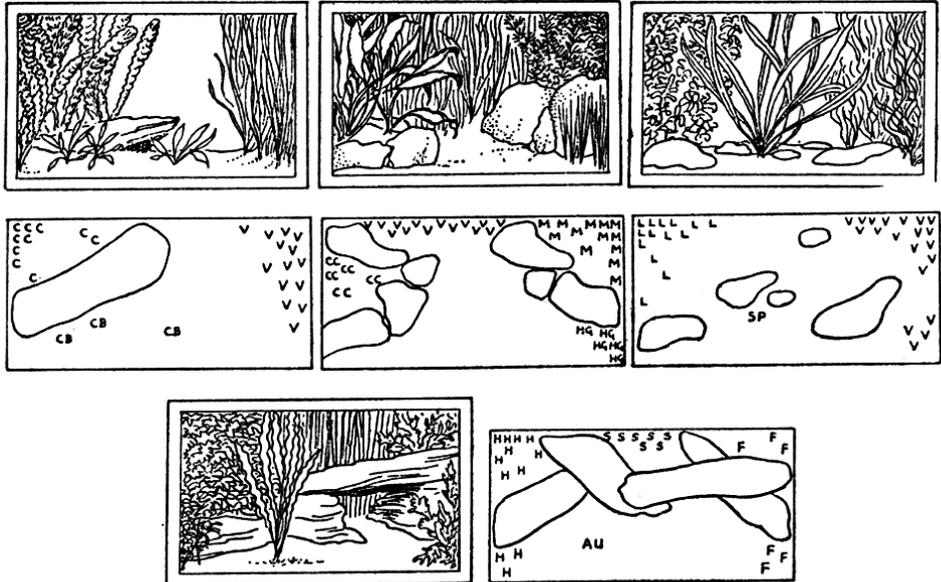
course, always set apart from the massed plants, usually somewhat nearer the front.

Sometimes the composition is aided by the placing of some low-growing plants near the front of the tank, perhaps to take the bareness off an expanse of rock or sand. Such plants are the little *Cryptocoryne willisii* or underwater four-leaf clover. Hair grass can also be used in this way, the scene being visible between the fine leaves when it grows tall.

When all plants are in position, put the cover on the tank and switch on the light. A few final touches may be necessary . . . the pushing down of a root here, the smoothing over of some

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sand there, and then it can be left to settle while attention is turned to the question of fishes. A little while after their introduction to the tank, the plants should have a number of shining, bead-like bubbles rising from them, due to the oxygen they have excreted. This is a good sign, showing that they are breathing efficiently.



Front views and plans of four layouts for tropical aquaria:

All) *Anonopeton undulatum*; C) *Cahomba*; CW) *Cryptocoryne willisii*; CC) *Cryptocoryne cordata*; F) *water fern*; N) *Hygrophila*; HG) *hair grass*; L) *Ludwigia*; M) *Myriophyllum*; S) *Sagittaria*; SP) *swordplant*; V) *Vallisneria*.

fry to depressions in the gravel (this goes on for about 5 days!). Don't be alarmed . . . look around. They will be found, with their mother, somewhere! At this point, the fry can be fed newly-hatched brine shrimp or fine dry food.

In a week or two, the mother can be removed and the fry reared on their

own using frozen baby brine shrimp and crumbled flake food. In eight months or so you will have a school of cichlids, ready to spawn. Remember to move them to larger quarters. Finally, if at first you don't succeed, try again. Cichlids are highly individualistic, just like people!

ANSWERS TO QUICKIE QUIZ

1. True
2. False (to provide circulation which assists in oxygenation at the surface)
3. False
4. True

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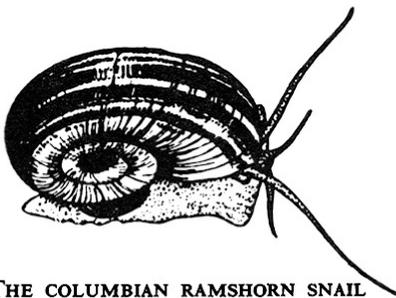


The Aquarist's Notebook



How About Snails?

AQUATIC SNAILS IN themselves are interesting animals, living pretty much on the same foods that fishes do. Whatever our reasons may be for desiring to keep snails in our fish tanks, the fishes decide for us whether it may be done. That is to say, quite a few



THE COLUMBIAN RAMSHORN SNAIL

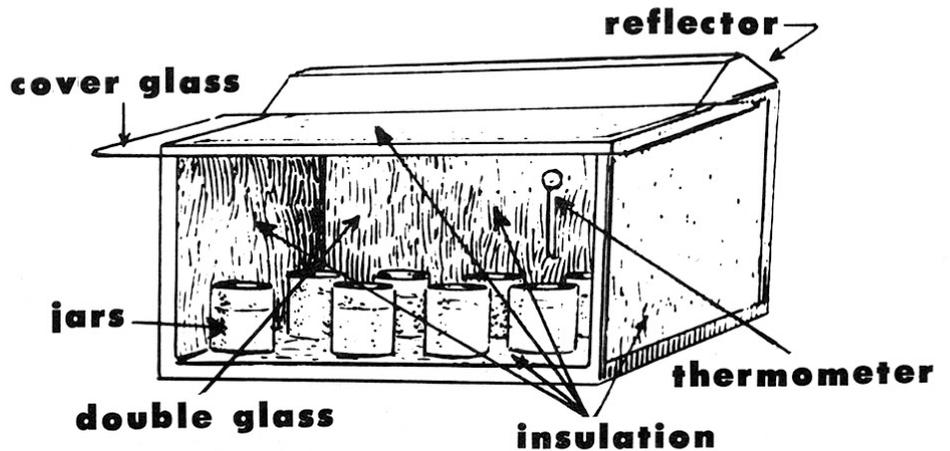
of our exotic fishes either amuse themselves or satisfy their appetites by taking a nip at a snail. The popular guppy is one of the slow-but-sure snail tormentors. The swordtail is pretty bad, while all the bubblenest builders (paradise fish, betta, gourami, etc.) and the cichlids are fatal, the latter shaking them out of the shell and eating them. Better snails' friends are found among

Continued overleaf, first column.

A Solution To The Betta Jar Problem

IF YOU HAVE EVER wondered how to keep a number of betta jars in a compact, attractive and yet warm place, the following idea may help. Secure an old (a "leaker" will do!) 10-gallon tank with reflector and glue a

controlled by turning the bulbs on or off, should a severe cold snap or torrid spell occur. Temperature can further be controlled to a nicety by having in the reflector several electric bulbs of low power, turning on as many as are



number of acoustical ceiling tiles on the bottom, sides and back of the aquarium. Also glue some tiles to the cover glass. These are used as insulation and may be painted to suit the aquarist's tastes, or left as is.

Next, cut a piece of glass to fit inside the tank about 1/2 inch from the front glass. This acts as a thermal barrier and will conserve heat. Place a good air thermometer inside the aquarium by means of a suction cup.

Now place the betta jars inside the tank. The heat given off by the bulbs and retained by the highly insulated walls and floor create an almost unchanging temperature which may be

needed to meet changing conditions. This unit is made quite easily and is low in cost, not to mention its attractiveness.

QUICKIE QUIZ

1. Water sprite has relatively hard leaves. (a) True, (b) False
2. "Blue-white" fluorescent bulbs are better for aquarium plants than are "warm-white." True, (b) False
3. Angelfish may breed as young as 8 months old. True, (b) False
4. Some dwarf cichlid eggs are colored brick-red. (a) True, (b) False

(Answers on next page)

The Aquarist's Notebook

the danios, the rasboras, the loaches and the South American catfishes. Usually, platys and mollies leave snails alone, as do most tetras.

The two most commonly used snails in the aquarium are the ramshorn (*Planorbis corneus*) and the pond snail (*Physa*). Neither of them nibble at healthy leaves but they do eat fish eggs. Once introduced among fishes that do not kill snails, the pond snail is hard to eradicate. Even fishes that do not touch adult snails, however, will eat newly-hatched red ramshorns with relish (they are good wholesome food).



THE RED RAMSHORN SNAIL

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all other vegetation. Neither do they eat brown algae. This is less common and less destructive. Neither are they able to cope with a strong growth of long, firm hairlike algae, once it gets off to a good start.



THE INFUSORIA SNAIL

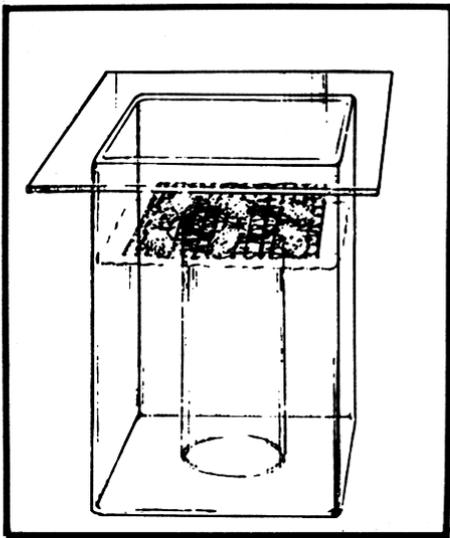
Other snails for the aquarium include the Columbian ramshorn (*Marisa rotula*), the freshwater limpet (*Ancylus*) and the "mystery" snails (*Ampullaria*). The Columbian ramshorn is a very pretty snail in which clear alternating stripes of ivory and brown adorn the shell. It is, however, a plant eater when

other food is scarce. The freshwater limpet is only 1/8th of an inch long, and looks like a miniature clam. The mystery snails are the giants of the aquarium, common varieties reaching a diameter of one to two inches in the aquarium. The female crawls above the water line at night and deposits a large mass of eggs which are soft at first, but they harden in a few hours.



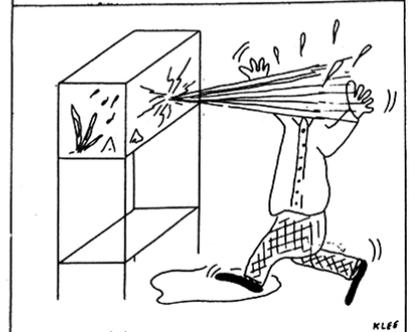
THE COMMON POND SNAIL

Eggs require proper conditions for hatching, principally warm, reasonably moist air. One *Ampullaria*, the so-called "infusoria snail" (*Ampullaria paludosa*) is a prodigious plant eater. Kept in a gallon jar and fed lettuce and other vegetable materials, the water in which it lives makes a very fine infusoria culture for tiny fry.



A MYSTERY SNAIL HATCHERY. In a dry atmosphere the eggs become too hard for the embryos to break through. If the eggs are placed as shown here on a piece of open wire screen that is just above the water, the young will emerge in about 2 weeks and fall into the water. Keep the tank covered and at about 80°F. Any jar, nearly filled, can be used to support the screen.

Painstaking aquarists are able to keep green algae wiped off broad or firm leaves such as swordplant, *Sagittaria*, *Cryptocoryne* or *Vallisneria*, but they cannot work through the delicate structure of the finer-leaved plants such as *Cabomba*. Plenty of small snails to scour these small strands is what is needed to keep ahead of algae. No snail, however, eats blue-green algae, a pernicious growth that chokes



ANSWERS TO QUICKIE QUIZ

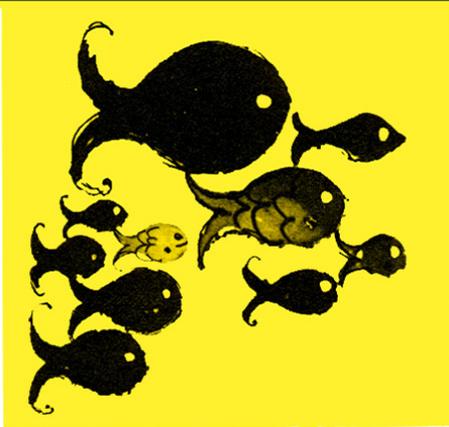
1. False
2. False
3. True
4. True

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Where Do We Place Our Tanks?

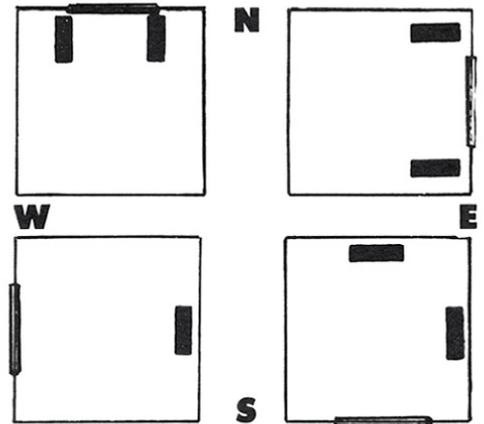
FOR THOSE AQUARISTS desiring to locate aquaria in rooms in such a way as to utilize natural daylight to best advantage, the following will serve as a guide to optimum location. The goal is to situate the tank where it will receive sufficient daylight for good plant growth but at the same time, avoid the excessive lighting that encourages the formation of blue-green algae (a particularly undesirable form).

In general, aquaria should be located on the wall opposite the window when the window is on either the west or the south side of the room (such rooms are usually very bright). If the window is on the south side, an aquarium may be placed on the east wall but it must be situated at least three feet from the window (see sketches).

The best location for an aquarium is in a room with a window in the east wall. In this case, lighting is excellent and algal growth is minimal. The tank should be placed on either side of the window as shown in the sketch. For northern exposures, a similar placement is recommended but in this instance, the tank must be located as close to the window as is practicable.

The above discussion assumes that the windows are unobstructed, i.e., that there are no trees or other structures present that modify the usual light paths. Should a room have more than one side containing a window, then

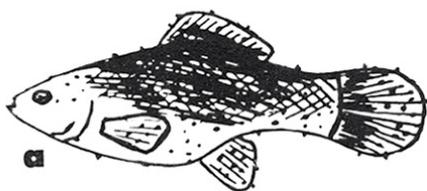
both should be considered and the best compromise location selected. Under no circumstances should aquaria



The above sketch shows the best locations (dark rectangles) for an aquarium, according to the position of the room's window.

An Ounce of Prevention...

IF THE PRINCIPLES OF good fish-keeping have been carefully followed, it is seldom that your fishes will become sick. Accidents will occur, however, as well as troubles over which the aquarist has little or no control.



An important part of keeping an aquarium healthy is to recognize the various fish ailments during their early stages. If you can, then control measures may be taken to prevent more serious conditions. Five very common disorders are shown in the sketches. They are: (a) *White spot* or "Ick", an infection caused by parasites which produces tiny white spots over the fish's body and fins; (b) *Consumption* a

Continued overleaf, first column.

be placed directly in front of a window. Invariably, algae will form and other problems, such as drafts, may cause concern also.

QUICKIE QUIZ

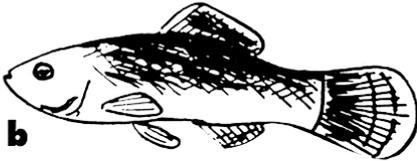
1. Brine shrimp eggs make good fish food. (a) True, (b) False
2. There is no such thing as blue pigment in fish. (a) True, (b) False
3. Fish can turn their heads in the same sense as can Man. (a) True, (b) False
4. The term "moon" refers to a type of platyfish. (a) True, (b) False

(Answers on next page)

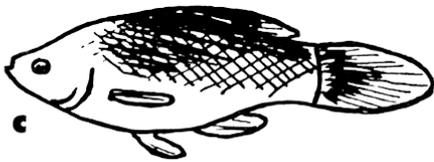
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PRINCIPLES *Continued*

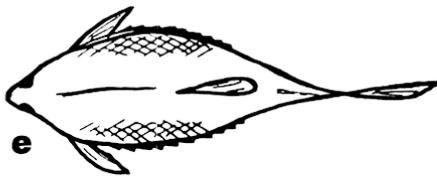
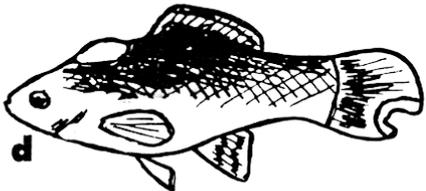
wasting away of the fish which is especially noticeable in the belly area; (c) *Folded fins*, a general condition indicating that something more serious is to follow; (d) *Fungus*, a white fuzzy growth that can occur on any part of a fish's body or fins and (e) *Dropsy*, a swelling of the body so great that the scales stand out.



White spot is a definite disease with a specific treatment. It is usually brought about by a sudden drop in water temperature or by infection from other fishes. There are several commercial remedies on the market for this disease and they work well. Ask



your dealer about them. Fungus is also a specific disease and remedies are available commercially, too. For some ailments, there are no cures. This is the case with dropsy and most often the case with consumption if it has progressed too far.



On the other hand, when an aquarist notices a fish with folded fins, there is still hope. Make a check for possible causes such as dirty water, black or foul gravel, overfeeding, chilling, etc. A preventative treatment with a broad-spectrum antibiotic preparation or a sulfa remedy, available at your dealer's, often will prove helpful. With tropical fishes, it is far easier to prevent a disease by using good methods of care than it is to cure it. 

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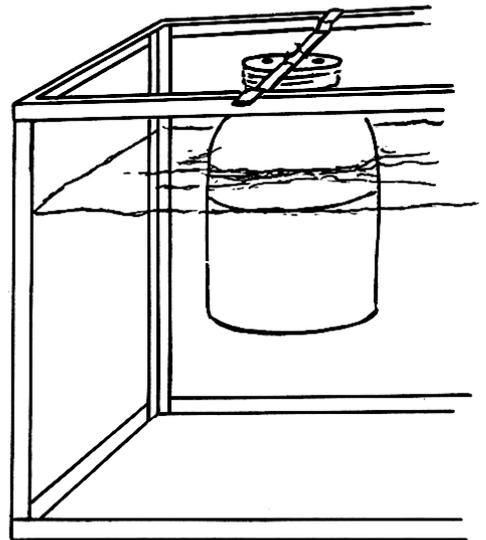


ANSWERS TO QUICKIE QUIZ

1. False. They become food only when hatched into baby shrimp.
2. True. Blue colors are produced by hard, prismatic-like crystals called guanine. These crystals are colorless.
3. False. Although many fishes can bend their spines to an amazing extent, no fish can turn their heads like Man.
4. True. It refers to a dark, moon-shaped mark at the base of the tail.

A Tank in a Jiffy!

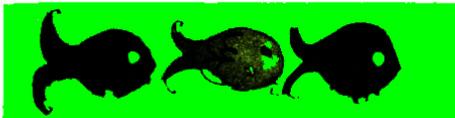
AS HAS OFTEN been said, "Necessity is the mother of invention." Forced to find a friendly refuge for seventeen newly-born guppies, the thought occurred to me that a large pickle jar suspended in the aquarium might furnish the answer. Accordingly, holes for ventilation and feeding were cut in the screw top and a thin strip of metal wired across it, the whole then being suspended in the aquarium as shown in the sketch.



Such an arrangement is handy for other uses as well. It sometimes happens that a fish is a little out of condition and is picked on by other fishes. Such a fish needs protection and treatment but it is important that neither the water or the temperature on it be changed. Something of this kind should fill that need very well for the fellow who has no extra space, and who is dependent upon only one heater.

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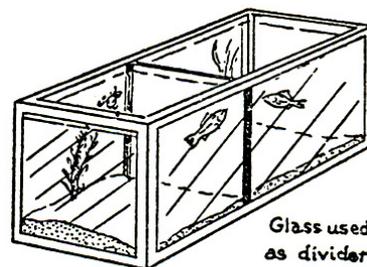
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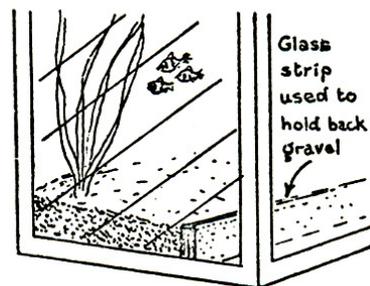
Glass Guide For Aquarists

HAVE YOU EVER GIVEN ANY thought to just how important a part glass plays in the fishkeeping hobby? The uses range from the obvious to the obscure and one or two may not have occurred to you.

If a tank cracks it may be possible to get away without re-glazing by cutting a piece of glass to the internal size of the back, side or whichever is cracked, and running a silicone sealing compound all around and pressing the new piece of glass into position.



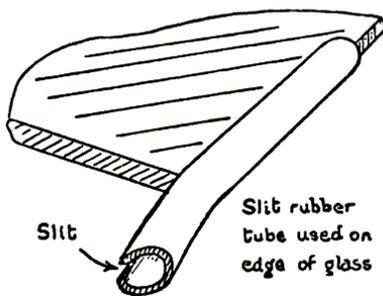
Glass used as divider



Glass strip used to hold back gravel

ABC's Of Sexing Fish

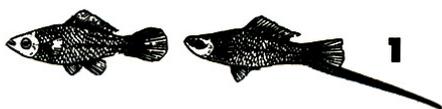
TO THE EXPERIENCED AQUARIST, the sexing of ordinary species may be simple but to the beginner, it may be one of the greatest mysteries in the aquarium hobby. With the help of the accompanying chart, however, a good deal of this mystery may be dispelled. Use it when you buy or exchange fish with a friend. It can be tacked up with tape easily, right on the tank from which your selection is to be made. In all of the illustrations, the female is first, the male second.



Slit

Slit rubber tube used on edge of glass

hold the gravel back and provide a clear area for feeding are worthwhile. If glass is put into a tank, then please take the sharpness off the edges by rubbing on a carborundum stone or you may regret it when torn or damaged fins appear. A piece of glass makes the collection of white worms a "piece of cake". Place the glass over the worm culture after feeding, and the worms may be scraped off the glass practically clean and ready for feeding.



1

The first three sketches are of live-bearers. In specialized cases, there are specific indicators that almost automatically sex the fish for you. In (1), for example, the spike-like extension on the lower lobe of the tail fin identifies the male swordtail; in (2), the far superior dorsal fin, a magnificent at-

Continued overleaf.

Glass can be used as a separator in a tank to keep two fish apart to prevent fighting or to encourage their ardour before mating. It also makes a good breeding trap if inclined at an angle across one end of the tank with a small space to allow new-born livebearer fry to slip through into safety. In both cases the glass is easier to position if rubber channeling (often available at your dealer's) is slid over the edges that will come into contact with the aquarium sides.

Thin strips of glass about 1-inch wide along the front of the tank to

QUICKIE QUIZ

Name the fish associated with the following aquarists:

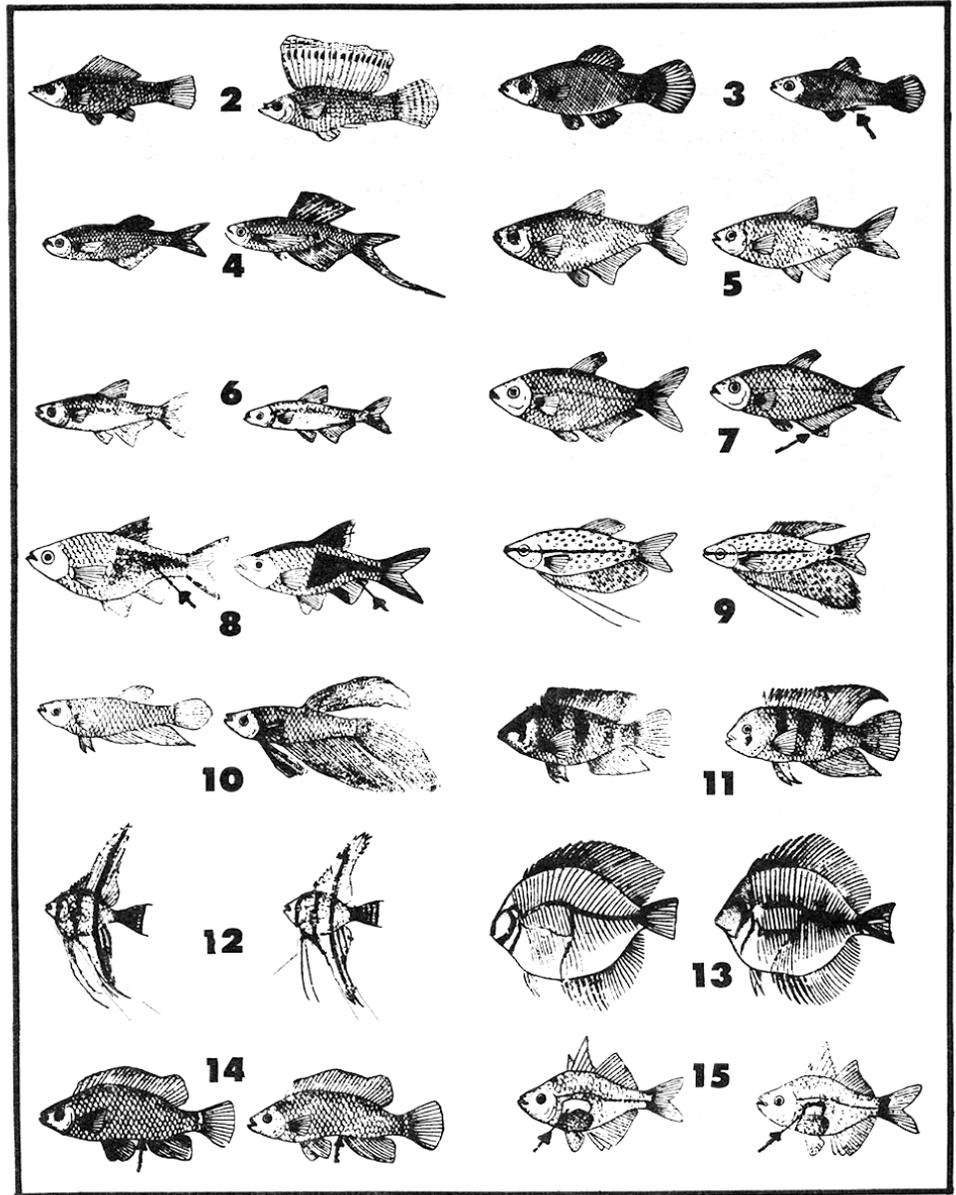
- (1) Simpson
- (2) Tutwiler
- (3) Hahnel
- (4) Cosby
- (5) Schubert

(Answers on next page)

traction, marks the male sailfin molly. In most other livebearers, however, the aquarist will have to rely on the modification of the anal fin in the male called a "gonopodium" (see 3). This is a tube-like structure that is intimately connected with the mating act in livebearers.

Some characins also have very obvious sexual differences. The male swordtail characin, for example (4), sports a spike-like extension on his tail fin and also a pair of "paddles" on his gill covers. Other characins, however, are not so easy. In these cases, body shape is an important indicator, the female usually having the deeper body (5). In slim fishes, you must look hard to find this difference as it often is very subtle indeed (see 6). Rasboras, barbs, minnows and the like are also sexed by the deepness of the body of the female. There are other very subtle differences that can be used in sexing all of these fishes. For example, the males in many species have a more sickle-shaped anal fin (see 7). In *Rasbora heteromorpha*, the male's triangular-shaped body marking is darker and more well-defined (see 8).

The bubblenest builders are mostly sexed on the basis of their anal and dorsal fins, which are longer and more pointed in the males (see 9). In some of them, the differences are slight (pearl gouramis, for example) and are best seen on very mature specimens. Bettas are easy, since the fins of the male are much longer than that of the female (10). The principle of longer and more pointed dorsal and anal fins in the male, holds also for cichlids (see 11). The exceptions here are angels and discus. In angels, the space between the pectoral and ventral fins is more vertical in the males, and the pectoral fins of the male fish (i.e., the "feelers") are straighter (see 12). Discus are very hard to sex. Radiographs of discus have shown some skeletal differences (see 13) but this is not practical for the average hobbyist and doesn't do the discus any good! Our sketch does show some differences in fin shape, however, and aquarists



should try to look for these.

Some fishes such as *Badis badis* and related species are naturally somewhat hollow-bellied. The principle of body shape still holds, however. The males are more hollow-bellied than the females (14). In the glass fish, internal differences in the shape of the air bladder exist, but in this case they are easily seen (see 15).

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ANSWERS TO QUICKIE QUIZ

- (1) Swordtail (Simpson swordtail)
- (2) Betta (the butterfly betta)
- (3) Guppies
- (4) Blue Gourami (Cosby gourami)
- (5) Barb (Schubert's barb)

THE AQUARIST'S NOTEBOOK
Vol. 1 No. 7

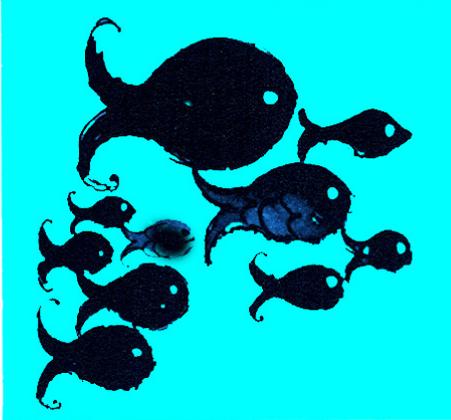
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Aquarist's Notebook - Volume II





The Aquarist's Notebook



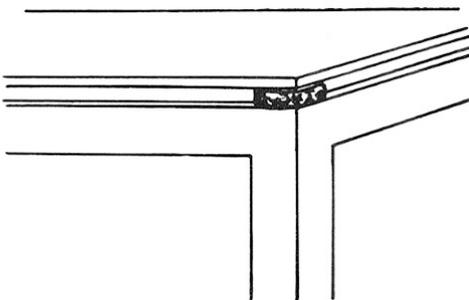
Let's Spawn Some Bettas!

FOR THOSE INTERESTED in spawning the beautiful Siamese fighting fish, or betta, the following explains just how one would go about it. First, set up a ten-gallon tank with an under-gravel filter, a medium-sized water

the female in the spawning tank with him. At this time the male's coloring assumes a brilliancy beyond relief. He maneuvers his body into peculiar contortions (see sketch) about the female, literally squeezing the eggs from her

The Cover Glass

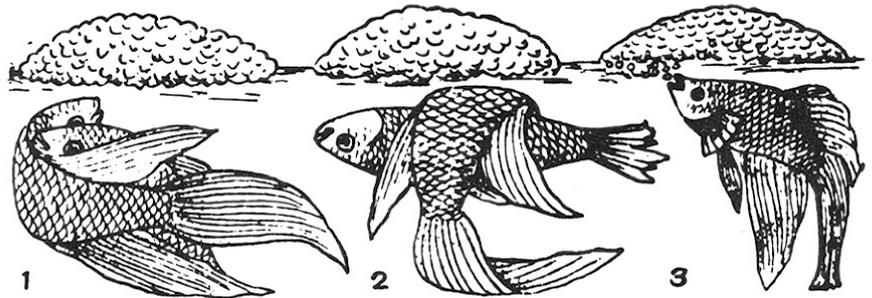
PLACING A COVER ON an aquarium is a simple enough thing, yet there are numerous ways of doing it, some much better than others. A cover has many functions. Mainly it keeps frisky fishes from leaping out, provided not too large an opening is left. Evapora-



Glass cover, setting on cork or rubber pads which have been secured to aquarium frame by a little dab of Silastic.

tion produces cold. A glass cover reduces evaporation; therefore it conserves heat. Also it is of benefit to plants to have the surface of the water dust-free. Fishing cats are not unknown but a good heavy glass top baffles them.

Continued overleaf, third column.



Part of the spawning "dance" of the pair. The male's body is almost bent double around the female.

The male then retrieves the eggs (which are heavier than water) and blows them into the bubble nest.

sprite and a thermostatic heater set for 80°F. Condition the male and the female (in separate tanks) for a week or two on a varied diet of flake dry food, shredded beef heart and live food if available. Then add the male to the prepared tank. The betta's nest consists of a mass of bubbles that adhere to each other, and sometimes the mass covers an area over six inches square. The bubbles are made by the male fish who rises to the surface and takes quantities of air into his mouth. He then submerges, releases the air in bubbles that rise to the surface. This may go on for ten to twenty hours.

When the male has blown a bubble nest about three inches in diameter, put

and fertilizing them as fast as they are expelled. While the female is recover-

Continued overleaf, first column.

QUICKIE QUIZ

1. "Liberty" is a variety of what kind of fish?
2. An opaque-white *Corydoras aeneus* egg is one which has not been fertilized. (a) True, (b) False
3. "Port" is a commonly used term for a type of cichlid. (a) True, (b) False
4. "Porthole" is a commonly used term for a type of catfish. (a) True, (b) False
5. Killifish are generally small and consequently need infusoria as a first food. (a) True, (b) False

(Answers on next page)

BETTA Continued

ing, the male is busy picking the eggs up from the bottom of the tank, not to eat, but to place them in the nest. This operation is repeated many times until many hundreds of eggs are laid.

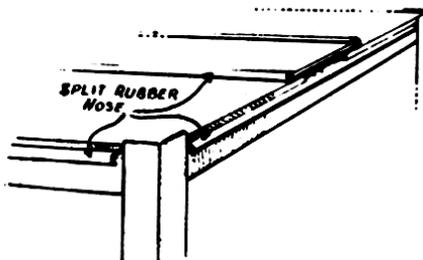
The task is finished, the male drives the female away from the vicinity of the nest (at this point, remove the female). He now assumes paternal duties by guarding the eggs, which will start hatching in from 36 to 48 hours; he will then guard the fry. After hatching, his job is to keep the fry near the surface. Any that drop below the safety line are returned to the nest where he will tuck them up with some more bubbles. For the next two or three days he is kept very busy. This goes on for three days, until the fry are free-swimming. Then remove the male; his job is done.



After the fry hatch, they hang downwards from the bubble nest. Often, they drop and have to be returned by the male.

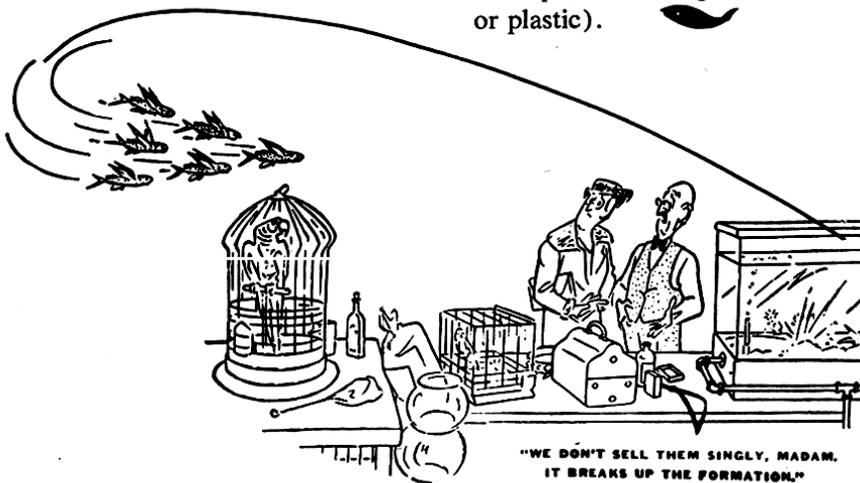
When you remove the male it is time to start a brine shrimp culture. Small quantities of infusoria water should be given frequently (use either the commercial tablets available, pond water or a culture you have made yourself from various kinds of vegetable matter — bananas, for example). In a few days, you can start feeding the newly-hatched brine shrimp. Remember to keep their bellies full! As they grow, regular foods such as frozen brine shrimp, tubifex worms, etc., may be given. Spread your fry out as much as your tanks will permit as they need room in which to grow. As soon as they can be sexed, remove the males to individual jars — one-quart fruit jars are excellent. A good way to sex young bettas is to examine their ventral fins. If they are sharply pointed, they are most likely males. Another way is to look down upon the fish from

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Split rubber hose on aquarium frame, supporting glass cover and protecting frame from drip. The upper slab of glass allows some ventilation, and, in the case of a large aquarium, makes lighter pieces to lift than when one big sheet is used.

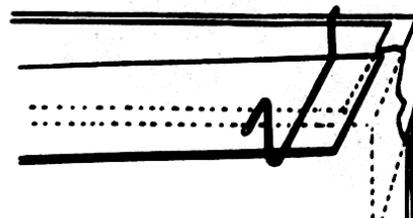
above. The males generally have a round belly with the body thinning rapidly to the tail. The females are generally thicker in the belly, tapering gradually to the tail. The females need not be separated. Good luck! 



- ANSWERS TO QUICKIE QUIZ**
1. Molly
 2. False. These eggs are normally milk-white.
 3. True. *Aequidens portalegrensis*.
 4. True. *Dianema longibarbus*.
 5. False. They generally are the largest fry of all aquarium fishes.

GLASS Continued

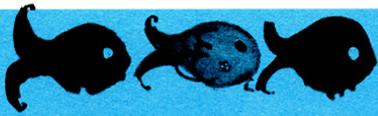
The one worst way to place a glass cover is to stand it directly on the metal frame of an aquarium. The sweat, from condensation, eventually gets in its work on the frame. One of the simplest ways to raise the glass a bit is by placing it on two thin sticks which have been laid across the top of the frame. Low rubber or cork pads on the corners are very satisfactory. They may be secured in place by the use of Silastic, available at your dealer.



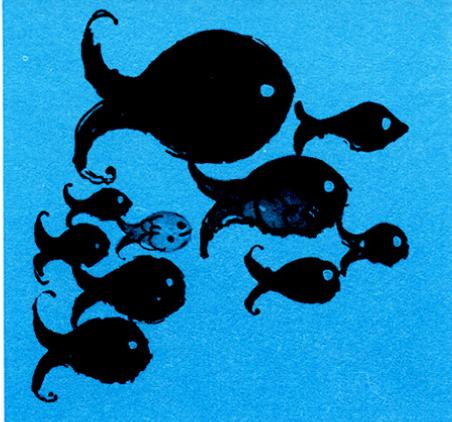
Cover swung inside the frame, on wire support. The other end could rest on the frame, making it easier to lift out.

Split rubber hose is sometimes used on the metal edge. Let the glass sweat if it will. It can do no harm. To secure ventilation, the top may be in three pieces as shown in the accompanying diagram, the top piece also being rubber edged. One of the simplest methods of suspending the glass below the top of the frame is by a pair of U-shaped wire hangers (stainless steel or plastic). 

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The Aquarist's Notebook



Aquarium Artistry

IN APPLYING ARTISTRY to aquascaping, there are a few elementary principles that are musts in the creation of the best possible effect. One of these is based upon the concept of the "dominant third", i.e., the observation that the human eye finds it easy to rest on an object of interest, to roam around it and return again, if that object is placed on, near or around one of the lower thirds of the picture area.

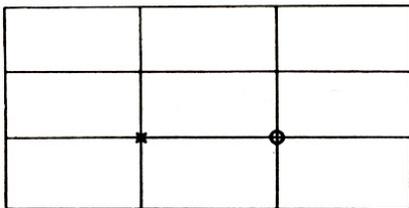


Figure 1: The "dominant third". Either of the intersections marked O or X are most satisfactory for important features in the furnishings of a tank such as rock or bold plants.

Imagine the tank front divided into nine rectangles (see Figure 1). If the object of interest is placed at or near the intersection of the line forming one
Continued overleaf, first column.

Breeding The Cave Spawners

THERE ARE A NUMBER of aquarium fishes that tend to hide both eggs and fry, certain of the dwarf cichlids being notable examples (*Pelmatochromis kribensis* is one). To properly prepare for a successful breeding (and subsequent rearing of the fry) of a cave spawner (the name given to a fish of this group), the aquarist is encouraged to provide two special kinds of places in the breeding tank. This article is not concerned with conditioning of the parent fish, feeding of the fry or other similar aspects of the total breeding picture, but solely with the ideal setting of the tank in which the fish are to be bred and the fry reared.

Two unusual devices are recommended: (1) a breeding cave and (2), a fry refuge. Figure 1 outlines how a 10-gallon tank can be arranged for this purpose. This is a very special tank, so designed that not only can it be used to breed cave spawners, but it is an attractive, permanent community tank for other such fishes in the bargain.

Numbers 1 through 5 in Figure 1 represent plants as follows: 1 and 3 — *Cryptocoryne affinis*, 2 — *Echinodorus grisebachii* (pigmy chain swordplant), 4 — *Cryptocoryne beckettii* and 5 — *Echinodorus paniculatus* (Amazon swordplant). Other crypts and center plants may, of course, be substituted. Finally, locations 6, 7 and 8 represent breeding caves, and locations 9 and 10 represent fry refuges.

A typical breeding cave is shown in Figure 2. The aquarium gravel is removed at one place, and two rock supports are positioned as shown in the sketch. A flat rock is laid across the supports, the resulting structure permitting access by the fish from both sides.



Figure 1: A special aquarium for cave spawners. Numbers 1 through 5 are plants; 6 through 10 are special devices. See text for details.

The fry refuge is also simple and is shown in Figure 3. It consists of a flower pot, broken at the top to form a side opening (number 4 in the

Continued overleaf, second column.

QUICKIE QUIZ

On the left are the partial scientific names of certain fishes; on the right are their partial popular names. Match them up.

- | | |
|--------------|------------|
| 1. everetti | a. zebra |
| 2. rerio | b. knife |
| 3. maronii | c. tiger |
| 4. tetrazona | d. clown |
| 5. carapo | e. keyhole |

(Answers on next page)

of these lower rectangles, we shall find that it is easy on the eye. It seems to be a natural resting point, thus the term, "dominant third."

How can aquarists use this principle to best advantage? Viewing our tank at normal viewing distance and height, we can soon spot the position of this lower third. We can then place an object, a plant or a rock, in this position, just to see how it looks. Unless there are other objects in the picture which are completely out of harmony with the rest, the effect should be a happy one from the pictorial point of view.

The aquarist should endeavour to construct a picture in depth, framed within the front side of the tank. The idea of an uninteresting glass box must be completely destroyed by concealing all inside framework from view. Carefully planted greenery can take care of this item. The gravel floor can cover all of the base framework but we must see that the gravel does not "climb up the glass" at the front of the picture.

We must use our medium with vigor, especially when we are competing in shows. Rockwork and plants must be strong and forceful. Instead of scattering an odd rock or two indecisively here and there, as if undecided whether to use them or not, we can mass our rock at a strong point just as the poster artist masses his color.

Do not choose fish too large or too small. The latter are simply just not seen. On the other hand, we must not choose fish which are large enough to make the picture look small by comparison. What should be done is to balance off our "masterpiece" with fish of such size and coloring that our little isolated world under water is a complete and self-contained entity. It must give us pleasure in feeling that we have created a satisfying picture, perfectly framed, and at the same time achieved a "mobile", with more grace of movement than any artist, using inert materials, could ever hope to produce.

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Figure). It is covered with a flat piece of slate (number 2), the latter secured in position by a rock on top of it (number 1). If the sand level (number 6) is high, flat rocks (number 5) may be used to raise the flower pot to a proper level. The pot is filled with gravel to the level indicated by number 3.



Figure 2: A typical breeding cave, embedded in the gravel and constructed of rock.

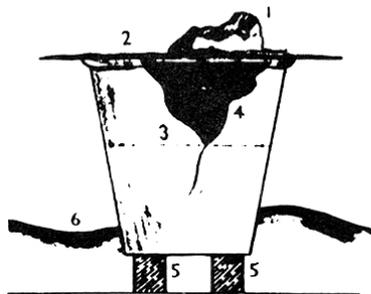


Figure 3: A fry refuge. For details of construction, see text.



Figure 4: The spawning pair, engaging in a prenuptial dance in front of the breeding cave.

The system works as follows. The spawning pair locate a breeding cave and proceed to enter into the usual cichlid prenuptial "dances" (using the *kribensis* as an example — see Figure 4). When ready to spawn, they enter the cave (Figure 5) and deposit their eggs.



Figure 5: After a while, the pair enter the cave and lay their eggs.

As some aquarists may know, dwarf cichlids like to move their fry to a different site, preferably secluded, when the latter hatch. Here is where the fry refuge enters the picture. After the fry hatch, the parents move the fry to a selected refuge after first hollowing out the gravel inside to their liking. Such protection for the fry minimizes attempts by the parents to eat their young, and as one or more of the parent fish usually stand guard just outside, it is easy to tell in which refuge the fry are. Consequently, newly-hatched brine shrimp or other suitable food can be dropped in front of the correct refuge.

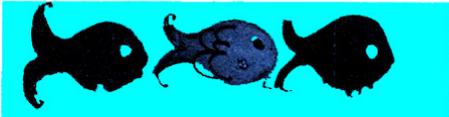
Thus, you can breed your cave spawners successfully, even with other fish in the tank; yet, the aquarium will always be in excellent condition and fighting among its occupants practically non-existent.

ANSWERS TO QUICKIE QUIZ

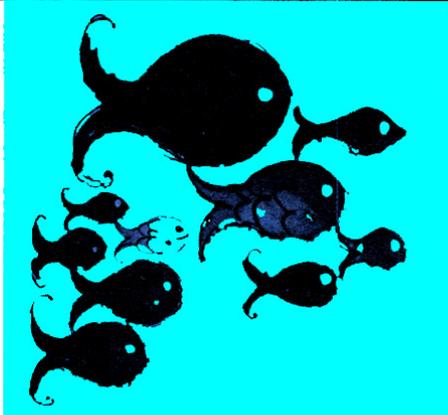
Barbus everetti - clown barb
Brachydanio rerio - zebra danio
Aequidens maronii - keyhole cichlid
Barbus tetrazona - tiger barb
Gymnotus carapo - knife fish

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The Aquarist's Notebook



Some Questions And Answers About The Barbs

THE FOLLOWING DIALOGUE represents several "no nonsense" questions and answers concerning aquarium barbs. They are designed to answer those questions that aquarists most frequently ask with regard to this valuable group of fishes.

supplemented with frozen foods such as adult brine shrimp.

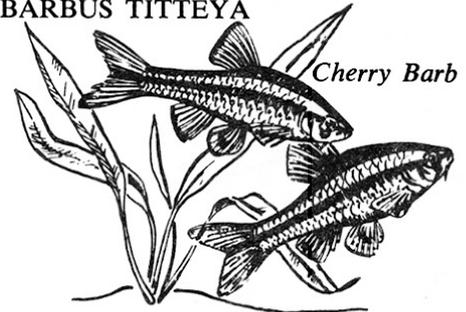
Question: Could you suggest a selection of the smaller barbs that would make a good community aquarium?

Answer: The cherry barb (Barbus titteya) always adds a touch of color

Aquarium Tips

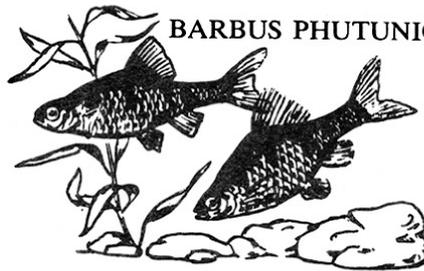
WANTING TO REMOVE a quantity of water from a tank containing three-day old, free-swimming cherry barbs, we devised the apparatus illustrated. A piece of rigid plastic tubing was pushed into the center of a practice golf ball (the plastic type with

BARBUS TITTEYA



Cherry Barb

BARBUS PHUTUNIO

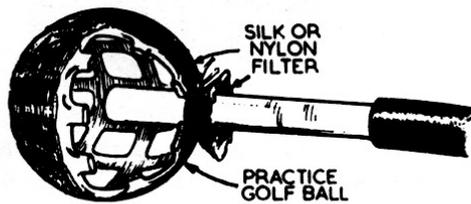


Question: Although barbs are easy to keep, what conditions do you consider ideal in order to see them at their best?

Answer: Barbs, being active fishes, are at their most attractive in medium and larger sizes of tanks and appreciate a reasonable depth of water. For the average barb species, tanks of from 10 to 15 gallons are ideal. In order to obtain the most attractive picture from an aquarium of barbs, at least four fish of each species should be kept as they are at their most active when kept in a small school. Clean water and tank conditions are essential. An excellent tonic for barbs is to siphon off about one-quarter of the water in the tank and run in some fresh, new water. The fishes can be maintained satisfactorily on a varied diet of dry flake food,

to any community. They are extremely active fish. The checkerboard barb (*Barbus oligolepis*) is another very attractive fish. It is hardy and peaceful and, although inclined to be a little on the shy side, is well worth a place in any community tank. *Barbus cummingi*

Continued overleaf, second column.



SILK OR NYLON FILTER

PRACTICE GOLF BALL

holes). The ball was then covered with a piece of nylon stocking, a length of flexible plastic tubing was fixed to the free end of the rigid tubing, and siphoning of water was then done without any risk to the fry.

Continued overleaf, first column.

QUICKIE QUIZ

The following are plays on words of the common names of some aquarium fishes. Guess the fishes!

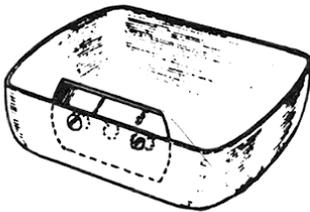
1. A sour fish.
2. Worth a bit more than 99¢
3. "Moth fish" didn't sound as romantic.
4. If you drop it, it breaks.
5. Someone else beat Joe Louis to it.

(Answers on next page)

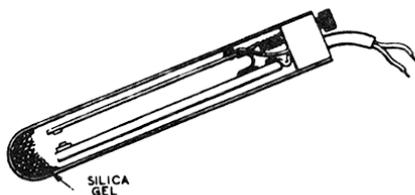
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AQUARIUM TIPS: *Continued from first page.*

To remove fish eggs deposited in a community tank on the glass sides of the aquarium (such as catfish eggs) or on stones, take the lid of a small soap box made of plastic and fix one edge of it with a razor blade, using two or three small bolts. The holes can be made in the plastic by drilling or using a heated screwdriver. When the blade is passed gently under the eggs, they will fall into the box and then collection is easily effected.



By adding a small amount of silica gel, which is a drying agent, to the tube of a thermostat or thermostat-heater combination, the condensation of moisture is prevented from affecting the thermostat contacts. The silica gel is blue when dry and pink after moisture has been taken up, so it can be checked to see if it is still effective. By using the silica gel in the tube, one of the main reasons for sticking thermostat contacts can be avoided as a dry atmosphere is maintained in the tube.



ANSWERS TO QUICKIE QUIZ

1. Lemon tetra
2. Silver dollar
3. Butterfly fish
4. Glass fish
5. Jack Dempsey

BARBS: *Continued from first page.*

is one of the smallest of the silver-colored barbs and is extremely active. The black ruby (*Barbus nigrofasciatus*) can hardly be left out of any community tank as it is certainly one of the most beautiful of the group. The gold barb should be included because its pure golden color forms a contrast to the other fishes and the greens and reds of the plants.

Question: Are there any of the commoner species that cannot be trusted in a mixed collection of fishes?

Answer: Tiger barbs (*Barbus tetrazona*), despite being one of the most strikingly beautiful barbs, are inclined to be a rather spiteful fish in a mixed community. They do not cause the death of the other fishes directly but tend to worry their tank mates and are very adept at fin nipping. Another fish which produces the odd rogue fish is the rosy barb (*Barbus conchoniuis*). Occasional male fish may turn into bullies and have to be removed, although others may remain quite peaceful.

Question: Is it a good idea to start breeding the egglayers by trying with a barb species? If so, which would you suggest?

Answer: The barbs do, indeed, offer some of the most suitable fishes for the beginner to breed. Two species come to mind as particularly good for this purpose; the rosy barb and the black ruby.

Question: What size aquarium and planting, and what type of water is satisfactory for breeding barbs?

Answer: The size, naturally, will vary with the species, but for the smaller barbs, an 8-gallon tank is quite adequate. Either natural (plants such as myriophyllum) or artificial (available at your dealer's) spawning media may be employed. One half of the tank should be provided with the medium, the other should be left bare. The water should be clean tap water which has been allowed to stand for about a week.

Question: How can one sex the majority of the barbs?

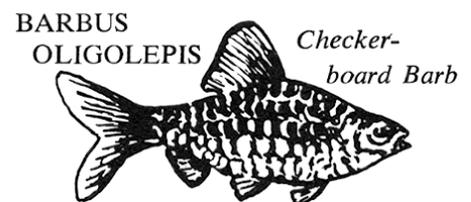
Answer: The male fish are considerably more colorful than the females

and, when in breeding condition, the females are far more heavily-bodied fish.

Question: Information on conditioning the parent fish and method of spawning would be appreciated.



Answer: The parent fish should be conditioned in separate tanks on live foods such as white worms, chopped earthworms, etc., and frozen adult brine shrimp. This conditioning process should take place at between 70-75° F. When the fish are conditioned, the temperature should be increased to 75-80° F. The female should be introduced into the spawning tank first, followed by the male after a few hours. If this is done during the evening, the spawning will usually take place during the early morning. The male, after a spawning display in front of the female, chases her into the spawning medium where from 100 to 500 eggs are scattered. These eggs adhere to the spawning medium. The process will continue for about two hours.



Question: After spawning, then what?

Answer: Remove the parents. The eggs will hatch in about 36 to 48 hours, and no attempt should be made to feed the fry until after they are free-swimming. The first food should be infusoria. After three to five days, newly-hatched brine shrimp may be offered. After 10 to 14 days, some fine dry food may also be given. From then onwards, they can be brought on quite easily by any mixed diet.

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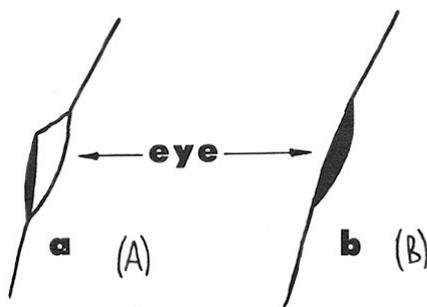
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Breeding The Bloodfin

Disease Symptoms

A PART FROM THE SYMPTOMS that show when a disease becomes established in a fish, there are certain early warning signs that may be observed before the disease actually breaks and that can forewarn the observant aquarist of approaching trouble, for example:



A. The eye of a healthy fish. B. The eye of a sick fish. When both fishes are turned slightly on their side.

(a) A fish that continuously swims with folded fins or refuses food indicates that something is wrong.

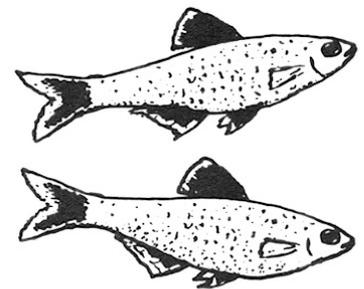
(b) A fish that is healthy will show

Continued overleaf, second column.

THIS LITTLE FISH is a native of South America, within a reasonable distance of Buenos Aires. In an aquarium it seldom reaches 2 inches in total length. This "ideal" size, coupled with a slim, streamlined shape, a certain claim to beauty and an equable temperament, has gained it many admirers.

In breeding them, it is well to give them an aquarium of their own, one large enough to give them ample room to stretch their fins, i.e., a minimum of 24" x 12" x 12". The slenderness of the male and the plumpness of the female are the only signs of sex differences. Live frozen foods such as adult brine shrimp and tubifex should be fed copiously, and the temperature allowed to fluctuate between 72° F and 78° F. Although the spawning has been described as being in the nature of a mad pursuit, during which the fish leap clear out of the water, their bodies contacting in the air, this is not always the way things go. The chase is always vigorous, but leaping into the air does not invariably form a part of it.

The eggs are small and non-adhesive. They are also heavier than water and so fall to the bottom of the tank where some protection is needed from the spawning fish. This can be provided by dense layers of nylon mops into which the eggs can roll or tumble. A trap consisting of glass or plastic rods (see sketch) is also useful. We



*The bloodfin, *Aphyocharax rubripinnis*. The male is on the top.*

recommend the use of water drawn from the tap only the day previously. This fresh water seems to act as a stimulant and often starts a spawning drive when everything else has failed.

Small eggs — small fry! Many aquarists are disappointed if they cannot see fry without difficulty as soon as

Continued overleaf, first column.

QUICKIE QUIZ

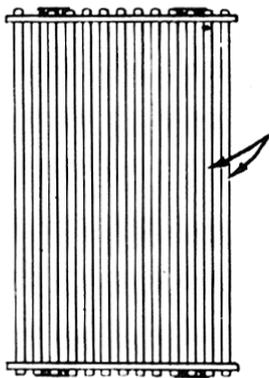
The following aquarium fishes come from the islands indicated. Match up the fish with the island.

1. *Hoplosternum thoracatum*
2. *Limia heterandria*
3. *Pachypanchax playfairii*
4. *Acanthopthalmus kuhlii*
5. *Belontia signata*
6. *Telmatherina ladigesi*
 - a. Java
 - b. Seychelles
 - c. Celebes
 - d. Haiti
 - e. Trinidad
 - f. Ceylon

(Answers on next page)

BLOODFIN continued.

the eggs are supposed to hatch, and too readily assume that the eggs have been infertile if after allowing a day or two to pass they still see no babies. It is far better to assume that all is well, and start adding food for the fry even if they are invisible. The best food for small mouths is water green with free-swimming algae, or a fairly new culture of infusorians. Also acceptable is an infusion made of egg yolk squeezed through a clean handkerchief.



glass
rods

A breeding trap consisting of a shelf of glass or plastic rods. This shelf spans the entire aquarium, a few inches from the bottom.

Follow the infusorians with newly-hatched brine shrimp, microworms, then powdered dry food. With such a diet, growth should be fairly steady and rapid. Within two months the youngsters should be $\frac{3}{4}$ inch in length. Cull all misshapen or undersized specimens as soon as seen, and spread the young fish around into all available tanks. The result should be a brood of fish worthy of exhibition in a "breeder's" class at any fish show. ●

ANSWERS TO QUICKIE QUIZ

Hoplosternum - Trinidad
Limia - Haiti
Pachypanchax - Seychelles
Acanthopthalmus - Java
Belontia - Ceylon
Telmatherina - Celebes

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A Garden Plant In The Aquarium

IF YOU'RE AN AQUARIST with an interest in gardening, you may know the half-hardy perennial herbaceous garden plant which produces tall spires of delightful scarlet-red flowers, and is named *Lobelia cardinalis*. But do you know the attractive aquarium plant of the same name? Unfortunately this plant, suitable for the aquarium, is not nearly as popular as it deserves to be. Perhaps this is due in part to its having no common name but more probably it is due to the fact that it is stocked by very few dealers.

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Symptoms continued.

good colors. If there is a loss of color there is reasonable cause to assume that the fish is distressed in some way. A prolonged discoloration, say for 24 hours or more, should be taken as a symptom of illness.

(c) The eyes are a good indication as to the condition of a fish for the eyes of a healthy fish are raised just a little above the surface of the head. If they sink into the sockets it can be taken for granted that the fish is in poor health.

A good way in which to ascertain the degree of health in a fish is to hold the fish whilst it is still in the water and turn it slightly on its side. If the fish is healthy the eyes will remain in the normal vertical position and will not share the movement of the body. If the fish is ill, the eye will turn with the body and the pupil will be seen from above.

Once it has been established that a fish is sick, a thorough investigation should be carried out to determine the exact nature of the complaint and the appropriate action taken to either isolate or cure the fish.

Lobelia cardinalis looks rather like giant *Hygrophila* in leaf form, but the leaves are much more rounded at their tips and are more robust. The stems of each leaf are about 1 inch long, and the breadth of each leaf is about $\frac{1}{2}$ inch. Color is a pale green.

The plant is quite easy to grow and can withstand a variety of conditions. We have seen very good plants grown under the following conditions: gravel, crushed granite chippings (no calcium carbonate); water temperature 76° F, with pH 7.4 and hardness level 8 DH. Lighting for the 30" x 12" x 15" aquarium was 65 watts (incandescent bulbs) used for 9 hours per day, and



A gardener's plant suited for the aquarium — *Lobelia cardinalis*.

the tank received about 2 hours of natural sunshine. A bottom corner filter was used in the tank which was sparsely populated with fish. No extra feeding was supplied to the plants in the tank, but *Lobelia cardinalis* benefits from such feeding possibly supplied by pressing a tablet of aquarium plant fertilizer into the gravel, near the plant's roots.

The plant can grow very tall, right out of the water, and benefits from having its growing tip pinched out to encourage side branching. It may be propagated from stem cuttings taken beneath a point where a leaf stem joins the main stem, with the lower leaves removed before planting. The plants are suitable for water which is not very soft, thus increasing their usefulness to the aquarist. If you are a gardener, here is a chance to combine two hobbies!



The Aquarist's Notebook



Aquascaping

WHEN CONSIDERING THE design of any aquarium aquascape, first take the rockwork and, in a tank-sized chalked area on a driveway, arrange the stones in a position that looks both natural and decorative, bearing in mind that the main features should be situated about one-third of the way from each end and not in the center. When perfectly satisfied with the results, plan

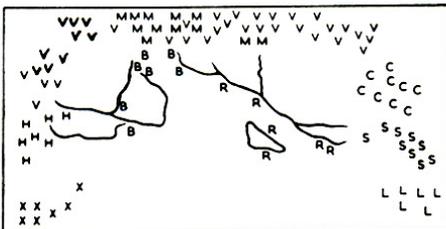


Figure 1. Suggested aquarium planting. B = *Cryptocoryne beckettii*. C = *Cambomba*. H = *Hygrophila*. L = *Ludwigia*. M = *Ambulia*. R = *Dwarf lily*. S = *Spiral Vallisneria*. V = *Ordinary Vallisneria*. X = *Giant Sagittaria*. Such a sketch helps when preparing for a fish show.

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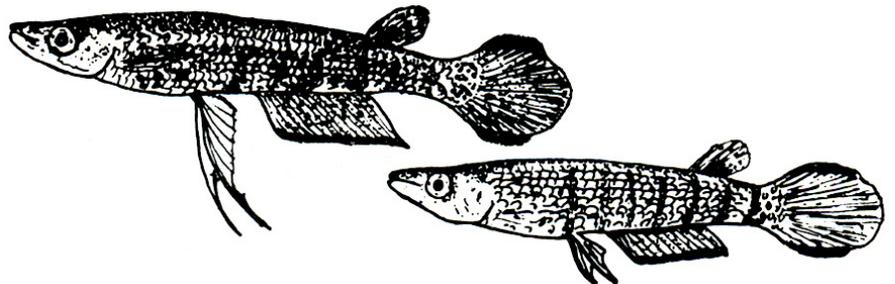
A Beginner's Killifish

APLOCHEILUS LINEATUS are far more beautiful than their name (which is pronounced AP-LOW-KYE'LUS LIN-EE-AY'TUS). If you intend to keep this beginner's killifish (and we recommend that you try them), however, we would suggest that it be kept with fishes its own size. They have large mouths and make no bones about disposing of fishes one-half inch or more in length. The guppy breeder,

ventral and anal fins. She also has more and stronger-marked vertical bars and very few red dots on her body.

A thickly planted aquarium with a heavy layer of floating plants such as *Riccia* is suggested. A temperature of 72° to 78°F is sufficient to encourage spawning. They will eat just about anything.

The male chases the female into the thickets of plants (or better still, nylon



Aplocheilus lineatus, male above, female below.

faced with many fish for which he has insufficient room, and other breeders who have to dispose of their "culls", could do no worse than have a tank or two of this beautiful species. They are by no means "toy" fishes, sometimes reaching a length of four inches.

It is somewhat difficult to describe accurately the colors of this fish for they vary according to the way the light strikes them. Red, gold, green, black, in spangles, patches and stripes, and an overall metallic sparkle is as broad a description as we can give. When mature, the female can be distinguished from the male by the presence of a black spot at the center base of the dorsal fin, and by her shorter

Continued overleaf, first column.

QUICKIE QUIZ

Here's a real teaser! Arrange the following seven fishes in decreasing order of size, considering only the *female* of the species.

- Melanotaenia maccullochi*
- Heterandria formosa*
- Astronotus ocellatus*
- Symphysodon discus*
- Barbus everetti*
- Rivulus cylindraceus*
- Rasbora maculata*

(Answers on next page)

mops hung in the aquarium for this purpose) where she lays single eggs. Spawning goes on more or less continually provided the fish are well-fed and healthy. A hundred or more eggs may be laid within a week, adhering to the plants (or mops). After about 15 days, the eggs start to hatch. Prior to this, the aquarist should have removed the mops or plants to a plastic shoe-sized box or a gallon jar; otherwise, the fry would be eaten by the parents (there is some tendency for them to eat their eggs also). A sufficient quantity of fungicide (acriflavine is recommended) to turn the water a pale yellow (if acriflavine is used) will help preserve the eggs from harm. An alternative route is to hand-pick the eggs from the mops with a pair of tweezers (using the tweezers to lift the eggs out, not to grab them) and to store them in similar water in a darkened place. This, however, is more work for the hobbyist.

The egg sacs of the fry are absorbed after two or three days, after which the fry are ready to receive their first foods from the aquarist. This may consist of newly-hatched brine shrimp as the fry are rather large at birth. Powdered food may also be given. Plenty of food encourages rapid growth. *Aplocheilus lineatus* is an old favorite in the hobby for good reasons: it is beautiful, hardy and reproduces easily. Why don't you try it today?

and elevation sketches should be made so that the approximate positions and locations of available plants added later will be remembered (see sketches 1 and 2).

The layout can be compared to a stage where there is a backcloth and wings, and if this method is copied then the design can be made to appear interesting and creates the impression that more plants are present. The curtains

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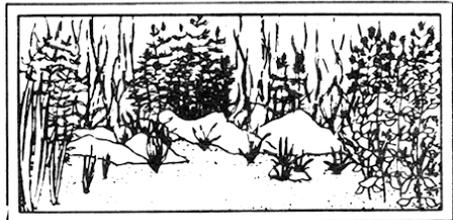


Figure 2. Approximate idea of how the aquarium is set up.

framing the stage are substituted with a barrier of *Vallisneria* or *Ambulia Limnophila*). Small plants may be situated to break harsh and unnatural lines between gravel and rock, and the highlights are provided by carefully selected bunches of small *Cryptocoryne*, etc.

It is important to remember that plants tend to grow naturally in small communities, and where these meet then they merge a little with the other varieties. One method to conceal the ageing appearance of some plants at the base is by "pruning" and bunching them in the following way. Assuming

that we have a quantity of such plants, 12 inches long but only the upper 6 inch portion is suitable, take about six to nine pieces of the plant at a time and arrange them side by side (perhaps on the kitchen drain board) so that each successive tip is about 1/2

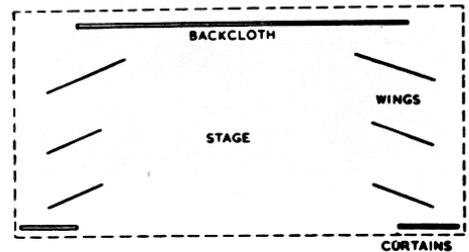


Figure 3. Stage plan, with curtains, wings and backcloth showing resemblance to Figure 1 layout.

inch to 1 lower than the one to its left. The undesirable ends are cut away and the plants bound firmly together at the bottom by a strip of lead and returned as soon as possible to an aquarium or can of water. The measurement A on the diagram in Figure 4 can vary from 12 inches to about 6 inches, depending on where the particular group of plants is to be located in the aquarium, while B is approxi-

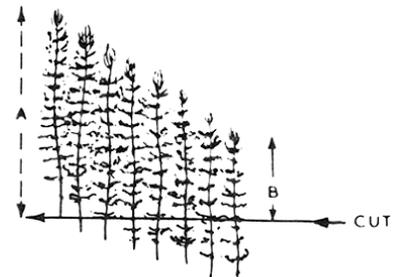


Figure 4. By adjusting the height of plant sprays it is possible to conceal their thinly-leaved lower portions. Height A is approximately twice that of B.

mately half that of A but can be adjusted to individual requirements. It can be visualized that when the plants are grouped, the head of the one in front will conceal the undesirable portions of the one to the rear.

ANSWERS TO QUICKIE QUIZ

1. *Astronotus ocellatus*
2. *Symphysodon discus*
3. *Barbus everetti*
4. *Melanotaenia maccullochi*
5. *Rivulus cylindraceus*
6. *Heterandria formosa*
7. *Rasbora maculata*

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The Aquarist's Notebook



"Skeeters" As Fishfood

MOSQUITO LARVAE, one of the best living fishfoods, have advantages and disadvantages, both to the aquarist himself and to his family and neighbors. In the first place, while gathering these larvae, he is pretty sure to collect a few bites himself from adult mosquitos!

The larvae are usually skimmed from the surface of stagnant pools, a net of cheesecloth secured to a pole being used for this purpose. One good point about them, especially as compared with daphnia, is that they stand great crowding without becoming suffocated. If carried in a pail, all they need is to be able to reach the water-surface, even though packed so closely that they touch each other. If unable to make contact with the air, they soon drown. This is why mosquito exterminators cover the surface of their pools with a film of oil, which prevents them from reaching the atmosphere.

Usually a "haul" is brought home 100% alive. In whatever way they are collected and transported, mosquito larvae have what seems to us to be an unfortunate habit of turning into adult

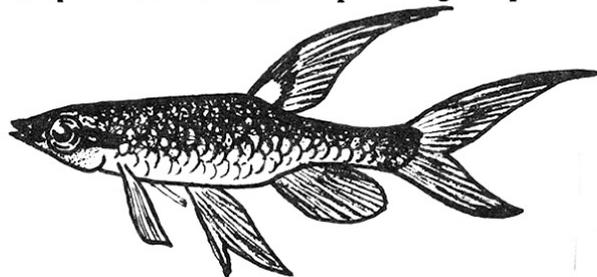
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Let's Breed The

Spraying Characin!

THIS species, from Brazil, the Guianas and Venezuela, is commonly called the spraying tetra, or the spraying samlet, the spraying characin or Arnold's characin. It is remarkable in that, when mating time arrives, both sexes leap together out of the water to spawn on the under-

side of some overhanging leaf or, in the aquarium, on the underside of the cover glass. This fantastic performance is repeated over and over again until the female is spawned out. Then the male takes up a position in the water some little distance from the eggs and, every now and again, dashes forward to lash the surface with his well-developed caudal fin and tail. The spray that these lashings sets up keeps the eggs thoroughly wet. The eggs hatch in 2 or 3 days, and then the dark fry drop down into the water. There they swim about in all directions in search of microscopic live food. As a rule the parent fish make no attempt to eat them.



side of some overhanging leaf or, in the aquarium, on the underside of the cover glass. This fantastic performance is repeated over and over again until the female is spawned out. Then the male takes up a position in the water some little distance from the eggs and, every now and again, dashes forward to lash the surface with his well-developed caudal fin and tail. The spray that these lashings sets up keeps the eggs thoroughly wet. The eggs hatch in 2 or 3 days, and then the dark fry drop down into the water. There they swim about in all directions in search of microscopic live food. As a rule the parent fish make no attempt to eat them.

In breeding this fish the following aids to success should be noted. Firstly, the spawning ground must be within 2 or 3 inches of the water. Secondly,

it is recommended that the spawning ground should have a slightly granulated or non-slip surface; for any eggs which fail to adhere to the glass and fall into the water will not hatch. Indeed, it is a practice among experienced breeders of *C. arnoldi* to suspend a piece of green-painted frosted glass, or a similar substitute (not necessarily green) horizontally, or at a slightly tilted angle, under the cover glass. The water should be matured, soft, and neutral inclining to acid in character. The temperature should average around 82°F.

Continued overleaf, second column.

QUICKIE QUIZ

1. *Ambulia* most closely resembles *Cabomba* or *Anacharis*?
2. *Riccia* most closely resembles *Salvinia* or bladderwort?
3. *Dermogenys* most closely resembles *Gasterosteus* or *Pterophyllum*?
4. *Apistogramma* most closely resembles *Trinectes* or *Tilapia*?
5. *Metynnis* most closely resembles *Monodactylus* or *Acanthophthalmus*?

(Answers on next page)

The Aquarist's Notebook

MOSQUITO LARVAE, *Continued.*

mosquitos — only a small porportion of them being biteless males. This is surely a case where “the female of the species is more deadly than the male”. Upon arrival home with the catch we are at once called upon to decide what to do (if anything) about the unwanted mosquitos that only too frequently pop out from the second stage of the larvae — called the pupae. This is, of course, assuming that there is a surplus of them after the fishes have been given all that they can eat.

Larva-container with mosquito trap.



It is easy enough to cover their container with a piece of mosquito netting, but how then to get out additional meals of larvae without the later-developed mosquitos escaping? One answer is to take advantage of their tendency to fly upward, and fix a trap in which they can be pocketed and killed. One form of such a trap is shown in the accompanying illustration. The stock of larvae is kept in a large bottle, the mouth of which is covered by a piece of mosquito netting, drawn up into a bag-like form and kept in place by a rubber band. The mosquitos collect in this and can easily be killed by squeezing the bag. Then a meal of larvae can safely be poured out. Using this general principle, it is not difficult to think of variations so that traps could be fitted over buckets or tanks.

ANSWERS TO QUICKIE QUIZ

1. Cabomba
2. Salvinia
3. Gasterosteus
4. Tilapia
5. Monodactylus

SPRAYING TETRA *Continued.*

The light should be diffused rather than bright. Further, just before and just after egg-laying takes place (pre-spawning signs are a sudden intensification of colour and plenty of frolicking at or near the surface) it is advised to feed the fish very generously on live food such as *Daphnia*, mosquito larvae or white worms dispensed from a perforated feeder. For there is nothing so certain as a full stomach to keep any cannibalistic leanings in check.

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C. arnoldi is not a large fish. Its sel-dom exceeds 2½ in. in length. It is also pencil slim. Yet it has plenty of energy and a captivating array of colours. The back is brownish yellow, the sides are yellowish to green overlaid with a reddish sheen, and the under-parts are yellowish white. The largish scales have black edges which create

Another way of using the jug (if you are fairly strong) is to cover it tightly with a small piece of netting and carefully replace this with a cork when you are ready to remove some larvae. Quickly turn the bottle upside down. When frightened, the larvae wriggle to the bottom of the water they are in. In a few seconds they will collect in the inverted neck of the bottle. Withdraw the cork for a few moments and put out the water containing the larvae, minus the mosquitos — which will then be trying to fly out through the up-turned bottom of the jug. Fact is, most of the mosquitos will be drowned by this action if the jug is full to begin with.

an interesting net-like effect. A dark stripe extends from the mouth through the golden-rimmed eye to the gill-covers, which are also ornamented with a greenish-gold blotch.

In both sexes the fins have some red in them, but in the male the red is very pronounced at or near the tips, which are sometimes marked with black, and the fins are much longer and more pointed than those of the female. Another thing, in the male the upper lobe of the caudal fin is greatly elongated, and there is a black spot above a white ground near the base of the dorsal fin.



“It's our aquarists' club tie”

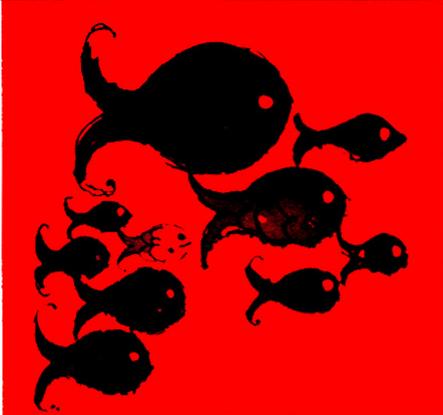
C. arnoldi minds its own business and causes no trouble in a community aquarium. It usually swims in the upper levels of the water and though it eats live food with great relish, it will not refuse dried food. It seems happiest and healthiest when it can live its life among tall-growing or floating vegetation. For normal maintenance, a temperature of 72°F to 75°F is as good as any. There are two other members of the genus known to the tropical fish-keeper. One of them, *C. callolepis*, has its scales adorned with shining red dots, and deposits its eggs on leaves under the water; the other, *C. guttata*, is another red-spotted species, but its sides are blue, its back is brown, its belly silvery white. It is not as stream-lined as the former species and it chooses depressions in the sand in which to lay its eggs.

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The Aquarist's Notebook



Try A "Fish Fan"!

FISHES ARE LIKE folks. They prefer a comfortable temperature, winter and summer. The idea that tropicals all like to swelter is wrong. Some do prefer plenty of heat, but the majority of them do best where it is only reasonably warm.

A large number of aquarists who have summer greenhouses exposed to full summer sun have learned to their grief that so-called "tropicals" can die of overheating. This can even happen without a greenhouse.

Every site where the heat is likely to become excessive should have some means of reducing the temperature of the water without endangering the health of the fishes by sudden chill. Proper ventilation is one of the simplest and cheapest methods. As an added help a current of air can be blown across the surface of the water from a small five or six inch electric fan. These fans are now so cheap, and take so little current, that it is only a slight expense to have one over a large aquarium or over a battery of smaller aquaria situated side by side.

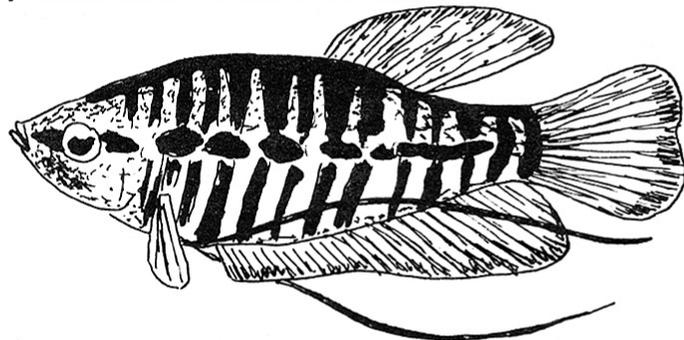
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A Gentle Gourami...

But Easy To Breed

JUDGED simply as a community fish, the air-breathing snakeskin gourami, as *Trichogaster pectoralis* is commonly called, has all the qualities looked for in a tropical except one: its inordinate size. A full grown specimen may reach about 9 inches in

brown bars. The pectoral fins are drawn out into long, hair-fine antennae. The anal fin, spinous anteriorly, is long-based and markedly yellow. The short-based dorsal fin is longer and more pointed in the male than in the female.



length, but to offset this undoubted failing it has neither a quarrelsome nature nor boisterous habits. Even when mating time comes round its manners remain peaceful and dignified. How different from the three-spot gourami, the blue gourami and the opaline gourami, the males of which often become most wildly dashing and savagenatured towards their own mates as they mature.

In coloration *T. pectoralis* shades from dull olive green on the back through golden yellow on the flanks to silvery underparts. The sides are adorned with a brownish to blackish stripe that zig-zags its way from the pointed snout through the large black eye to the root of the tail, and which in turn is crossed by numerous backward slanting shadowy to blackish

In the wild *T. pectoralis* is found in South Vietnam, Thailand and the Malay Peninsula and, of course, it is necessary to maintain its tank at a temperature in the neighborhood of 70°F to 75°F, with a rise to 80°F or thereabouts for breeding. But besides this basic requirement, it is liveliest

Continued overleaf.

QUICKIE QUIZ

1. Guppies take a minimum of 12 weeks before they are ready for breeding. True or False?
2. A pH of 6 is twice as acid as a pH of 7. True or False?
3. The combtail is a type of bubble-nester. True or False?
4. All fish eggs that are white are infertile. True or False?
5. "Lepis" is a Latin word that means "scale." True or False?

(Answers on next page)

GOURAMI, *Continued*

and shows its colours best in sediment-free, slightly acid water well furnished with plants growing lushly under a bright top light.

It doesn't eat the plants, but it will spend a lot of time picking at the leaves to rid them of algae, which it likes and should have in its diet. For the rest, it should be given the regular dried foods and small living foods such as *Daphnia*, midge larvae and white worms. Scraped lean meat, cooked or uncooked, makes a good substitute for live food. As an alternative to algae, Bemax, duckweed and shredded lettuce or minute portions of cooked green vegetable (spinach preferably) may be offered.

T. pectoralis breeds like the other gouramis mentioned above. The male assumes richer colors and blows a bubble nest at the surface of the water. If the female is ripe for spawning, a condition made easily apparent by her fuller sides, darker appearance and coquettish ways, she falls in with the male's inclinations and allows herself to be coaxed beneath the nest. There they embrace time and time again, during which hundreds of buoyant eggs are laid. If the eggs do not rise immediately in the water both sexes

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gather the slow-starters into their mouths and spit them out again into the nest. After spawning is over, more bubbles are tossed up to the nest to help sandwich the less secure eggs into position. In about 2 days the eggs hatch out and the fry can be seen quite clearly if you look up through the mass of froth towards a bright light.

Both sexes also share in the task of caring for the young in the larval stage. If some of the rapid developers leave the nest before they are strong enough to swim properly the male or the female will see to it that they are returned to the nursery with the least possible delay.

In breeding the snakeskin gourami the following points must be observed. Firstly, the spawning tank should be on the large size, say, about 3 feet long. Depth of water is not all that important, but larger broods of quick

portant, but larger broods of quick growing fry usually result from hatching the eggs in water only about 8 inches deep. Jars of Infusoria should be got ready when spawning seems imminent because the fry will die like flies in the winter time if miniscule food is not available from the start of their lives. Infusoria or a manufactured fry food or, as a last resource, flour-fine dried food, should be fed to the fry for about 2 or 3 weeks, after which most of them should be large enough to take tiny live food such as microworms, Grindal worms and so forth. A bottom-haunting peaceful catfish like *Corydoras aeneus* can be introduced into the tank after the fry become free-swimming to keep the floor clear of uneaten dried food. Do not make the mistake of introducing any snails into the tank to act as scavengers because they, or their descendants, will only eat the eggs of subsequent spawnings.



"Can Sammy have half an hour's exercise in your nice big tank, please?"

Another thing to remember is to keep the surface free of dust and other scum by drawing sheets of newspaper over it every day; for a film of any sort on the water prevents the fry from taking their gulps of air. Of equal importance is a well-fitting cover to keep the warm, moist air in, and an even temperature of the water; for the fry are easily killed off by a rapid fluctuation of upper-level temperature, or definite chilling of the water.

The snakeskin gourami is as prolific as the three-spot and blue gouramis, and will spawn several times every year, usually from late spring to early autumn, if conditions are right.

FISH FAN, *Continued*

The air should be directed against the surface of the water only and not against the outside glass. The reduction in temperature is produced by evaporation, and the freshly oxygenated water is carried down into the aquarium, partly by its own weight, and partly by the circulation produced by the fan. Be sure the fan is well supported, however, with little chance that it might fall into the water. The glass cover of the aquarium should, of



A really useful kind of "fish fan".

course, be removed; a screen may be substituted.

Some fanciers are very fussy about temperature, and try to keep drafts off their tanks. When the weather becomes really hot, a gentle reduction of a few degrees by this method can hardly be other than beneficial. Ordinary aeration from pumps is also a great help in hot weather, for it renews oxygen in depleted water and releases carbon dioxide.

ANSWERS TO QUICKIE QUIZ

1. False. They are often ready at 6 weeks of age.
2. False. A pH of 6 is ten times as acid as a pH of 7.
3. False. It lays floating eggs but builds no nest.
4. False. Some fishes, certain *Corydoras* as an example, lay eggs that are normally white-colored.
5. True!

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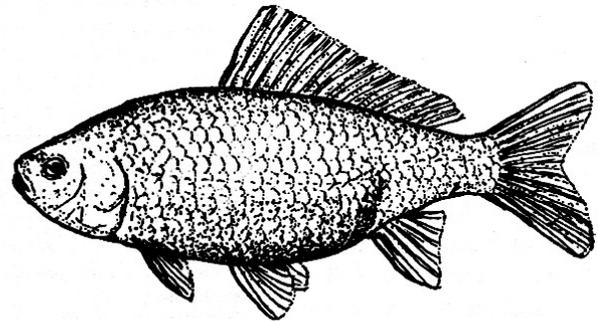
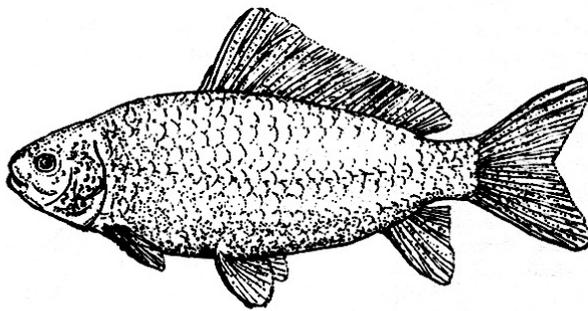


Goldfish Are Easy To Breed!

GOLDFISH ARE BY NO MEANS difficult to breed. In fact, providing the two sexes are present, breeding will always occur if the fish are kept in a healthy outdoor pool during the breeding season. Such difficulties as may

tion, the excessive thickness of the first ray to these fins is sufficient indication.

The female, whilst not normally exhibiting any such tubercles, has a slender first ray to the pectorals and, if carrying ripe eggs, will also present



Male goldfish (left) showing tubercles on the gill cover. Female (right) with abdomen distended with eggs.

QUICKIE QUIZ

Match the following fishes
With the basic colors given:

1. Angelfish
2. Bloodfin
3. Neon tetra
4. Argentine pearl; fish
5. Marbled gourami

- a. silver and red
- b. blue and black
- c. blue and white
- d. red and blue
- e. black and silver

(Answers on next page)

arise consist mainly in the treatment of the eggs and subsequent fry for, if these are left in the pool, not only will their development be slow because of the low temperature but precious few will survive since the parents (and any other fish) will devour all they can find, this applying especially to the eggs which the fish will search for most diligently.

The sexing of goldfish is comparatively easy where mature specimens are concerned; that is to say in fish from 12 months upwards. The male in breeding condition exhibits small spiny tubercles on the gill covers and also along the leading edge of the pectoral fins. Even if not in breeding condi-

a bloated appearance so that, when viewed from above, the body tends to bulge near the vent. This bulge is usually more marked on one side than the other. Of course, as with all things in Nature, exceptions may be found, such as males which never exhibit tubercles and females which do. These cases, however, are extremely rare and may be ignored by the beginner.

The method of breeding in goldfish is that the male commences to chase the female, causing her to move by nudging her in the ventral region with his head. The tubercles, which are quite rough to the hand, probably assist in this procedure. The chase becomes
Continued overleaf, second column.

Foiled Again!

SEVERAL KINDS OF aluminum foil are available for wrapping foods in the kitchen. This foil can also be used to make an attractive background to an aquarium, and it is possible that there might be some already available in your home. It has a shiny side and a dull side (some come in a crinkled pattern), and the former seems to give a more pleasing result.

Foil should be cut to a size about 2 inches each way larger than the back glass of the aquarium. A piece of stiff card cut to the size of the back glass has the foil folded over it with the duller surface inside. It is unnecessary to use glue as the foil when folded will remain in place. It can then be placed on the back glass and held there with several strips of adhesive tape.

The foil can thus be used straight from the roll but a more attractive backing to the aquarium can be obtained if the substance is first slightly crushed and then slightly straightened before attaching it to the card support. This method gives the background a certain quality of roughness which is effective. In both cases the foil acts as a reflecting surface for the contents of the aquarium which are slightly mirrored in it. Light reflected back into the aquarium seems to show the fish to better advantage and plants in the tank seem to grow even better for this. When an ordinary mirror is placed on the back of an aquarium it usually reflects the aquarist's face when he views his aquarium. This disadvantage is not present when foil is used as a background.

Kitchen foil can also be used inside the reflector hood on the aquarium to illuminate the interior of the tank evenly. A cover glass will prevent water from condensing on the foil. If you have never tried aluminum foil as a background to your tank, you may find the results very worthwhile. 

ANSWERS TO QUICKIE QUIZ

1. black and silver
2. Silver and red
3. Red and blue
4. Blue and white
5. Blue and black

GOLDFISH, Continued.

quite violent and, eventually, having selected a suitable patch of underwater plant, the female will head straight into it when, with the male alongside, a violent flapping of their bodies occurs.

A proportion of the mature ova is thus extruded and this may be seen to separate and fall slowly throughout the water, each egg increasing in size as it falls. This increase is caused by an intake of water. Careful observation of the male as these eggs are laid will reveal that he has also extruded milt which will appear as a puff of smoke rapidly spreading through the water as the eggs fall.

Usually about 50 eggs are extruded on each occasion that the flapping occurs until the entire number are de-

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posited (500 to 1,000 according to the size of the female). The eggs are adhesive and, providing the plants are not smothered in mulm or free algae, will adhere to the leaves and stalks of these sufficiently firmly for the plants to be washed by repeatedly dipping into fresh water without any becoming dislodged. To obtain the best results with the eggs, a temperature of from 72 to 75 °F is required and this necessitates the use of a tank heater.

The eggs should be removed from the pool and placed in clean aquariums, care being taken to ensure first that the water is of the same temperature as that where the eggs were laid, and secondly, that such plant material as supports the eggs shall be spaced out to ensure its survival. This last is very important since if masses of plants are laid in an aquarium and the temperature then raised, parts of it will

rot, fouling the water and killing the eggs.

At the suggested temperature the eggs will hatch in from three to four days although 24 hours is sufficient time in which to assess the percentage of fertility, infertile eggs becoming white and later exhibiting fungus. The young fry may be seen as numerous "exclamation marks" hanging on the glass and this stage, during which the contents of the yolk sac are absorbed, may last from one to three days as eggs do not all hatch at once, probably because the temperature in aquaria heated by immersion units varies according to proximity to such heaters.

The fry then commence to swim, though this is erratic at first as they have no filled swim bladders and are therefore heavier than water. By continued effort, however, they at last succeed in breaking through the surface film and in swallowing a bubble of air which initiates the development of the swim bladder. As soon as the fry are free-swimming they require



The sex of goldfish can also be ascertained in breeding season, by close inspection of the pectoral fins. In males, the first rays are definitely thickened and uneven.

food. Green water from a pond or cultivated infusoria will make an excellent first food. The latter can be made by pouring boiling water on lettuce leaves (or almost any kind of vegetation) and then leaving the mixture exposed to the air for a matter of days. From the second week on, powdered dry food and some newly-hatched brine shrimp may be added to this diet, and in three weeks the usual artificial dry foods may be used as the staple diet. 

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Oranges By The Dozen!

THE ORANGE CHROMIDE is usually considered a difficult fish to keep, let alone breed, but neither is really true. I have found, for example, that it is a simple matter to spawn them,

havior, his overall brightness and, in many cases, his larger size.) Inspection later that day revealed a clump of dark brown eggs nesting in a little depression in the sand in the tunnel. A

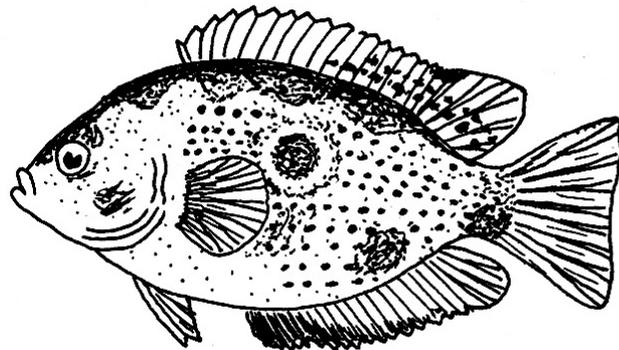
Earthworms

EARTHWORMS ARE CREATURES beloved by gardeners because they aerate the earth and cause a continual interchange of humus between the soil layers. They are ferociously stamped upon by irrational housewives and to add horror upon horror they are forced to bear the ghastly scientific name of *Lumbricus terrestris*, of the Order Oligochata. Moles eat them, birds both big and small eat them, extremely small children with a great amount of relish eat them, but most important of all, fishes eat them!

Earthworms are an extremely nourishing food for fishes, although slightly laxative, and can be fed chopped to the larger fishes (e.g., the larger cichlids) and minced or mashed to the smaller ones (e.g., the tetras). Like all foods, earthworms must be properly prepared before they are given to the fishes. This is where a great many aquarists go astray, for they merely wash the worms before shredding them regardless of what lies within the intestine of the creatures.

The correct procedure is this: as soon as the worms have been extracted

Continued overleaf, first column.



certainly no harder than any 'other cichlid.

The tank I used was an ordinary 15-gallon aquarium, 12 x 12 x 24 inches, in which I placed a layer of fine washed sand. As most cichlids detest plants and love hiding in rocks, I selected some suitably shaped rocks and placed them on the sand so as to form a tunnel into which the fish could swim. The tank was filled with water and heated to 80 °F.

I introduced the fish to the breeding tank the next day, and they showed no inclination to spawn whatsoever. Day after day went by and still no spawning activity was observed, but on the sixth day I saw the male repeatedly chasing the female into the rock tunnel. (Telling the sexes apart is not easy but the male can usually be distinguished from the female by his more assertive be-

rough count suggested that there were about 100 eggs.

The parents were left with the eggs for three days, but there was no sign of hatching and I was frightened that the eggs might soon "disappear", so I removed the parents and placed an air

Continued overleaf, first column.

QUICKIE QUIZ

Which of the following fishes are shaped like or resemble the familiar objects listed?

- | | |
|---------------------|-----------------|
| 1. freshwater sole. | a. arrowhead |
| 2. angelfish | b. cigar |
| 3. kuhli loach | c. insect |
| 4. penguin fish | d. hand mirror |
| 5. butterfly fish | e. coral snake |
| 6. snakehead | f. hockey stick |

(Answers on next page)

CHROMIDE, *Continued.*

stone near the eggs to provide artificial fanning.

Two days later the eggs were "shivering", and I knew that everything was going well. However, I had to wait another three days before the fish actually swam. As a first food I used infusoria, produced by soaking a lettuce leaf in a beaker of water for one and a half days. Not being prepared for their free-swimming (I had waited so long!), I was not quite ready with the infusoria on the first day, so I used hard-boiled egg yolk which they ate readily. After a week on infusoria, I tried to switch them to mashed white worms but it proved unsuitable so I made a mash of garden worms and daphnia, and they took it eagerly. As they grew, I increased the size of the particles of chopped worms and daphnia, and they did wonderfully on this diet.

Don't let the false tales about this pretty, well-mannered little cichlid discourage you from spawning them. It is easier than most aquarists believe! ●

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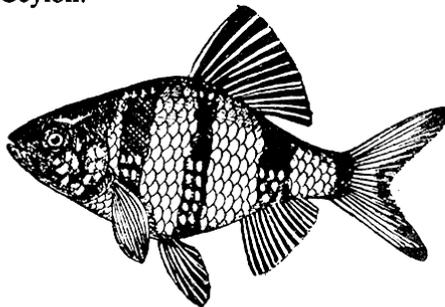
EARTHWORMS, *Continued.*

from the earth they should be placed in glass jars for an hour or so without soil or a filling of any kind), where they will lose their mucous covering and evacuate their intestine. Only after these operations have been performed should the worms be washed in clean water and fed to the fishes.

Earthworms may be bred in containers of earthenware or wood, which should be placed in a dark and warm position and contain leaf mold or any loose soil rich in organic matter. They may be fed on decaying leaves and finely grated vegetables and fruits. ●

The Black Ruby

ONE of the handsomest, hardiest and best-behaved occupants for a community tank is the black ruby barb, which is native to the shallow, weedy and overhung fresh waters of Ceylon.



The general color of the male is greenish olive on the back, yellowish grey on the flanks, and silvery on the belly. Three broad black vertical bars adorn the flashing-scaled sides. A fourth bar extends across the head and through the gold-rimmed eyes to fade away on the throat. There is a flush of scarlet across the head, growing in intensity towards the snout. The dorsal, anal and ventral fins are black, and the caudal and pectoral fins are silvery clear. Normally, and age for age, the female is fuller-bodied than the male and her colours are considerably more subdued. Both sexes average about 2 in. in length.

Feeding the black ruby presents no difficulties, for it is omnivorous by nature, but requires a proportion of live and flesh food and algae (or a suitable substitute such as cooked spinach) in its diet if it is to be kept in robust health.

This barb will not pick on the other fishes in a community aquarium unless they are small enough to be mistaken for something extra special in the way of live food, will not uproot or denude the higher plants of their foliage, or hide itself away for what may seem like hours on end, but it will wage war to the death on snails.

Breeding procedure follows the typical *Barbus* pattern, the male intensifying his colours and chasing the egg-swollen female in and out of the plant life. Every now and again there are momentary pauses during which the couple engage in what looks like the opening movements of a wrestling match. Sometimes eggs are released while the circling movements are going on, sometimes the chase just continues without any eggs being laid until such time as the female is driven at or into the plants. The eggs are adhesive, and to trap them, plants with fuzzy or mossy foliage are recommended. The tank for spawning should not measure less than 2 ft. in length. The temperature should be maintained at about 80°F.

Directly spawning is over the parent fish should be removed to another tank. The fry emerge from the eggs in about 3 days, but do not begin to swim about freely until another 48 hours have passed. This quiescent period is taken up with absorbing the yolk sac. When they have done this, and are seen to be moving jerkily across the floor of their aquarium as if searching for something (something to eat, of course), then it is time to introduce food.

Infusoria is their best baby diet, and enough of these microscopical forms of life should be fed to them every day to keep their silvery bellies rotund and shining. As they become big enough to take other food, provide tiny water fleas, brine shrimps, Grindal worms or mashed white worm or newly hatched midge larvae. Powdered dried food may be given them as a substitute for live food, but, naturally, the best results are obtainable only with the former. Generally speaking, the youngsters reach full size in 9 months to a year.

The species has a life span of between 3 and 4 years and can stand a slow drop in the temperature to 65° with no ill-effect. This is not all. It is a very prolific fish and will breed several times every year. ●

ANSWERS TO QUICKIE QUIZ

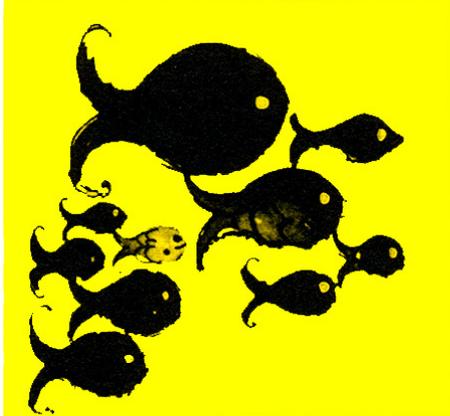
1. Lady's mirror
2. Arrowhead
3. Coral snake
4. Hockey stick
5. Insect
6. cigar

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Power Failures And Fish

DO YOU DREAM OF waking up in the morning to find a power-cut in operation with disastrous results to your fish? We have all suffered these nightmares, but we are glad to report that they can be forgotten by using the device described below.

The "sensing" element is designed on the well-known "fail-safe" principle. A lamp bulb connected to the power line provides heat which holds the contacts of a thermostat open. Should there be a power-cut, or the lamp fail, the contacts close and connect a battery to an electric bell which continues ringing until switched off by the awakened aquarist.

The arrangement of the parts and the electrical wiring is made clear by the drawing. Construction is as follows. Take a plastic bottle and cut round the top, leaving about 1/4 inch of the neck intact, and cut a hole in the bottom the size of a quarter, for the lamp-holder or socket. If the neck is too small, heat it quickly over the stove and push the thermostat smeared with soapy water into the hole to enlarge it.

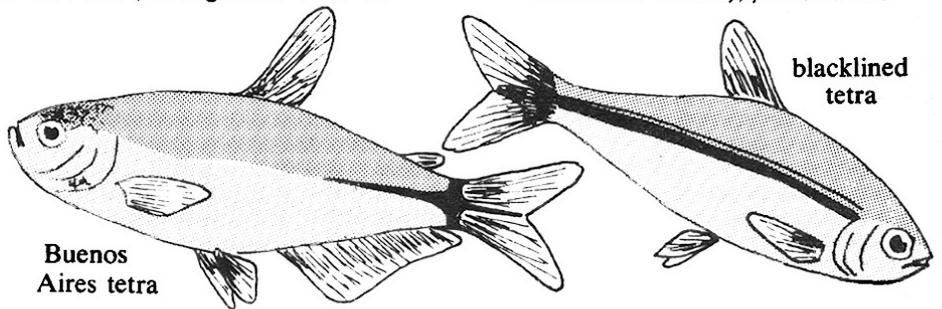
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Two Easy Tetras To Breed

FOR THE BEGINNER WHO wishes to breed his first characin, perhaps the easiest, to gain experience, would be the blacklined tetra (*Hypheosobrycon scholzei*) or the Buenos Aires tetra (*Hemigrammus caudovittatus*).

Select only a well-filled female; from the side view she should be quite deep in the belly. Having caught her, place her in a jar half-filled with water from her tank. If looked down upon from

Continued overleaf, first column.



Either will spawn quite happily in a 10-gallon tank containing tap water at 80 °F and a number of weighted nylon mops or artificial spawning "grass".

Select only a well-filled female; from the side view she should be quite deep in the belly. Having caught her, place her in a jar half-filled with water from her tank. If looked down upon from above, her flanks should be quite well distended. Now select a slim fish for her male partner. Again viewed from above, he will taper from the gills to the tail and not show any sign of bulging sides. If the water in the breeding tank is slightly warmer, both fish may be tipped straight in. It is preferable to do this in the late afternoon. The pair will have time to settle down and feel secure in their new surroundings before darkness falls.

QUICKIE QUIZ

- Find the fish in the following:
- The first is in **CRY** but not in **HOWL**,
 - The second is in **FROWN** and also in **SCOWL**.
 - The third is in **MERRY** but not in **GAY**
 - The fourth is in **YESTERDAY** and also **TODAY**,
 - The fifth is in **DYE** and also in **DIP**, The sixth is in **HOP** but not in **SKIP**, The seventh is in **PORCH** but not in **HALL**.
 - The eighth is in **BAT** and also in **BALL**.
 - The ninth is in **SIGNET** and also in **SWAN**.
 - The tenth is in **JANET** and also in **JOHN**.
 - The eleventh is in **TRUNK** but is not in **CASE**.
 - The twelfth is in **FRILL** and also in **LACE**,
 - The next is in **LID** but not in **STOPPER**
 - The last is in **POLICE** but is not found in **COPPER**.

Answers on next page.

above, her flanks should be quite well distended. Now select a slim fish for her male partner. Again viewed from above, he will taper from the gills to the tail and not show any sign of bulging sides. If the water in the breeding tank is slightly warmer, both fish may be tipped straight in. It is preferable to do this in the late afternoon. The pair will have time to settle down and feel secure in their new surroundings before darkness falls.

By next morning it is quite likely that spawning will be taking place, the male chasing the female and pressing her against the material chosen for spawning. As they quiver side by side, she will eject four or five eggs and he will inject into the water thousands of sperms. Each egg on emerging is slightly oval in shape, but quickly becomes a sphere. Through the tiny invisible opening one sperm is taken in, and development begins. Eggs will be seen not only in the spawning medium, but many on the bottom of the tank.

If there are plenty of eggs, or if the breeders begin to lose interest in each other, remove them quietly but quickly, with as little disturbance as possible. Return them after temperature adjustment to two separate tanks, one for males, the other for females. This allows the females to refill with eggs more quickly, and when required for breeding again, one fish from each tank is bound to provide a male and a female.

If it is possible to view the eggs and if this is done late in the same afternoon, the developing embryo will be seen in quite a number of clear eggs; others will have turned an opaque white. These are infertile, and will grow fungus, but do not attempt to remove them. More harm than good will be done, and it is very unlikely that they will harm the fertile eggs. By the next morning, dozens of tiny glassy fry, looking like eggs with tails attached, will be seen lying on the bottom glass. Gentle aeration may now be placed in the tank, but do nothing more than this. By the morning of the second day, 48 hours after spawning, many of the fry will be free-swimming. Now give them a full 2 lb jam jar of

The air hole at top and bottom should now be made with a heated screwdriver or similar tubular tool. A pen knife is useful to cut round the three sides of the flap, the fourth side being left as a hinge. Attach sufficient lamp cord to the lamp socket to reach from your bedside to a convenient electrical outlet. Now screw the plastic bottle, bell and battery shelf to the prepared board and assemble as shown in the drawing.

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The wiring is as follows: red thermostat wire to right-hand bell terminal and the black one to the switch. The other side of the switch carries a short wire to the crocodile clip, and a similar wire and clip is attached to the remaining terminal.

The unit is designed to hang on a wall but may be arranged differently provided that the plastic bottle is fitted upright. If enclosed in a case, holes should be made in the top and bottom

thick infusoria. Since infusoria organisms are always carried about in the air, it is only necessary to provide some slightly warmish water containing vegetable matter (such as lettuce leaves) in which the infusoria find a good medium for breeding, and they will enter and multiply. These cultures, of course, must be started before breeding is attempted.

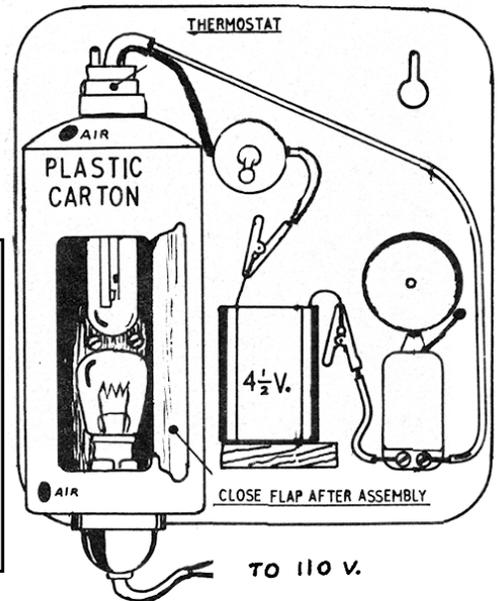
Within a week or 10 days, finely powdered dry food may be used, followed by newly-hatched brine shrimp.



ANSWER TO QUICKIE QUIZ

Corydoras Julii

to allow air to circulate, or the operation will be delayed. The plastic bottle can be of the ½-gallon Clorox type; the lamp should be of low wattage, no greater than 10 watts.



Put it into operation in this way. With the bell switch in the "off" position, plug the lamp into the electrical outlet and allow time for the thermostat to warm up. Now put the bell switch to "on"; the bell will now remain silent until the power is cut. Test initially by pulling the main plug. The bell should ring 1 to 3 minutes later. Some adjustment may have to be made to the thermostat, which may be purchased at your dealer's.

In the event of a power-cut, first of all insulate the tanks with cushions (especially foam rubber ones from armchairs), pillows, blankets, etc. Cover the tanks completely, hoods and all, leaving no exposed glass. A tank 2 ft. by 1 ft. well covered in this way will lose heat in a cold room at a rate of about 3 °F per hour if left alone. Do not be tempted to read the thermometers for at least 2 to 3 hours as this will only cause the tanks to lose heat. Concentrate on getting the room as warm as possible. 

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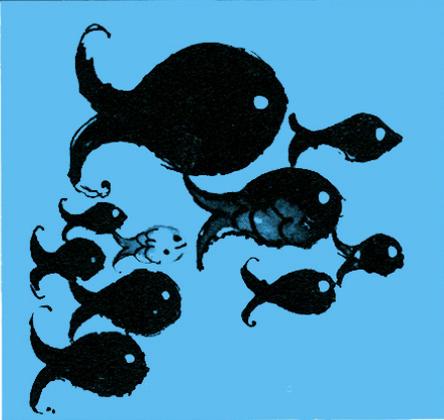
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How To Net A Fish

NO AQUARIST CAN AFFORD A BAD CATCH. A clumsy netting can mean at least uprooted plants, and at worst a stunned or injured fish. If the fish you are after starts a panic-stricken scurry around the aquarium, leave it for a while and try again when the fish has calmed down. Never net two fish together.

Keep several nets of varying sizes. Use a biggish net for fast swimmers, a smallish one for rarely-in-a-hurry fishes. Bend the handle of the net you use for middle-water swimmers so that, having enveloped your fish, you can bring the mouth of the net flat against the glass. A faint tap of your finger on the outside of the glass will send the fish deep into the net. Then swiftly, surely, up and out with it. If you do not do this, as you lift the net the fish will swim quickly away up the glass, and you will have to start all over again. Angels in particular are best caught in this way, for when frightened they stun themselves so easily.

A loach is more easily driven by means of a gently nudging rod, into a net, than chased. Not poked or jabbed

Continued overleaf, first column.

The Sailfin Mollies

WHEN YOU ARE OFFERED A MOLLY, can you tell which kind it is? Perhaps not. There are now many kinds, and some of them are man-made — hybrids of various sorts. However, if one is confronted with a sailfin type of molly, black, it is fairly safe to say that it is either *Mollienesia latipinna*, or *M.*

strain was developed. But it was sometimes of rather poor fin size.

M. velifera, a native of Yucatan, is larger than *M. latipinna*, and its large sailfin starts considerably farther forward on the head and is usually level with the gill-plate. It also has a wild

Continued overleaf, second column.



velifera, if a pure-bred fish; or a cross between these two if it is a hybrid.

The male of *M. latipinna*, shown in the drawing, has a dorsal fin starting well back from the head and well behind the line of the gill-plate edge. It can have a gloriously full sailfin, or a rather small one, for it is a most variable fish in both coloring and finnage. In the wild state it is found in Florida and the southern edge of Texas; always near the coast, and sometimes in salt water.

The best kinds of *M. latipinna* are found in these salt or brackish waters and among them are melanistic (black) sports. It is from these the pure black

QUICKIE QUIZ

Find the fish in the following:
The first is in LORD and also in MASTER,
The second is CORN-PAD but not in PLASTER,
The third is in KISS but not in EMBRACE,
The fourth is in DRAW and also in TRACE,
The fifth is in CHEF and also in COOK,
The sixth is in STREAM but not in BROOK,
The seventh is in AUTUMN but not in SPRING.
The last is in SEALING WAX and also in STRING.

Answer on next page.

The Aquarist's Notebook

NETTING *continued.*

mind! And make sure the net used is of finest mesh. A kuhli loach will wriggle in a twinkling through a hole you will have difficulty in finding afterwards. I have seen a spiny eel, one of the most awkward fish to catch, neatly trapped between two nets. But the nets must be held firmly together as the fish is lifted.

Butterfly fish, I find, are better lifted out in a jar than netted, and one's other hand held over the top to prevent any sudden leaps. Neither of my own butterfly fish has ever tried to jump when being moved, but one of them did develop mouth fungus after being clumsily netted. Gravid fish, if they must be transferred to another tank, are best moved in a net suspended in a jar of water, rather than by net alone. I have never lost a gravid female, or had deformed young, moving them in this way. And baby livebearers, up to a quarter of an inch long, are easily and probably more safely moved in a cup than in a net.

A catfish, though a tricky customer, is well and truly yours once it is in your net, for as you lift it, the cat will dive naturally downwards. Get to know the natural reactions of your fishes. It simplifies catching them enormously.

As you lift the net out of your tank, cup your other hand gently about the body of the fish, or, if the fish is a small one, completely enfold it in the net, as in a ball. This will prevent your fish indulging in any of those hair-raising leaps, and save you a frantic search on the floor!



ANSWERS TO QUICKIE QUIZ

ROSACEUS

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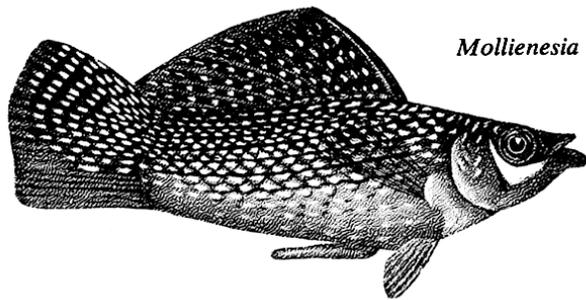
MOLLIES *continued.*

black form and this was originally the only black sailfin molly.

In addition, there are two more sailfin mollies to be found wild in Central America. They are *M. petensis*, which is only found in the coastal area below Mexico. In other words, between the areas of *M. latipinna* and *M. sphenops*, a small dorsal fin variety. It is now considered that *M. formosa* is a naturally formed hybrid between these two mollies.

we like it best because it always breeds for us easily!

Breeding black sailfin mollies is fairly simple for being large livebearers there is little trouble about food for the youngsters. Newly-hatched brine shrimp is ideal as well as a little chopped-up spinach. However, the female has a large mouth and though mainly vegetarian, she appears to enjoy a meal of baby mollies. Being black they are easily easy to spot and



Mollienesia latipinna

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M. petenensis was at one time called the spike-tailed molly because the lower rays of its tail were dark — like the developing sword of a male sword-tail. However, this peculiarity only appears on the male and otherwise the fish is very much like *M. latipinna*.

So we are left with two main sailfin mollies, and from these have been bred and developed most of the aquarium sailfin mollies. Our preference is for *M. latipinna*, either black or in its natural iridescent coloring. It is smaller than the best of *M. velifera* varieties, but has a character in the aquarium that we like better. Perhaps

probably attract her attention.

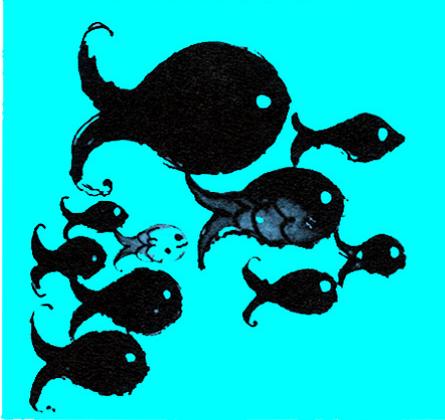
We grow a tankful of *Sagittaria* with the water restricted to a depth of about four inches while the plants are growing. They will grow no longer than the water depth. Then, when the molly is decidedly gravid (expecting her young), we raise the water level another four to six inches and put her in. This is less upsetting to the expectant mother than the more conventional trap and does the job very well for the babies soon learn how to dodge into the dense bottom growth.

A tank of low-growing *Sagittaria natans* such as this can be used most successfully for keeping and breeding a trio of mollies (or other livebearers). When it is started off in this way, we find that the *Sagittaria* will rarely try to grow longer though when the plants are transplanted to another tank with deeper water, they will go away fast. It is a method of clothing a tank that has the merit of providing ideal conditions in the water, and also it gives babies a very good concealment.





The Aquarist's Notebook



A Beginner's Fish-

The Flame Tetra

Cure That Noisy Pump!

WHEN AQUARIUMS ARE kept in the home, noisy air pumps can raise a problem which does not arise when pumps are confined to the fish house. What can be done to lessen the noise of a vibrator air pump?

Firstly, check to see that the vibrating mechanism of the pump is correctly adjusted. If you are not sure about the mechanical and electrical parts of your pump, you should take it to your local dealer. Even better than this is to have your pump serviced, if and when necessary, by the manufacturer.

Considering that your pump is operating correctly and is correctly adjusted, what steps can be taken to minimize the noise it makes? One person I know keeps a rather noisy pump in a room which is not very often used, and has an air tube leading into his living room in which he keeps a number of tanks. Such a method is rather clumsy and means that the air tube has to be led from one room to the other, concealed, etc, and to me the bother involved outweighs the advantage of this method.

Continued overleaf, 1st column.

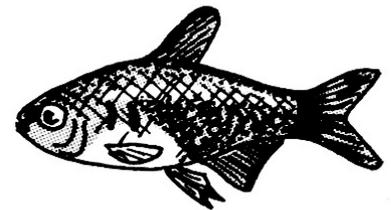
ALTHOUGH THE FISH mainly bred by us are barbs and angels, we have for the past three years been breeding the glowlight tetra quite successfully. It has been a thrill for us each time a batch of glowlights were raised and, as the tetras are such a delightful little fish, we thought perhaps we would try another type.

An opportunity soon arose when a fellow member of our aquarium society called to ask if we would like to have a pair of flame tetras (*Hyphessobrycon flammeus*) which he thought were ready for spawning. He himself did not have the room for breeding. May I mention here that one of the advantages in belonging to a society is that there is always someone ready to help you out, either with fish or a word of wisdom.

After quarantining the pair of fish for two weeks in one of our all-glass tanks specially kept for this purpose, the male and female were then separated for two weeks's conditioning, during which time they were given plenty of frozen adult brine shrimp, flake dry food and scrapped beef heart. After this period the female looked really well-rounded, and the male was in beautiful color. One could certainly see where the name of "flame" came from!

As the fish seemed ready for spawning, I then prepared the breeding tank, which was 18 in. by 10 in. by 10 in. I washed it well in salt water, being careful to rinse it thor-

oughly in cold water under a running tap. Then the bottom of the tank was covered with an artificial spawn-



The flame tetra

ing medium which I obtained at my dealer's. The temperature was set at 80°F.

Continued overleaf, 3rd column.

QUICKIE QUIZ

Find the fish in the following:

- The first is in JET and also in JADE,
- The second is in PADDLE and also in WADE,
- The third is in CUP and also in SAUCER,
- The fourth is in KEATS but not in CHAUCER,
- The fifth is in DAM and also in DYKE.
- The sixth is in CYCLE and also in BIKE,
- The seventh is in WOMEN and also in MAN,
- The eighth is in POT and also in PAN,
- The ninth is in AUGUST but is not found in MAY,
- The tenth is in GREEN but not in GRAY.
- The last is found in NEW YORK.

Answers on next page.

od of cutting out the noise of the pump. There are other, much simpler methods.

Sheets of foam plastic can be bought in stores for a small sum, and these can be stuck, using a suitable adhesive, to the base and sides of the pump to help muffle the sound produced. I have found that certain pumps produce less noise if placed not on their base as is normal, but on their end, top or one of their sides. By moving the pump into each position while it is in operation, it is often possible to find one in which the pump will operate without causing itself any damage and with less noise than if placed, as usual, on its base. When such a position is found and foam plastic is stuck around the pump, the noise emitted can be reduced drastically. Take care that the vibrations of the pump do not cause it to slide off the shelf or support on which it is placed, to crash onto the floor and become damaged.

The method which I have found to be most suitable for the type of pump I use involves the use of strips of rubber, up to ¼ inch wide, cut from an old inner tube. Having held the pump while operating in a variety of positions and angles, I found the position in which it made the least noise. Then I cut some narrow rubber strips and tied several of them tightly around the pump, both crosswise and lengthwise. Then I suspended the pump by another strip from a cup hook which was screwed into a firm wooden shelf which would not vibrate. I had to ensure that the pump was suspended at the angle which originally produced the least noise. The result is a pump which causes no annoyance whatsoever. It is necessary to check now and again to see that the piece of tube from which the pump is suspended is in good condition and is not liable to break and allow the pump to fall.

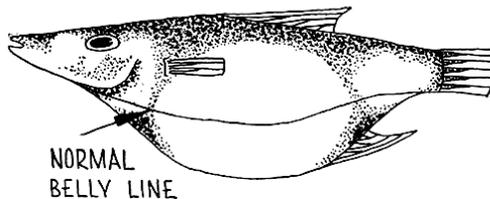
ANSWERS TO QUICKIE QUIZ

JACK DEMPSEY

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Dropsy In Fishes

THE BODY TISSUES AND certain internal organs of a fish suffering from dropsy fill with fluid. This causes the belly to swell to enormous proportions and makes the scales stand out at right angles to the body. The fish quickly loses its color and becomes extremely languid. In the early stages of this fatal disease, the symptoms can easily be mistaken for those associated with scale protrusion.



Very little is known about dropsy. It has been found, however, that dropsy can be contagious when a fish is infected with a parasitic-type virus and the exudation from the bloated body tissues contaminates the surrounding water.

Drawing off the fluid from a drop-sical fish with a hypodermic syringe will help to check the declining condition of the fish, but it does not bring about a permanent cure. Quite often the victim lingers for weeks before it eventually dies. In some cases, chloromycetin has helped, but only in rare cases.

Tropical fishes generally possess a high resistance to dropsy, with the possible exception of aged mollies, but it is likely to occur sporadically in collections of fishes.

The tank was left empty of fish for two days and, on the evening of the second day, they were introduced; first the female, then the male. When the fish appeared settled, the lights were switched off and we hoped to see them spawn the following morning.

Next day they did not seem to want to cooperate at all, and although frequent visits were made by us to see if they were spawning, they were just not interested. About 8 P.M., my wife went to put the light on in the room and casually glancing at the tank was quite amazed to see the fish merrily spawning away. She was worried that they had been disturbed, but they were still spawning when I arrived home from work at 9:15 P.M. that night.

The spawning procedure absolutely fascinated us. The fish would swim around together, then suddenly they went to the top where they would spin around each other, the female releasing a large number of eggs which were fertilized by the male. This continued for two hours, after which we removed the parents and covered the tank with newspapers to keep light away from the eggs.

Three days later, the fry could be seen hanging on the sides of the tank. A small amount of liquid fry food was added at this time. Two days later, serious feeding was started, with liquid fry food and dust-fine dry food fed twice a day. One week after this, newly-hatched brine shrimp was offered to the fry and they took this readily.

This batch of flame tetras was moved into a larger tank when they were 4 weeks old. At this stage, they would eat almost anything, and were coming into full color. If there are any aquarists who are tempted to try and breed tetras, we can well recommend the lively and colorful flame, knowing that you will be both pleased and proud with the results.

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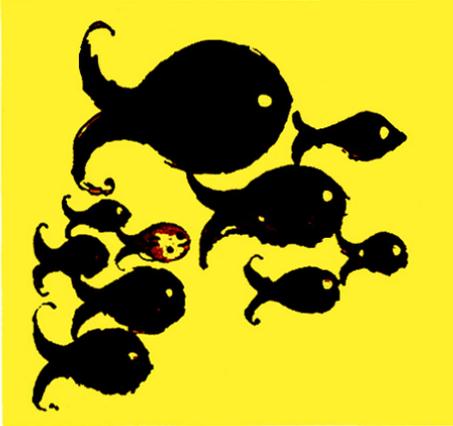
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Aquarist's Notebook - Volume III





The Aquarist's Notebook



Success With The Livebearers

How About Something Different?

AMONG THE aquarium fishes that have attracted attention for many years are the piranhas. The habit of piranhas taking lumps out of any living creature that moves in the water has been somewhat exaggerated, but there is considerable truth to it. It seems that a man without a scratch on him can swim safely in some piranha waters, but if there is any trace of blood on him the fish will attack at once. If the school of fish is a large one, not one scrap of flesh will be left on his bones within a few minutes.

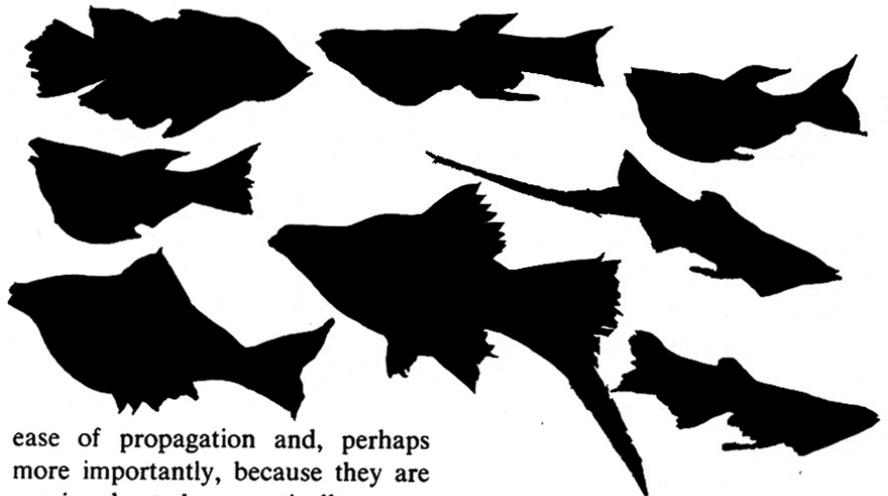
This same ferocious instinct is shown in large aquariums where these fish may be kept. Provided the school is well-fed, and none act oddly to the others, all will be safe. But if new fishes are introduced — whether of the same species of piranha or not — a difference of movement will be perceived and the newcomers will be attacked at once.

Continued overleaf, 1st column.

LIVEBEARERS, popularly represented by such fish as the swordtail, guppy, platy and molly, are undoubtedly the most widely and regularly bred of all aquarium fish, partly, no doubt, through their

Adult fishes should be fed once a day; the younger the fish, the more often they will require food, small amounts being given at each feeding. The actual amount to be fed is en-

Continued overleaf.



ease of propagation and, perhaps more importantly, because they are species kept by practically every aquarist from modest beginner to expert.

The majority of livebearing fishes available to the hobbyist are omnivorous in diet (i.e., capable of accepting foods which are animal and vegetable in content), tubifex, whiteworms, daphnia, shredded earthworms, boiled spinach, scraped carrot, algae, etc., being accepted with equal relish. It should be remembered when feeding live foods, however, that small digestive organs are common to the livebearer and such foods must be chopped or shredded as necessary.

QUICKIE QUIZ

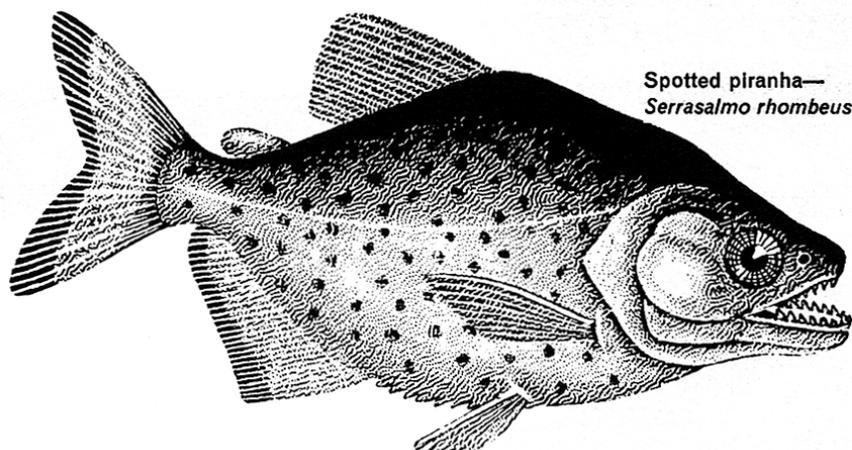
Find the fish in the following:
The first is in **PINEAPPLE** and also in **PLUM**,
The second is in **FILTH** but not in **SCUM**,
The third is in **FAIRY** but not in **GNOME**,
The fourth is in **WANDER** and also in **ROAM**,
The fifth is in **COMMON** but not in **RARE**,
The sixth is in **HELPING** as well as in **SHARE**,
The last is in **VASE** but not found in **URN**.

Answer on next page.

PIRANHA *continued.*

Not only this, but any member of the original school that is wounded by the defense of its victim, will also be attacked.

If you decide to keep a specimen (we do not recommend more than one unless you are really expert) for a "conversation piece", their food should at first consist of small live fishes. Later on, the piranha can be weaned onto raw meat, liver, fish or any kind of raw flesh. I have raised countless piranhas whose sole diet was nothing more than shredded



Spotted piranha—
Serrasalmo rhombus

beef heart. Because they are heavy meat eaters, the filtration provided the aquarium must be efficient and vigorous. Be careful not to offer this

meat with your fingers. A half to full grown piranha usually takes bites that are just the size of a finger end!

LIVEBEARERS, *continued.*

tirely dependent on the species of fish kept, the temperature, and the relative merits of the food. White-worms, for example, are more fattening than either daphnia or tubifex and should, therefore, be fed more sparingly. The old maxim, "little and often", still holds very true, feeding being continued at regular intervals until no further interest is shown and the food sinks to the aquarium bottom. After a little experience in feeding by this method, the amount required on subsequent occasions can be gauged with ease.

A water temperature of 75 °F is considered by many as the lowest at which the livebearer will thrive. This belief, however, is totally incorrect as livebearers show a wide tolerance to changes in temperature (provided they are gradual), 68 °F suiting them equally as well as 82 °F. It is certainly true that they breed more rapidly and show more intense coloration at higher temperatures, but so too is the fact that this en-

sure a shorter life-span for the fish. The gestation period of the female is affected by the temperature; such a period from the time of her fertilization by the male is approximately 3 weeks at 82 °F, and 4 weeks at 75 °F.

Water, as we are aware, is either acid, neutral, its various degrees of acidity or alkalinity being measured by what is known as the pH scale. Most of our common livebearers, excluding the molly and perhaps the guppy (which has been known to live and breed in brackish water) are appreciative of slightly acid water, with an approximate pH of 6.8. Mollys, however, are a much different proposition as they require water of a distinct alkaline nature.

With livebearing species, an organ known as the gonopodium (which takes the place of the anal fin) has been developed in the males. This organ allows the female's eggs to be fertilized within the body cavity where, upon hatching, they undergo further development so that when the young appear they are able to fend for themselves immediately. The sexes of livebearers are quite easily defined, the female being somewhat larger and deeper-bodied than the male, her pectoral, ventral and anal fins being well-rounded whilst in the male the pectorals are rounded and the ventral fins pointed.

Breeding, as can be imagined, is easily accomplished, even in the

community tank, though the danger of their being eaten by their parents or other occupants of the tank is great. Signs of the female bearing young are best revealed by the area around the rear of her anal fin becoming darkened, coupled with a growing roundness of the body. Upon the appearance of such signs it will be found a wise policy, if it is desired to save the fry, to transfer the female to an isolated aquarium where she may rest safe from the amorous advances of the male and deliver her brood in peace. In order to provide effective cover for the fry immediately after birth, the aquarium should either be heavily planted with bushy plants and floating ones, or else provided with an artificial spawning medium such as nylon mops.

After birth, the female should be removed and feeding of the fry started two days later with newly-hatched brine shrimp or powdered dry food. In due course, the usual foods may be supplied. Growth of livebearer fry is rapid.

ANSWER TO QUICKIE QUIZ

PIRANHA

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The Aquarist's Notebook



Keeping And Breeding

Corydoras

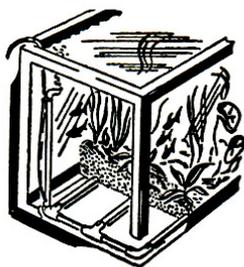
CORYDORAS AENEUS is a very popular and useful catfish which has been imported in large numbers the past few years. The *Corydoras* genus inhabits the northern half of South America and is found in large numbers in Brazil.

spolizei", meaning the sanitary squad.

The coloration of *Corydoras aeneus* is basically bronze, gradually changing to a light cream on the ventral side. *Corydoras* are easy to keep because they are hardy and

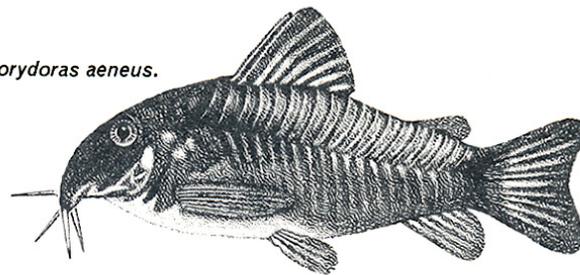
Filter Controversy

IF THE NUMBER OF different makes of aquarium filters on the market is anything to go by, then a very wide use of filtration as an aid to aquarium-keeping is being made throughout the hobby today. Although filters are not essential aquarium accessories for the experienced hobbyist, the beginner is well advised to use them. Further, where artificial aeration is being em-



ployed, the filter offers the best possible means of using the air supply. Voices of the experienced are in fact seldom raised against the principle of aquarium filtration, but these same voices are quite often heard speaking in favor of or emphatically against some particular kind of filter or another. What is the beginner to
Continued overleaf, first column.

Corydoras aeneus.



When the genus was first discovered, it was known by German aquarists as the "Panzerwels", meaning plated or armored catfish. Since then, these fish have been known even as "Gesundheit-

will eagerly accept almost any food. They are peaceful and are rarely attacked by bigger fishes because of their armored protection. This consists of hard plates which replace
Continued overleaf, second column.

QUICKIE QUIZ

Find the fish in the following:

- The first is in **DACE** but not in **DAB**,
- The second is in **TAXI** but not in **CAB**,
- The third is in **CIRCUS** and also in **CLOWN**,
- The fourth is in **WHITE** but not in **BROWN**,
- The fifth is in **ALARM** but not in **SCARE**,
- The sixth is in **TRAP** and also in **SNARE**,
- The seventh is in **SIGN** and also **ENDORSE**,
- The eighth is in **SMOOTH** and also in **COARSE**,
- The ninth is in **MOTHER** but not in **DAD**,

- The tenth is in **HAPPY** and also in **SAD**,
- The eleventh is in **SCHOOL** and also in **SCHOLAR**,
- The twelfth is in **DIME** but not in **DOLLAR**,
- The next is in **LOVE** but not in **HATE**,
- The fourteenth is in **EARLY** and also in **LATE**,
- The fifteenth is in **GRASS** but not found in **HAY**,
- The sixteenth is in **CURD** but not in **WHEY**,
- The last is in **AQUARIUM** and also in **SWIM**.

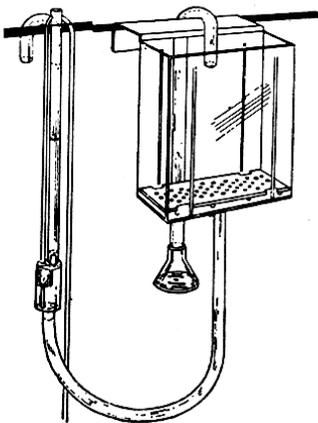
Solution next page.

FILTERS *Continued.*

think when he hears conflicting opinions?

The conflicts here, such as inside filters being better than outside ones or vice versa, or undergravel filters being the best of all or being positively harmful, arise from aquarists' attempts to generalize from their own individual experiences, and these may or may not have been analyzed correctly. Discussion of filters often bogs down because what is being compared cannot be comparable. There is no standard aquarium. Some are of large capacity, some are small; some are heavily planted, some are unplanted; fishes that may be kept present a wide range of types, as do, indeed, the water plants; foods used differ from one aquarist's tank to another. Yet all these things, among quite a few other factors, could influence the results obtained with any filter.

Aquarists are not always even



certain of what they mean by "filtration", and confuse a filter's capacity to remove non-dissolved, suspended particles from water (which is really all that filtration can be held to imply, and its possible additional use to limit the accumulation of dissolved substances in water (which is absorption or adsorption, taking place only when some agent such as carbon is included in the filter, or a bacterial process that breaks down such material into simpler, less harmful substances). It is, of course, suspended matter that causes opacity or cloudiness of water, and therefore it is filtration that is usually the aquarist's primary con-

CORYDORAS *Continued.*

scales on most other fishes. *Corydoras* can really be regarded as the armadillos of the fish world!

Breeding these fish is much easier than most people think. It is essential to start with young fish, and to rear them under standard conditions, i.e., water of medium hardness (150 ppm), a temperature of 72 to 76 °F, and a well planted tank with plenty of loose mulm on the bottom. The mulm is important (this is merely the fine debris that accumulates in the average tank) because it harbors food for which the fish search, and this ensures the development of strong barbels.

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Condition the fish by feeding them on tubifex, whiteworms, chopped earthworms or frozen adult brine shrimp. Keep the catfish separately from other fishes, and after two or three weeks, the female becomes rounder (when viewed from above) than the male. This is

cern. The real difference in filters is that some, such as the outside type, remove suspended material mechanically, and that others, such as the undergravel type, convert suspended material into water, carbon dioxide and end products such as nitrates, by a bacterial process that utilizes oxygen in the water. But even the outside filter breaks down some suspended material in the same way; the difference is merely one of degree. If regular partial changes of water are made in the aquarium, both types of filter work well. If changes are not made, then neither works well although the undergravel type will fail first. More care to preserve this distinction would help in discussions. 

the best means of sexing. As spawning time approaches, the female takes on a reddish hue on her ventral side. The pair are then placed together in a clean tank about 10 or 15 gallons capacity. Spawning usually takes place within two or three days at a temperature of about 78 °F. A trick that frequently works is to add some fresh tap water, a few degrees lower than the temperature of the tank water. This may stimulate the fish into spawning provided the female has been well-conditioned and is full of eggs.

The eggs measure almost 2 mm in diameter and are an opaque white color, much like the *infertile* eggs of most other fishes. They are laid in groups of four or five, and may total three hundred per spawning. Even when plants are present, the catfish prefer to lay about 80% of their eggs on flat surfaces such as the sides of the tank or on a filter. Some of the eggs are laid just under the surface of the water. At this point, remove the parents (although they do not appear to eat their eggs), and add a little acriflavine to prevent fungus from spreading. It is good practice to supply aeration to oxygenate and circulate the water.

At a temperature of 78 °F, the eggs hatch in less than three days, and the fry soon begin to look for food. This may be provided in the form of commercial liquid fry foods available at your dealer, and very fine grade dry foods made into a paste which sinks quickly. The young have hearty appetites and many are lost through underfeeding. They grow rapidly and lose their shyness after two or three weeks. When a month old, they are able to eat microworms, and two weeks later they will eat dwarf white worms. 

ANSWER TO QUICKIE QUIZ
CICHLASOMA SEVERUM

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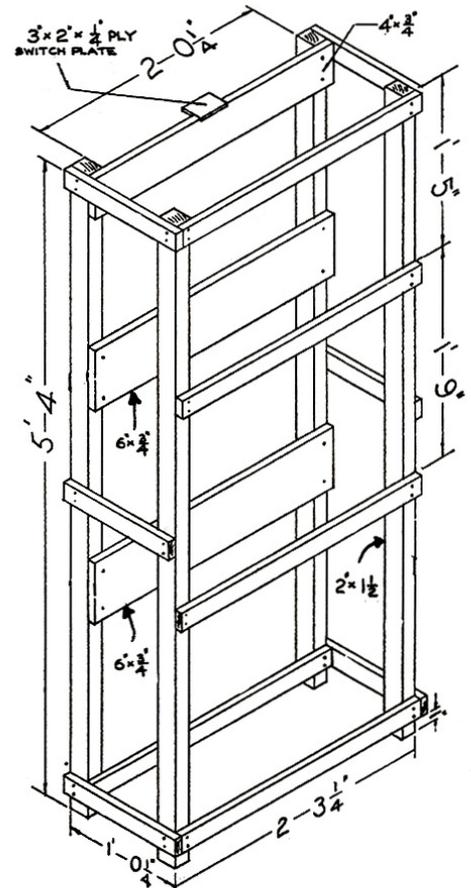
An Easily Made Aquarium Case

THE HOME LAYOUT described in this article is designed to accommodate two 24 in. by 12 in. by 12 in. aquaria with provision for a 24 in. by 15 in. by 12 in. breeding tank if desired. The outer case, which is tilted forward for feeding, can be completely removed for other purposes.

The sizes given here may be altered to suit individual requirements but the size between uprights must not be less than the tank length plus ¼ inch. This is to allow for discrepancies in tank sizes and slight error in cutting the windows in the outer case.

To make the front and back of the stand the uprights and cross-rails should be cut to the exact length; the positions of the screw holes are then marked on the cross-rails and drilled (7/32 in. diameter) and finally countersunk to take the head of a 1½ in. No. 10 screw. The position of the cross-rails is next marked on all four uprights remembering that the bottom rail is kept 1 in. up from the floor. The frame should then be laid flat and the rails placed in position. A ⅛ in. diameter "thread hole" is drilled in the upright, concentric with the clearance hole in the cross-rail. This is to ac-

As only simple joints are used in the construction, the cabinet can be



Details of the stand assembly (overall 5 ft. 4 in. high, 2 ft. 4¾ in. wide and 1 ft. 1 in. from back to front). All unmarked rails are 1½ in. by ¾ in.

Tips You Can Use

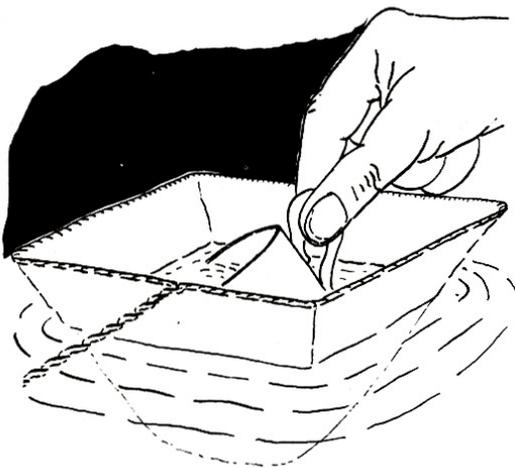
Check with this list to see if you have done all you can to give your plants the best conditions:

Good top light on for sufficient hours daily

Water not excessively hard

Temperature even throughout the aquarium

Snail population under control and no excessively vegetarian fishes present



Young fry must not be lifted out of the water in a net, but when gathered in a net at the surface they can be ladled out by the use of a cup ●

QUICKIE QUIZ

Find the fish in the following:
 The first is in **BUS** but not in **TRAIN**,
 The second is in **HALTER** but not in **REIN**,
 The third is in **SHRUB** and also in **TREE**.
 The fourth is in **OBSERVE** but not in **SEE**,

The fifth is in **CUBE** and also in **SQUARE**.
 The sixth is in **SURPLUS** and also in **SPARE**.

Answer on next page.

made by any handyman provided reasonable care is taken in marking out and in squaring each frame. The materials used should be the best available and free from knots, shakes and other defects. The ideal would be to make the stand uprights out of a hardwood with pine or fir for all other pieces. All wood must be straight and any warped or unseasoned timber should not be used. As the size of the outer case is determined by the dimensions of the stands, the stand must be made first.

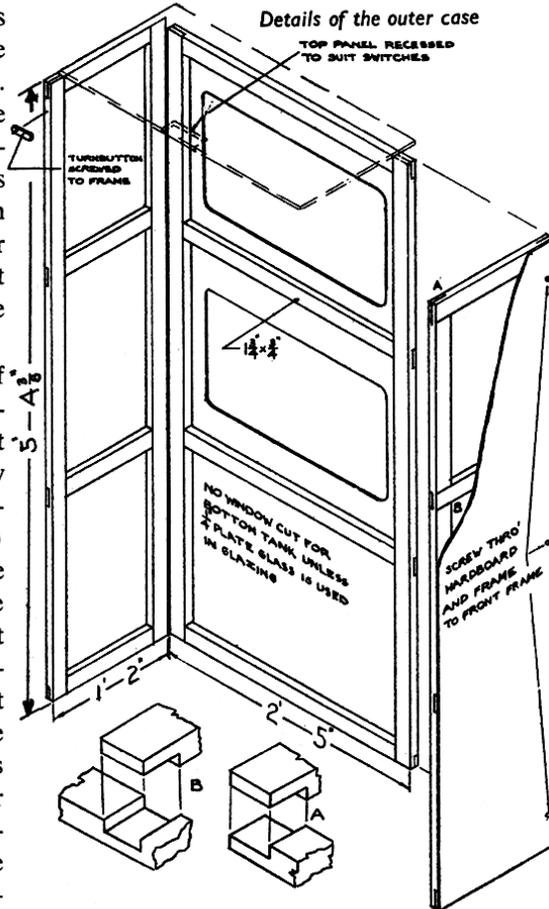
The sizes given here may be altered to suit individual requirements but the size between uprights must not be less than the tank length plus $\frac{1}{4}$ inch. This is to allow for discrepancies in tank sizes and slight error in cutting the windows in the outer case.

To make the front and back of the stand the uprights and cross-rails should be cut to the exact length; the positions of the screw holes are then marked on the cross-rails and drilled ($\frac{7}{32}$ in. diameter) and finally countersunk to take the head of a $1\frac{1}{2}$ in. No. 10 screw. The position of the cross-rails is next marked on all four uprights remembering that the bottom rail is kept 1 in. up from the floor. The frame should then be laid flat and the rails placed in position. A $\frac{1}{8}$ in. diameter "thread hole" is drilled in the upright, concentric with the clearance hole in the cross-rail. This is to accommodate the thread of the screw, which would otherwise split the upright or be very difficult to turn. One screw should be inserted at each joint and the frame checked for squareness (the diagonals should be equal in length) before the second screw is fitted.

The front and back frames are connected by the six short cross-rails in a similar manner, ensuring that the screws do not foul the screws of the front and back frames. The stand is now complete and should be quite stable.

The outer case comprises three frames which are half-lap jointed and glued and screwed together with $\frac{5}{8}$ in. No. 6 screws. The clearance

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hole this time is $\frac{9}{64}$ in. All three frames must be checked for squareness before second screws are inserted.

As the outer case should be a good fit to the stand, on the same principle that the best drawers are those which fit well into the opening, the large frame should be made slightly wider than the breadth of the stand, and planed down until just wider than it.

It is better to nail the hardboard (or plywood if this is used) on to the side frame board before assembly as doing so afterwards may strain the joint between front and side frames. In nailing the hardboard or plywood to the frames,

$\frac{5}{8}$ in. long finishing nails should be used as these do not require countersinking later. The frames must be laid flat for nailing since a frame which has bend in it during nailing will retain the bent shape.

The side frames should be screwed to the front frame with $1\frac{3}{4}$ in. No. 10 screws. The hardboard or plywood tops is next nailed to all three frames and the whole assembly tried for fitting over the stand.

The hardboard or plywood of the front frame is tacked into position, allowing about $\frac{1}{8}$ in. projection at each side. The windows are then accurately marked on the face of the sheet in the case of glazed tanks, but with unglazed tanks the windows may be marked accurately on the back of the sheet, i.e., from the inside of the frame. A $\frac{3}{4}$ in. drill is used at each corner of the window and the windows marked accordingly. A keyhole or sabre saw may then be used to commence cutting out the windows. The entire cover is then tried in place and the front hardboard or plywood nailed into correct position. The surplus at the edges is planed off, and all corners are rounded with sandpaper before painting or covering with wood-grained vinyl "paper". Turnbuttons (these are just flat pieces of metal that are anchored by a screw and which can be turned with the fingers — see sketch) should be fitted at the top back corner of the outer case to retain the case hard against the stand.



ANSWER TO QUICKIE QUIZ
BARBUS

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Aquarium Flatworms

A TINY LEAF-SHAPED creature, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, undulating over the gravel or sometimes even swimming freely, is a startling sight in any aquarium. It looks very much like a leech and one wonders how it could have got there. Most likely it is a flatworm, of which there are many kinds in the United States.

The sketch shows one quite common species, which is usually pale brown, transparent, with its internal organs showing yellow and dark brown. When seen sideways it is very thin.

Flatworms have very fine hairs, or cilia, all over their bodies. It is on these that they move, and in stagnant water the hairs promote a slight movement to provide oxygen. These creatures are very tenacious of life for in drought they can encase their bodies in a protective coating of slime, and if unable to find food can survive for years without it.

These are dangerous creatures in any aquarium, for most of them are

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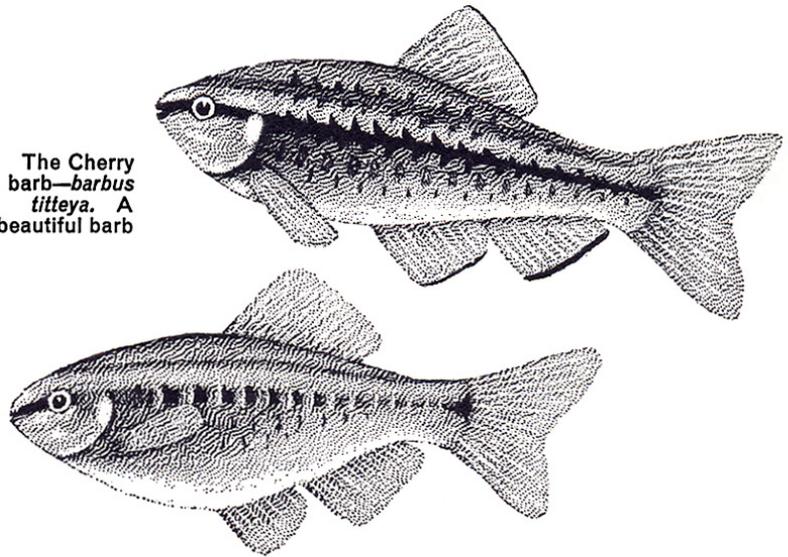
Fun With The Cherry Barb

ONE OF THE MOST beautiful of the barbs, the cherry barb differs from most of the group in that it is much calmer and gentler in temperament. In fact, it is rather

time — since around 1936. Mature specimens may grow to a size of 2 in. but this is the exception, the average size being $1\frac{3}{4}$ in. The male is particularly colorful, depending of

Continued overleaf, first column.

The Cherry barb—*barbus titteya*. A beautiful barb



on the timid side, preferring to retire into thickets of plant life, rather than be to the fore as its more boisterous cousins. Without a doubt, this is one of the “quieter” barbs and has much to recommend it to the aquarist for apart from being peaceful and beautiful, it is small, hardy and easy to breed. For popularity in the group, this one surely comes near the top of the list and is a firm favorite with us.

The cherry barb comes from the shady streams of Ceylon and has been in this country for quite some

QUICKIE QUIZ

Find the fish in the following:

The first is in **CROWD** but not in

ALONE,

The second is in **VOLUME** and also in **STONE,**

The third is in **MODEL** but not in **TOY,**

The fourth is in **GIRL** but not found in **BOY,**

The fifth is in **STOOL** but not in **CHAIR,**

The sixth is in **APPLE** as well as in **PEAR.**

Answer on next page.

The Aquarist's Notebook

CHERRY BARB *Continued.*

course on moods and condition, and all shades between a deep cherry red and a warm blush pink are seen at various times. He is especially attractive at breeding time when the body takes on a sheen of ox-blood blue, superimposed on a deep cherry red, with irregular small bars on and just below the lateral line.

The female is of a rusty brown shade and is quite attractive in a quieter way. A brown to black longitudinal line or band runs from the corner of the mouth through the eye to the middle of the caudal fin. The band is less pronounced in the male. Fins of the male are cherry red, those of the female yellowish brown. There is one pair of barbels on the upper jaw.



These are not difficult fish to induce to spawn, and an average hatching will number 150 to 200 youngsters. It is our experience with the cherry barb that it does not spawn all at any one time, the female preferring to drop a few eggs each day over a period of seven to ten days. This means that the youngest hatchlings will vary considerably in size to that of the oldest. Although some have found this fish an avid egg-eater, we have not found it to be so. In any event, a bottom layer of nylon mops or other artificial spawning medium will prevent the parents from eating their eggs. The fry are easily raised on a liquid fry food or finely powdered food. Altogether, this is a charming little fish and an excellent subject for the smaller community tank. ●

FLATWORMS *Continued.*

carnivorous, and can envelope their prey in slime. This same slime can occasionally be seen behind them when they travel over plants or rocks.

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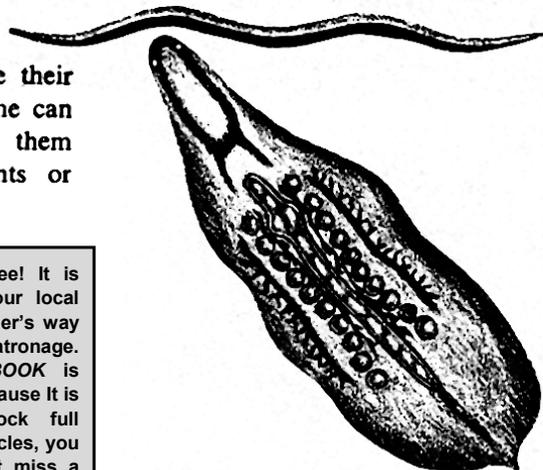
It is obvious that they are most easily transported on plants and any large collection of aquatic plants can carry a few. Nevertheless, they are slow-moving creatures and easily caught, so if a good watch is kept for them, there should be little trouble.

Reproduction of these flatworms is in two ways. They are all hermaphroditic, and so fertilize themselves. Young flatworms have a number of young ones develop inside them, and at a certain stage these babies eat their way out of the

TROPICAL QUERIES

At one of our club meetings, a member expressed the opinion that water plants root best in washed sand alone. Yet the experienced writers on aquarium management usually recommend a mixture of peat, clay, and fine grit as a planting medium. I should appreciate your comments.

Neither your club member nor the experts are wrong. There is less danger of a newly purchased plant rotting away from the crown down-wards if it is anchored in washed sand alone. But after a root system has been produced the plant does best with something to feed on, such a compost made up of clay and peat, and some coarse sand or grit to keep it open.



parent's body. This appears to cause no harm to the parent and in fact several generations are produced in this manner.

Later, when the flatworm is mature, instead of producing new babies in its body it develops some eggs which can often be seen through the transparent body. These eggs are never laid but remain intact until the flatworm dies and disintegrates. Then, and only then, do the eggs hatch and the new cycle of life begins.

With such a generous means of reproduction, the ability to go without food for long periods, and their means of encasing their bodies to withstand drought, it seems certain that these particular kinds of flatworms are well suited to survive.

One or two chemical treatments for aquarium have been described using lime water or potassium permanganate, but these are rather critical in quantities and are also poisonous to fishes. We prefer to watch for flatworms and use long tweezers to pull them out. 

ANSWER TO QUICKIE QUIZ
COLISA

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How To Rescue A Bubblenest

IT IS A LITTLE unusual, but not really rare, for a pair of bubble-nest-builders (bettas, paradise,

aquarium containing the same kind of water.

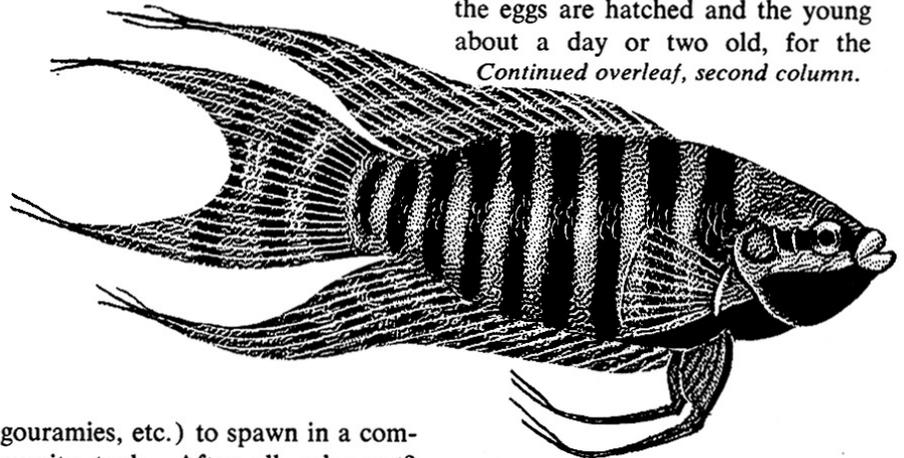
I do not remove the nest until the eggs are hatched and the young about a day or two old, for the
Continued overleaf, second column.

Story Of The Neon Tetra

THE arrival of 4 one-inch-long fishes in New York in 1936 caused quite a furore in aquarium circles. Offers of more than 100 dollars were made for a pair of these undescribably beautiful fishes. Thereby hangs a tale.

In the early days of the hobby, seafaring men of various nations imported practically all new fishes. The sailors had little time for excursions inshore and the fishes brought by them were caught near the seaports. As the interest in aquaria increased, some men who had made a living by collecting animals, birds and butterflies in the tropics, devoted their efforts to small freshwater fishes. Today several firms have fish collectors in various parts of the world, mainly in Brazil, the Guianas, the Argentine, Malaynesia, etc. To keep expenses at a reasonable level and to assure adequate and safe transportation for the fishes collected, the majority of these expeditions follow well-established lines of travel. Inaccessible localities remote from civilization are rarely visited.

Continued overleaf, first column.



gouramies, etc.) to spawn in a community tank. After all, why not? Eggs develop and something must be done about it. A timid couple may find a corner among aquarium grasses and floating plants in which to build a love nest.

Even though they succeed in hatching the eggs and guarding the young for a week or two, they cannot possibly prevent the babies from wandering far enough away to be eaten by "friendly enemies." Therefore some plan must quickly be put into effect if the nest and its precious contents are to be preserved. Obviously, the corner of the aquarium containing the father and his family can be partitioned off. This is apt to be both difficult and inconvenient. The stratagem I have found to be effective is to dip out the nest in a saucepan and deposit it in another

QUICKIE QUIZ

Find the plant in the following:

The first is in **ARRIVES** but not in **DEPARTS**,

The second is in **BILLIARDS** and also in **DARTS**,

The third is in **ANKLE** but not in **KNEE**,

The fourth is in **SLEIGH** but not in **SKI**,
The fifth is in **STRAIGHT** but not in

NARROW,

The sixth is in **THRUSH** and also in **SPARROW**,

The seventh is in **TEN** and also in **NINE**,

The eighth is in **BEER** and also in **WINE**,

The ninth is in **THIRD** and also in **THREE**,

The tenth is in **TWIG** but not in **TREE**,

The last is found in **ABUNDANCE**.

Answer on next page.

NEON TETRA: *Continued*

For the discovery and importation of the neon tetra we are greatly indebted to the intrepid French collector, A. Rabaut, whose roving disposition led him into many parts of South America. He spent years in Venezuela prospecting for emeralds; at another time he hunted alligators for their skins. One cannot mention an outpost of civilization in Brazil, Venezuela, Columbia or Peru that has not been visited by him repeatedly. His wide experience fits him perfectly to explore out-of-the-way places, and his willingness to take a long chance has been responsible for the finding of *Hyphessobrycon innesi*.



The quest for new fishes led Rabaut beyond the regions regularly visited by fish collectors. His successful neon expedition started from France in February, 1936. A month later he and his wife, who accompanies him on his travels, reached Manaus, the seaport on the mighty Amazon, almost 1,000 miles from the ocean. After preparations to go further into the interior, he travelled almost another 1,000 miles by river boat to the neighborhood of the Colombian frontier, a trip of over 15 days. Then he went by canoe up the Putumayo (called Ica in Brazil), a northern tributary of the Amazon, into the Amazonas district of Colombia.

After a base had been established, trips on foot, lasting several days, were made into the primeval forest, yet untrodden by the foot of white men.

Small forest streams, bare of aquatic vegetation, their bottom consisting of mud to a depth of several feet, were explored. This was very difficult, as the banks of the narrow rills, only from two or three feet wide, were overgrown by plants, covered by dead leaves and

ANSWER TO QUICKIE QUIZ
VALLISNERIA

BUBBLENESTS: *Continued*

parent is able to guard them for a time. Neither parent is removed with the nest. Young have been successfully reared without the care of the parents, especially with those species that have eggs which are lighter than water, such as giant gouramies. With such species the eggs may be removed before hatching.

The experiment is always worth trying, for, under the conditions mentioned, the young would be lost anyhow. On a number of occasions I have rescued and reared a fair proportion of the young of three-spot gouramies, paradise fish and *Trichogaster leeri*.

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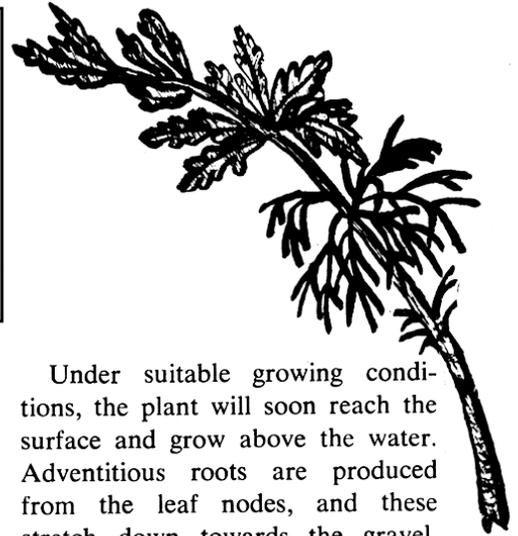
criss-crossed by a maze of dead forest giants. Everything had to be cleared away before net and seine could be used. The darkness of the forest made it difficult to see anything in the water. Persistent search revealed the beautiful neon tetra. The water depth was from one to three feet and the temperature 74 to 76 degrees. Rabaut built boxes out of mahogany and cedar lined with pitch, for storing and transporting the fishes. He spent over 3 months in the wilderness before a worthwhile number of fishes had been collected and laboriously carried on the backs of natives and then by canoe to his base, a wooden can or two at a time.

Air was supplied by hand-pump, even in the depth of the forest, and natives were 24 hours at this back-breaking task.

Food had to be taken along because no game or fruit was to be found. Fish was the only fresh food, and this was plentiful.

A Valuable Aquarium Plant

AMBULIA, as it is usually called in the trade, has leaves of a light, bright green color, and these are produced in whorls of from about 4 to 8. The leaves are about ½ inch broad and range in length from about ¼ to ⅞ inch. Young leaves at the top of the plant are relatively entire compared to the finely divided more mature leaves whose segments are slightly broadened at their ends. The plant's stem is fairly strong in contrast to the fine leaf formation.



Under suitable growing conditions, the plant will soon reach the surface and grow above the water. Adventitious roots are produced from the leaf nodes, and these stretch down towards the gravel. These rooted pieces may be used as new plants if cut off beneath the roots and planted, after removing the lower leaf whorls. Ordinary stem cuttings can be taken for propagating material.

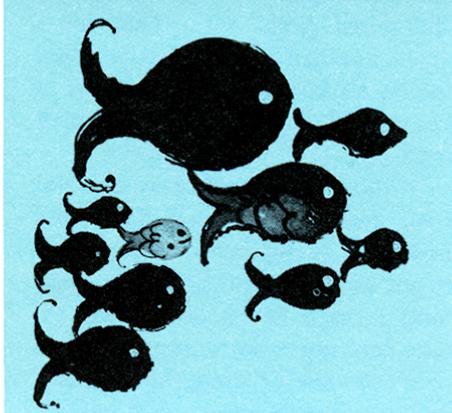
My own plants have grown well in water at 78°F, with a water quality of pH 7.0 and hardness of 90 ppm. No special feeding seems necessary although an undergravel filter seems to produce stronger growth. About 5 hours of artificial lighting per day is sufficient for the plant, this being enough to prevent the growth of algae on the plant's fine leaves also.

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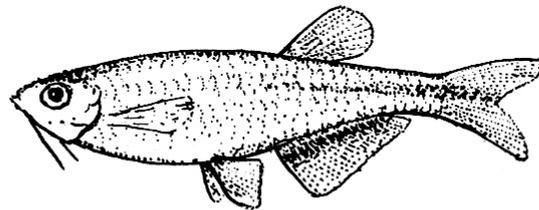


Beginner's Guide To

The Pearl Danio

ADMIRER alike for its delicate beauty, peaceful habits, ceaseless activity and hardiness, the pearl danio, technically known as *Brachydanio albolineatus*, has remained a

B. albolineatus thrives best in a well-lighted aquarium maintained at a temperature range of 72°F to 75°F but a gradual drop to the middle sixties (°F), or a slow rise



Making Glass Jar Aquaria

THERE IS NOTHING difficult about cutting down a glass preserve jar to make an excellent, non-toxic container for an aquarium plant needing a compost richer than plain, washed gravel, or in cutting down a large pickle jar to make a convenient aquarium to serve as a breeding tank for small fishes or a quarantine tank.

To make such a container, all you have to do is to wind three or four turns of darning or knitting wool around the jar at the desired height, moisten the wool well with alcohol (wood alcohol is best), and set it alight. The instant the flames have died down, hold the jar under a dripping coldwater tap. The glass will then break right round where the wool was with a sudden crack. To make the cut-down jar safe to handle, blunt the razor-sharp edges with a few rubs of a carborundum stone. If the jar is to be used as a tank, the edges may also be bound with vinyl electrician's tape. 

firm favorite ever since it was first introduced to tropical aquarium keepers about 50 years ago. It is found in the wild in standing and fast-moving fresh waters in Further India, Burma and Sumatra and attains about 2½ in. in length.

The general color is shining gun-metal blue to violet overlaid with a shell-pink to greenish iridescence which melts imperceptibly into pearly white flushed with pink on the underparts. A magenta red stripe, colored green to gold along its edges, extends from roughly the middle of the body to the bifurcation of the caudal fin. This is yellowish green, as are the other fins, though a faint to pronounced reddish tinge is present in their bases. Small, hair-fine barbels are present on the mouth. Sexing mature fish is easy because the female is fuller-bodied and deeper-bellied than the male, and her colors are never quite as bright.

to the eighties (°F) will be attended with no ill-effects. Nevertheless, it is asking for trouble to subject this fish to extremes of temperature for any length of time.

Continued overleaf.

QUICKIE QUIZ

Find the fish in the following:
The first is in **FAST** but not in **SLOW**,
The second is in **RAIN** but not in **SNOW**,
The third is in **ORANGE** and also in **PEAR**,
The fourth is **OXYGEN** but not in **AIR**,
The fifth is in **MOON** but not in **SUN**,
The sixth is in **OUNCE** and also in **TON**,
The seventh is in **SQUARE** and also in **ROUND**,
The eighth is in **LOST** but not in **FOUND**,
The last is in **HARE** and also in **HOUND**.

Answer on next page.

The Aquarist's Notebook

Like most lively fishes, *B. albolineatus* is always ready for food, and in this it is easy to please; for anything alive or dried will be accepted with relish. It should be stressed, however, that live food such as *Daphnia* or midge larvae, combined with separation of the sexes over a period of a week or so, cannot be bettered for bringing a pair into breeding condition. This condition, it seems hardly necessary to say, is clearly recognized by the male's enhanced colors and extra liveliness, and the female's distended abdomen and sides.



'Darling—our first-born!'

As a sexually excited male is a most enthusiastic driver, the tank destined for spawning a pair should measure at least 18 in. long. Obviously, unless it is the intention of the breeder to transfer some of the post-larval fry to another tank for growing on, then the larger the spawning tank the better. For with plenty of swimming space and the right sort of food in clean, well-oxygenated water, it is possible to coax the youngsters along to a saleable size in the proverbial no time.

ANSWER TO QUICKIE QUIZ

FIREMOUTH

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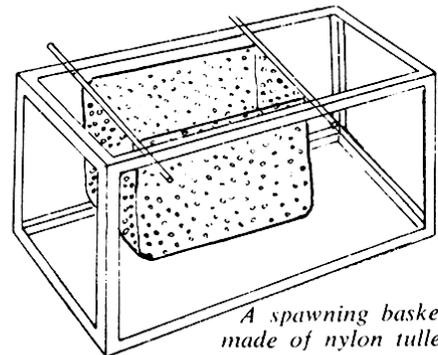
At this point, however, it is necessary to draw attention to the fact that the pearl danio is an avid eater of its own eggs. Therefore it falls to the aquarist to devise some method of protecting them from the parent fish. The most natural method that comes to mind is to carpet the floor of the tank with a tangled mass of weighted-down, fine-foliaged vegetation into which the eggs will fall. But a surer aid to success is a perforated plastic sheet cut to fit inside the aquarium like a false floor, and raised just off the bottom on stones. Shallow water, too, not more than 5 in. deep over the protection given, is essential. For in a greater depth the fish are likely to take quite a heavy toll of the eggs before they fall to safety. It is recommended to introduce the conditioned fish into the prepared tank last thing at night, for then you can be almost certain that they will spawn the following morning or afternoon. Returning to the actual spawning for a moment, many breeders mate two males to a female to ensure a high percentage of fertile eggs.

When spawning is over (a spawned-out female looks thin and tattered in appearance) the parent fish should be removed from the tank. If a perforated screen has been used to save the eggs, this should be lifted out. But plants, or a floor covering of glass marbles (which some successful breeders prefer to defeat the spawners' cannibalistic intentions), can remain where they are.

As a rule, the rather large eggs incubate before 2 days are out, but

the fry, which at first adhere to the plants, the glass floor, or the sides of the tank, do not become free-swimming until they have absorbed the nourishment contained in the abdominal yolk sac. This takes about another couple of days, then the fry strike out in all directions in search of microscopically small food.

Without question the least trouble-free and most growth-promoting first food is Infusoria. But if this is not available and flour-fine dried food is used as an alternative, do take care not to introduce too much of it at a time or else pollution, with its attendant dangers, will set in. Should you be away from home most of the day, a siphon-type drip-feeder for Infusoria (or a liquid fry food which can be purchased from your dealer) is quite easy to rig up above the surface of the water. Larger food such as micro-worms should follow on as a matter of course. That is, as soon as the fry are large enough to take it.



A spawning basket made of nylon tulle.

Assuming that all goes well, the fry should measure about 1 in. long within the space of a month, and be ready to breed themselves at the age of 6 months. Like all rapid developers and extremely active livers, the pearl danio is past its prime for breeding at about 18 months. Its life-expectancy is about

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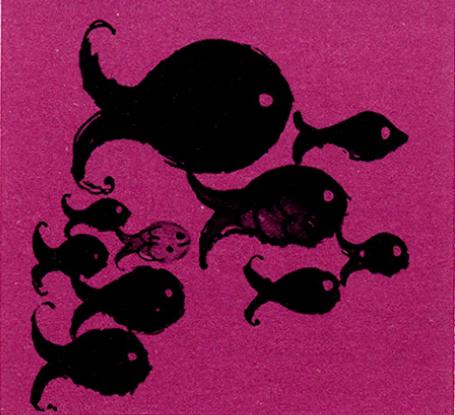
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Keeping And Breeding

The Blind Cave Fish

NOTWITHSTANDING THE deprivation of its sight by untold centuries of life underground, the blind cave fish (*Anoptichthys jordani*), a characin from San Luis Potosi, Mexico, never bumps into

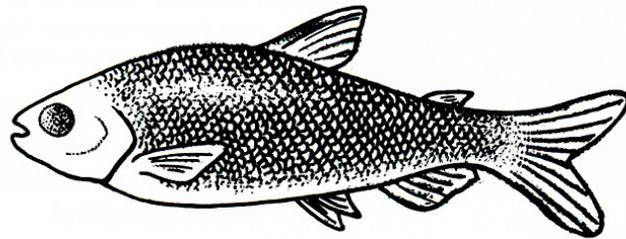
vibration. Indeed, it can snap up worms wriggling in the water as quickly, if not more quickly, than normal-sighted fishes. Obviously, too, its sense of smell must be very acute for it can find pieces of meat

A Brook For Your Garden

OVER a period of years I had constructed four informal ponds and a pond-cum-bog garden at the rear. They had all been built at different levels, and channels had been left at each end to serve as inlets and outlets for water. At the far end of the pond on the left I had built up a solid rockery. It is not so easy as it might seem to persuade a stream of water to flow with a natural effect, and as I built this up, it was channelled out here and there on the top, whilst odd bits of stone were stuck into the wet cement.

The pond at the lowest level was close to my garden shed, where I already had electric lighting. I bought a centrifugal pump, also a foot valve and strainer supplied by the manufacturers; the strainer is essential to prevent mud and leaves being drawn into the pump. The maximum output of the pump was 750 gallons per hour, with a consumption of 210 watts. I screwed the pump to a shelf in the shed,

Continued overleaf



rockwork or the sides of its aquarium, becomes entangled in the plants, has head-on collisions with other fishes sharing its tank, or fails to find its food.

That it avoids doing these things is due, without a doubt, to its heightened senses of location and

or dried food lying on the bottom in the proverbial no time. Clearly, then, there is no need to emphasize the fact that the blind cave fish makes a most efficient scavenger. If it has any faults at all it is that some specimens tend to become fin nippers with age.

Continued overleaf.

QUICKIE QUIZ

Find the fish in the following:

The first is in DOSE but not in PILL

The second is in COLD and also in CHILL

The third may be found in RAIN and also in WATER

The fourth is in MOTHER as well as in DAUGHTER

The fifth is in OCEAN but not in SEA

The sixth is in POTATO and also in PEA

The seventh is in HILL but not in DALE

The eighth is in BARGAIN and also in SALE

The ninth is in COTTAGE but not in HOUSE

The tenth is in JUMPER and also in BLOUSE

The eleventh is in START but not in BEGIN

The twelfth is in BRANDY but not in GIN

The next is in FRONT and also in REAR

The fourteenth is in GUN but not in SPEAR

The fifteenth is in AQUARIUM but not in TANK

The last is in SMACK and also in SPANK

Answer on next page.

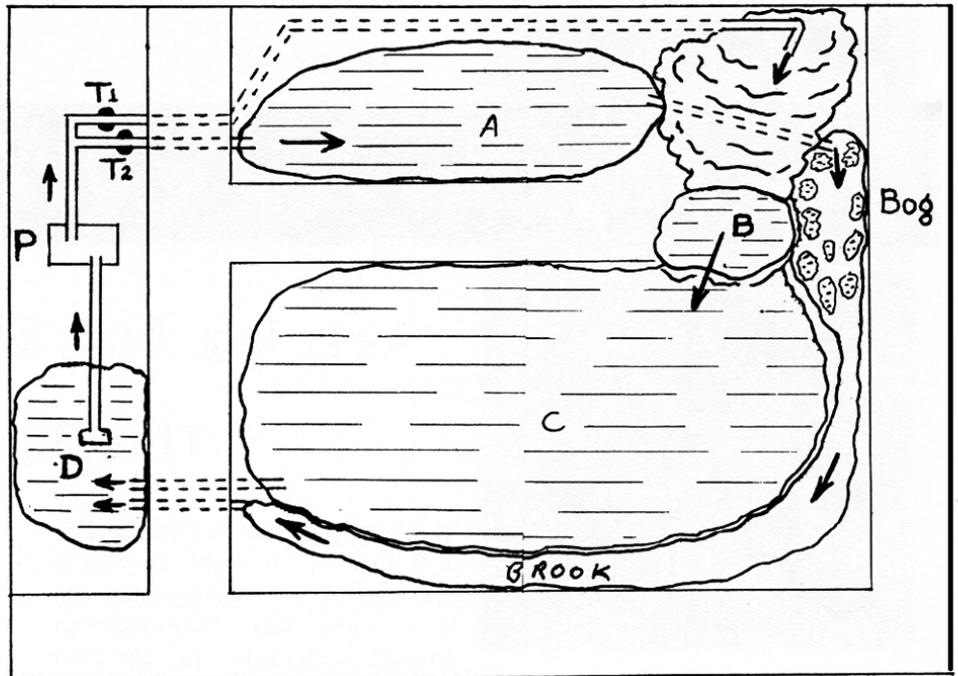
BLIND FISH *Continued.*

In general appearance it is flesh-colored, overlaid with a silvery sheen. The fins are faintly or pronouncedly tinged with pink. The places where the eyes were in the long, long ago (the species is said to be derived from *Astyanax fasciatus*, the Mexican tetra, specimens of which must have become imprisoned where no light penetrated by a landslide or earth tremors), are rudimentary sockets partially or completely grown over. It attains about 3 inches in length and, except for the solitary specimens mentioned, is generally peaceful. Females are more deeper-bodied than males.

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It is a hardy fish which thrives well at a temperature range of 64 to 75 °F, and is quite at home in the well-lighted aquarium. It swims in a slightly head-downward position, and is always on the go. It can be bread in captivity fairly easily, and the female — the larger of the two sexes — scatters her non-buoyant eggs at or near the surface of the water. The breeding tank should be filled with crystal-clear water, its bottom furnished with spawning mops of nylon (your dealer can supply one or more commercial artificial spawning media products).

At a temperature of 78 °F the eggs hatch in about three days, and three days later the fry become free swimming. As first food, infusoria or a liquid fry food is required, but after 10 days, newly-hatched brine shrimp can be fed. Provided there is ample swimming space in well-aerated water, the fry never fail to make rapid progress. 



Plan view of the garden described in the article. Ponds A, B, D and the 'central pond' C are connected via piping (broken lines indicate buried sections) to one another and the pump P. Arrows indicate direction of flow. Pond B receives the waterfall flow from a rockery and pond A supplies the bog garden and 'brook'. T1 and T2 are stop valves on pipes from the pump

about 4 feet higher than the bottom of the pond. Following the maker's simple instructions, electric wiring was quickly completed.

From the foot valve and strainer in the pond to the pump in the shed, I used flexible connecting hose, 1 inch bore, and adjustable pipe clips, as a suction lift must not be restricted in any way with small bore pipes. Inside the shed I used galvanized metal piping, 1 inch bore, and two stop valves. My purpose here was to be able to control two streams of water, together or separately, both of which could be shut off, or increased, as I fancied.

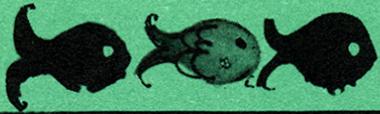
The longest length of piping ran from the shed to the back of the rockery and was hidden from view behind the walls of the left-hand pond. The shorter length led to the near end of this pond, which was close to the garden shed. Under the rockery, a channel led into the pond-cum-bog garden and the outlet

from here led to a channel on the right-hand side of the large central pond. The outlet from this, was under the footpath and into the pond at the lowest level, as was the outlet from the central pond. Thus the water drawn from the pond could be divided into two streams, both of which would terminate at the source from which they were drawn, the same water being used over and over again.

When the pump was switched on at last, the result was very effective. Water flower over the rockery, into the tiny pond below it and into the large central pond, while the "babbling brook" ran through the bog garden and made its way under the footpath to the lowest level pond. All the piping had been concealed and my visitors were enchanted with the lovely spectacle. As for myself, I considered that my labors had been well worthwhile, in fact, a huge success! 

ANSWER TO QUICKIE QUIZ
SCATOPHAGUS ARGUS

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A BEGINNER'S GUIDE

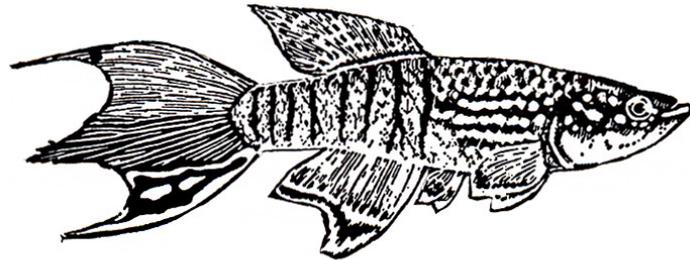
TO THE APHYOSEMIONS

THE APHYOSEMIONS ARE a large and showy genus of freshwater fishes found mainly on and in the neighborhood of the Guinea Coast of west Africa. They belong to the family Cyprinodontidae, popularly known as killifishes, and average some 2 to 3 inches in length. The chief characteristics are a rather elongated body, with the top of the

In point of fact some of these egg-burying aphyosemions may well be bracketed with the true annuals, that is to say with those fishes that complete their entire life cycle within the space of a year. Incidentally, the longest known of the annuals (among the cyprinodonts) are the pearl fish (*Cynolebias*) that occur in the small pools that disappear and reappear

When A Fish Falls

ONE THING IS CERTAIN, that the fish on the floor is not going to die just because it is out of the water. Make sure that you pick it up successfully at the first attempt when you do try. One of the best ways of doing this is to slip a piece of damp paper or card under the fish and flick it into

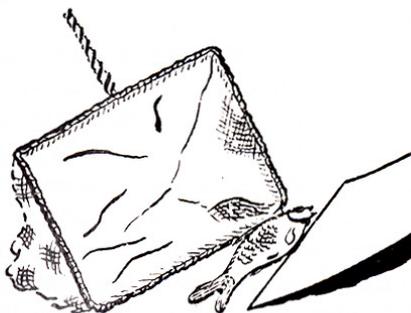


head flattened, and the dorsal fin set fairly well back towards the tail. In all species that aquarists know the male may be distinguished from the female by his brighter and greater array of colors.

seemingly limitless plains or pampas of south-east South America.

But be all this as it may, egg-burying aphyosemions are not the only members of this fascinating genus available to the tropical aquarist. There are indeed a far greater number of species to be had that

Continued overleaf.



a net. But no two situations are alike; you must decide the best course yourself.

Obviously the tactics used will vary depending upon whether you are picking up a big cichlid or a tiny guppy, whether it is easy to get at the fish or whether it has slipped into

Continued overleaf.

Essentially aphyosemions are fishes of leafy-shaded ponds and streamlets and temporary pools formed by prolonged rain or rivers overflowing their banks. That species inhabiting areas where the waters dwindle to nothing or next to nothing in times of drought have not become extinct is explained by the fact that they lay their tough-shelled eggs in the mud and bottom-debris, and the period of incubation of the eggs often extends over several months or, put in another way, until the return of the rainy season.

QUICKIE QUIZ

Find the fish in the following:
The first is in **NICE** and also in **NEAT**,
The second is in **FATE** and also in **FEET**,
The third is in **OYSTER** but not in **STEW**,
The last is in **BROWN** but not in **BLUE**.

Answer next page.

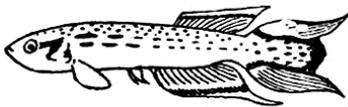
FISH ON FLOOR *continued.*

some awkward corner. The important thing is do not rush the job; you have adequate time to think and get the right piece of apparatus for the task.

If, after returning the fish to the water, you find that the skin is lacerated and the fish has picked up some dirt, it is best to isolate it in a little jar or spare tank and some methylene blue to the water. This minimises the chance of the wounds becoming septic or developing fungus. Methylene blue is quite harmless to fish: about 5 drops of a 1% solution added to a 2-lb. jam-jar three-quarters full of water is adequate. This drug, however, is not kind to plants and it should not be used in a planted tank. A day or two's stay in the methylene blue solution is usually all that is necessary to achieve healthy healing of the skin of a damaged fish.



APHYOSEMIONS *continued.*



deposit their eggs in vegetation either near the surface or just clear of the bottom, and live their lives less briefly. Among the loveliest of these species are *A. bivittatum*, *A. chrystyi*, *A. spurelli*, *A. cognatum* and *A. vexillifer* (names currently used by aquarists, but not in every case by ichthyologists, to distinguish one species from another).

On average the fry of the above and closely related species take from about a fortnight to three weeks to break free from the egg. As in the fry of livebearers, that are normally born with the yolk sac already absorbed; so, too, the aphyosemions. They emerge from the egg ready and

ANSWER TO QUICKIE QUIZ
NEON

able to take tiny living food. Fine-sieved *Daphnia*, freshly hatched brine shrimp, and the like, may all be given for the first two or three weeks, after which bigger food should be supplied as often, within reason (bear in mind that over-generous feeding of live food can deplete the oxygen content of the water and bring about pollution), as possible.

Spawning is not all over and done with after some relatively brief body-pressings or rushes in the plants, but lasts over a period of a week or more. During this time eggs are laid daily or almost daily. Hence fry are of all sizes or stages of development,

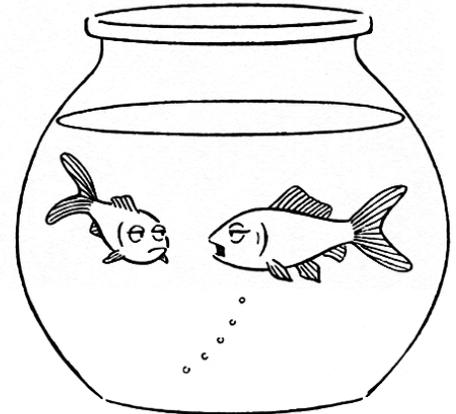
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and must be sorted every now and again to prevent the larger ones depriving the smaller ones of their fair share of food.

In the main aphyosemions are non-aggressive (excepting some males towards one another) and may be introduced into a community tank. But because they are seldom at ease in the company of other fishes and shun a bright light, they are best kept by themselves. A tank about 18in. long will make a suitable home for a pair or trio (a male and two females). Soft water strained through peat or standing over a peat floor is desirable though not essential. A temperature range of from about 72°F to 75°F is recommended. Feeding presents few difficulties. Some species will accept the first-class dried foods quite freely. The majority, however, demand live foods or suitable substitutes. A point to bear in mind is that all aphyosemions are good jumpers, and it is asking for trouble to leave their aquarium uncovered.

In general aphyosemions are not

addicted to cannibalism, but the wise aquarist guards against the fry being eaten by hatching the eggs in a separate container. As the fish will spawn as readily on bunched nylon threads as in tangles of feathery foilage it is no trouble to harvest the eggs. It is of great importance, however, to place the eggs in water similar in quality to that in the spawning



"I sometimes wonder if we
move in the right circles"

aquarium. Also, the eggs must be protected from bright light. It is interesting to note that no harm will come to the embryos if the eggs are detached from the spawning medium. Naturally enough the eggs should be under close observation, and any which are attacked by fungus or turn white must be removed without delay. The fry, also, must be protected against the possibilities of the spread of disease brought about by unfavorable conditions. Thus, the water in which they are living must be kept free of all putrefying matter and changed (if there is not much of it as, say, when the fry are kept in the initial stages of their development in 2 lb. glass jars) quite often, with the precaution that the temperature of the fresh water is raised to the level of the old. For the rest, their requirements are the same as their parents. In most species, growth is quite rapid.



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Tricks With The Trichogasters

GOURAMIS OF THE genus *Trichogaster* have most of the qualities essential to a good tropical aquarium fish. All are pleasingly colored, easy to feed, active, hardy within the limits

the female fuller sides — is a tank to themselves. A tank measuring 18in. x 12 in. x 12 in. will do. But a larger tank is recommended.

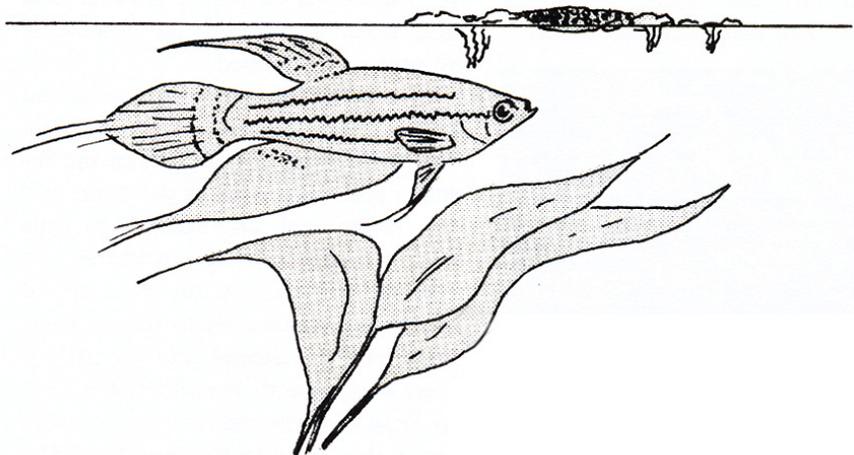
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Fresh eggs for fishes

HAVE you ever come across an ants' "nest" in the garden and wanted to use the so-called "eggs" as a nice little tid-bit for your fish? Unfortunately, more often than not such a "nest" is disturbed whilst digging and it is a tedious task to separate the eggs from the ants and the soil.

However, why not make the ants *work* for you? For want of a better method which I have not yet discovered, this is how it can be done: using a small trowel, spread the whole colony comprising ants, eggs and soil on to a flat surface such as concrete path, wooden board, or, perhaps best of all, the household shovel. Next, clear a small area in the center of the mass and into this space put a small cover such as a small box lid or tin lid — though not one smelling of shoe-polish — in which two or three tiny entrances have been made in the open edge. A light tap with a hammer is often sufficient. You will then be surprised how quickly the ants will find this new hiding place and frantically carry their precious embryos

Continued overleaf.



of their temperature range, which is from about 68°F to 86°F, and in general are well suited to life in a well-planted community tank. Plants are of prime importance for two reasons. For one thing, they furnish the fish with the sort of surroundings they are used to in the wild. For another thing, a male gourami at breeding time becomes ill-disposed towards his companions including the female of his own species, and plenty of plants along the back and ends of the aquarium is the best precaution against too-vigorous chasing.

The proper place for a pair of gouramis in breeding condition — the male showing intensified colors and

QUICKIE QUIZ

Find the plant in the following:

- The first is in **CHURCH** and also in **CHAPEL**,
- The second is in **PEAR** and also in **APPLE**,
- The third is in box but not found in **TIN**,
- The fourth is in **LOST** but is not in **WIN**,
- The fifth is in **BLACK** and also in **BLUE**,
- The last is in **AQUARISTS NOTEBOOK**.

Answer next page.

under "safe" cover out of the light. As soon as all the eggs have been deposited, the thief of a fish-keeper lifts the lid and scoops up the eggs with a spoon!

Snaring the ensnarer

Another occasional source of "fresh egg", also to be found in the garden or the countryside, are the spiders which jealously nurse their eggs in a large white silken-covered ball. These are usually found in old walls, bank-side cavities, or in cavities under flat stones. If you are quick you can catch the speedy spider and carefully relieve it (let's not say steal) of its cocooned eggs and the silken cover can be carefully peeled off over the top of the fish tank. Several hundred tiny but highly acceptable eggs will then drop into the water.

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Other species of web-building spider's eggs are also to be found in corners of the garage or garden shed. These are more loosely cocooned and, though inclined to be "sticky," can sometimes be lifted away from the crevice with a penknife blade and then opened over the top of the tank.

Since all our native spiders at least are acknowledged to be friends of man, it is not suggested that you specially hunt them out for the purpose of pilfering their eggs, but I think the enthusiast can be forgiven for snatching the opportunity when the occasion arises of providing a little change of diet for his fishes.



ANSWER TO QUICKIE QUIZ
CABOMBA

Trichogaster males blow a bubble nest at the surface. A nest is usually attached to, or near, floating vegetation. It is more or less a slightly domed raft composed of beads of froth bound together by an agglutinary secretion. Spawning takes place at any time of the year but it is more likely to occur in late spring or summer than during the autumn or winter. What is needed to bring a couple into spawning condition is a bright toplight, a temperature in the neighborhood of 78°F, and plenty of the right sort of food, that is to say live *Daphnia*, washed chopped tubifex, gnat larvae, and the like. Sexing of mature fish is easy (even when they are not in breeding condition); for the dorsal fin of the male is long and pointed; that of the female is shorter and rounded.

During egg-laying there is an actual embrace between the sexes. The male wraps his body round that of the female, seemingly applies pressure, and the excitement engendered by this and the preliminary overtures — chasing and display on the part of the male — causes her to release eggs. Most of these ascend into the nest of their own accord, but those that start to float towards the bottom or sides are gathered up in the mouths of the fish and then blown out again in the right direction. The energetic male does most of the work.

When spawning is over it is desirable to take the female out of the tank to safeguard her against too much bullying, though separation of the sexes is not vital if the tank is a large one (the importance of shelter plants has been mentioned above). Almost always both sexes are interested in the welfare of their offspring. The eggs hatch in under three days. The fry, which start to move about two days later, may be fed on freshly cultured *Infusoria* and flour-fine dried dried food. The male need not be re-



'Why can't you go to the petshop to get your fish like everyone else?'

moved until the fry have made good headway. A glass cover is essential to prevent cool air blowing across the surface.

Of all the *Trichogaster* spp. usually available *T. leeri* is, perhaps, the one with the most beautiful markings. But the delightful blues are close runners-up. They are sub-species or aquarium-produced sports of *T. trichopterus trichopterus*, a silvery olive fish with two black-brown spots on the sides — the original two-spot gourami that ranges from Bengal, India to the Malay Archipelago. The spotted fish with delicate blue sides and paler markings on the blue fins is *T. trichopterus sumatranus*, which may or may not be a geographical race of the type, or a fish developed after years of selective breeding in captivity in Sumatra.

The blue fish with inky-blue markings extending from about the middle of the body to the tail-base is the opaline or Cosby gourami, which is said to have been developed by an American breeder some twenty-five years ago. Blue gouramis seldom grow larger than 5 in., if that. They may live for upwards of three years.

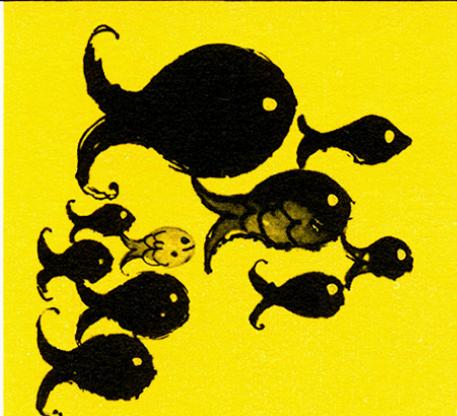


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Tropical Queries

I have been told that acid water can be hard. Is this correct?

Yes, if the water contains a lot of minerals. Soft water is water lacking calcium and other hardening salts. Distilled water, for instance, is truly soft water; so is snow water and rainwater. Soft water passed through peat will give you soft water with an acid reaction. If you added drops of hydrochloric acid or peatwater to hard tapwater all you would get would be hardwater giving an acid reaction.

I am a beginner and was advised by my dealer to feed live-food because then, he said, there would be no danger of my polluting the water. I have been feeding *Daphnia* and whiteworms. But now the compost has turned blackish and there is a sort of mould spreading over it. Also, the fish keep rising to the surface. Please tell me where I have gone wrong?

You will have to clean out your aquarium without delay. You have fed more of the worms than the fishes have been able to cope with, and these uneaten worms have worked into the compost, died there, and brought about a state of acute pollution. It is quite as easy to turn water bad with too much livefood such as worms, that will die in the sand, as with too much dried food left to decay on the top.

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Green Water-

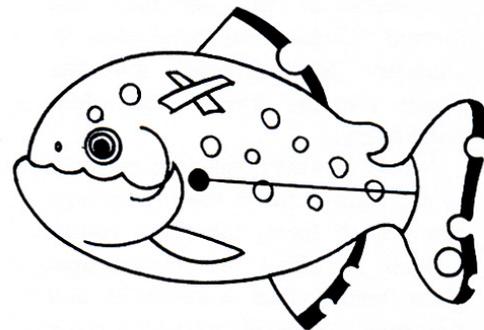
A Tough Problem

OF ALL the irritating and unpleasant things that can happen to an aquarist, nothing is more likely to ruin his disposition and destroy his faith in the essentially benign purposes of nature than green water, particularly when it occurs, as it usually does, in a tank he is especially proud of or for some reason wants to watch closely.

The writer recalls vividly his own initial experience with this condition. He observed one morning that the water in his prize aquarium had lost its usual transparency. The next day it had a slightly green tinge. By the end of the week the contents of the tank had completely disappeared in a fog of pea soup which the strongest light would not pierce. Hoping the condition was temporary and would clear itself up, he postponed doing anything about it, as the tank was a large one and cleaning it out would be no small job. Finally deciding that further waiting was hopeless, he drew off all the water he could without removing about a hundred and fifty fish and replaced it with clear water. The improvement that resulted lasted only a few hours, and three days later the condition was worse than ever.

On the advice of more experienced friends the light was then cut down. The only result, after forty-eight hours, was to bring the

fish to the surface gasping for air. Salt was added, likewise on the advice of friends. Effect — none. Other suggested remedies were tried without any improvement whatever,



and finally the tank had to be cleaned out completely, washed, replanted and gotten off to a new start.

Continued overleaf.

QUICKIE QUIZ

- The first is in **MAGAZINE** but not in **BOOK**
- The second is in **BAKE** but not found in **COOK**
- The third is in **BEAUTY** and also in **BEAST**
- The fourth is in **NORTH** but not in **EAST**
- The fifth is in **TALE** and also in **FABLE**
- The sixth is in **DESK** but not in **TABLE**
- The seventh is in **PANDA** and also in **BEAR**
- The eighth is in **NET** and also in **SNARE**
- The ninth is in **COIN** but not in **NOTE**
- The last is in **TROUSERS** and also in **COAT**.

Answer next page.

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Following this experience an investigation was made which disclosed the following interesting facts:

Water everywhere in indoor aquariums as well as out-door ponds, etc., is constantly receiving air borne spores of algae, yeasts, molds and other bacteria. When the water contains appreciable percentages of dissolved or suspended organic matter, the spores develop into bacteria which break down this matter into its component salts. These salts are the food of plants, and when there is sufficient actively growing plant life in the aquarium the salts are absorbed by the plants practically as fast as they are formed. Under these conditions an aquarium is "balanced" and the water remains sweet and clear indefinitely.

When, however, the salts referred to are formed faster than the plants can absorb them, the algae spores (which in effect are microscopic plant seeds) find a foothold and tiny microscopic plants which swim about in the water develop in prodigious numbers. These algae take up the excess salts and keep the water sweet, but unfortunately they also create an unsightly appearance. Moreover they compete with the higher plants in the aquarium, robbing them of both food and light. In time the higher plants will succumb, leaving the algae in full possession.

It will be seen therefore that the development of green water arises in the first place from an unbalanced condition in the aquarium. The decay and dissolution of an undue quantity of uneaten food, dead snails, fish, plant leaves, excrement, etc., leads to a high bacterial content (indicated by cloudy or ill smelling water) which produces more food than can be consumed by the plant life present in the tank. The algae step in and the tank becomes green.

Cutting down the light kills the algae, removing the effect without touching the cause. This is true of any other remedy which merely kills the algae. In warm weather the sudden death and rapid decomposition of a quantity of algae may foul the tank and kill the fish. The only logical, safe and permanent remedy for green water is to reduce the amount of decomposing organic matter in the tank or increase the number of plants. This means:

1. Find out whether the excess is caused by too many fish.
2. If not, watch your feeding and siphon off the bottom dirt more frequently.



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TROPICAL QUERIES

continued.

I should like to know the name of a cryptocoryne that is really easy to grow and will multiply rapidly in sand alone.

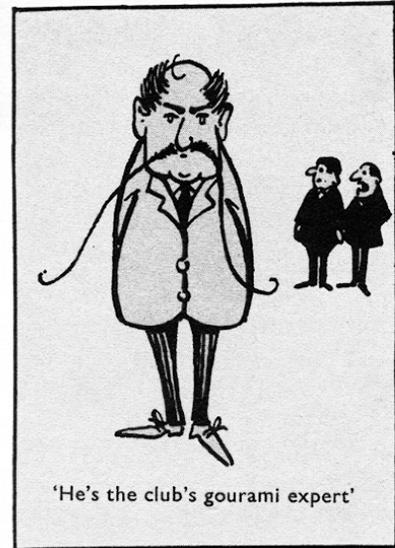
Your best choice would be *C. affinis=haerteliana*. But *C. wendtii* is another member of this wonderful genus that may be grown without difficulty.

What species of fish (scientific name, please) is a Congo salmon?

Phenacogrammus interruptus, sometimes called *Micralestes interruptus*, is often referred to as the kongo-salmer in Germany. Perhaps it is superfluous to add that the species is native to the Congo.

I cannot keep a corydoras catfish in my aquarium for more than a month or two, yet the other fishes, mainly tetras, live on for a long time. Please could you give me any reason why the catfish always die?

**ANSWER TO QUICKIE QUIZ
ZEBRA DANIO**



It could be that the water is not suitable. Tetras live longest in water that is soft and acid; corydoras, on the other hand, flourish best in water that is a trifle hard and neutral to alkaline. Again, it is not an uncommon thing for catfish to be deprived of food when placed in a community tank. You see, most catfish are most active when the light is fading or after dark. So, when you introduce food, alive or dried, into a lighted aquarium the fishes swimming in the middle to upper layers gobble it up before it reaches the bottom. The way to get around this problem is to introduce food a few seconds before the light is switched off, or just before dark.

Would you recommend snails as scavengers in the tropical aquarium?

The short answer is no. But on the other hand, if you keep fishes that will nibble at the egg-capsules and so keep the snail population in check, then it is true to say that some snails do help to keep the bottom clear of uneaten fish food. Further, the excreta of snails provides nourishment for the plants.

Is a 1/4-in. thick glass strong enough to support the combined weight of water, sand and rocks in a 36 in. by 15 in. by 12 in. tank?

It should be, provided the glass is bedded on a level cushion of well-kneaded cement. But a wired glass of similar thickness would give greater strength.



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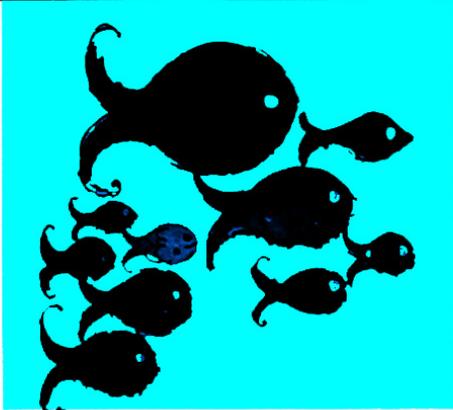
The Aquarist's Notebook

P.O. Box 139

Fairfield, Ohio 45014



The Aquarist's Notebook



Fun With The Sissortail!

Crystalwort

CRYSTALWORT or *Riccia fluitans* is indigenous to many parts of the temperate and tropical world. Its generic name is in honor of Pietro Francisco Ricci, a Florentine botanist; its trivial epithet is from the Latin *fluito*, to float. And float it certainly does (excepting for lichen-like terrestrial forms that colonise permanently wet mud and send down anchoring filaments called rhizoids), in thick spongy masses at the surface of the water. The miniscule foliage — the topmost layer just submerged — is strap-like (known as a thallus) and repeatedly branched and forked at the ends. It is of the loveliest shade of green imaginable.

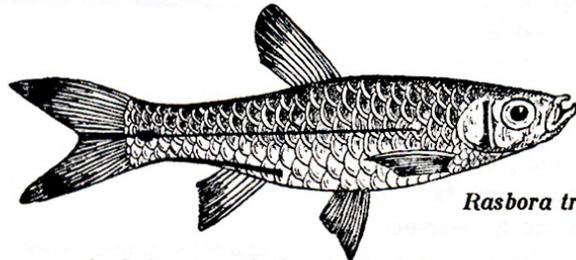
For aquarists the plant has the great advantage that it will tolerate a wide range of temperature, and is therefore well-suited to the cold-water or the tropical aquarium alike. Neither is it faddy about the chemistry of the water, though old or soft water appears to suit it best. It is to be pointed out, however, that it will not grow unless it is provided with plenty

Continued First column.

OUR HOBBY has been singularly well served in the way of descriptive nomenclature. We could have found ourselves asking for 'black and white striped danios' or 'gobies with a black dorsal'. Instead we have 'zebra' danios and 'rhino horn' gobies and all the other pleasing

cribes the appearance of the fish when swimming. Other fishes also spread and retract their caudal fin but the coloring and shape of the *Rasbora trilineata* are such that, when swimming, it resembles nothing so much as a long slim pair of scissors.

The long, silvery body of the fish

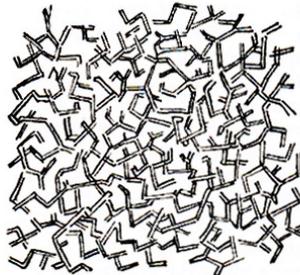


Rasbora trilineata

names that so exactly bring to mind some distinctive feature of the species in question. Along with 'cardinals', 'tigers', 'neons' and 'X-rays', few names are more apt than the common name given to the *Rasbora trilineata* — the scissortail. This exactly des-

is largely transparent with a slight greenish gold tinge over its back. One thin black horizontal line runs from just behind the gill to the base of the tail and another appears just above the anal. The fins are faintly

Continued First column.



Riccia fluitans

QUICKIE QUIZ

The first is in **GRACE** but not in **POISE**,
 The second is in **SILENCE** and also in **NOISE**
 The third is in **MAY** but not found in **JUNE**,
 The fourth is in **SONG** and also in **TUNE**,
 The fifth is in **WHIST** but not in **BRIDGE**,
 The sixth is in **LEDGE** and also in **RIDGE**,
 The seventh is in **TELEGRAM** and also it
CABLE,
 The eighth is in **MINK** but not in **SABLE**,
 The ninth is in **CIGAR** and also in **PIPE**,
 The last is in **ONION** but not in **TRIPE**.

Answer next page.

SCISSORTAIL *Continued.*

golden, but it is the caudal fin that is the fish's most notable feature. Divided into two lobes, the tail bears two oblique black marks edged with white which, when the tail is flicked in and out, bring to mind the movement of a pair of scissors.

In its native waters of Malaya, Sumatra and Borneo, the scissortail is not at all uncommon and has been reported to grow to a size of 7 to 9 in., but a maximum of about 3 in. is more usual in the home aquarium. This might seem, perhaps, to be quite a sizeable fish for a community tank and since it is a very active swimmer it does appreciate a swimming length of no less than 24 in.; but for all the length it can achieve it is not a heavy-bodied fish and it is very peaceful.

A soft acid water suits its requirements most closely, but it is quite hardy and does not demand that conditions should be too exact. Swimming in mid-water, it is also usually to be seen well to the front of the tank. It will take all types of food, but a feed of *Daphnia* provides it with the opportunity for some fast exercise. The females are heavier-bodied than the males and slightly longer.



CRYSTALWORT *Continued.*

of strong light. Given this, myriad bubbles of oxygen are produced and twinkle crystal-bright (whence the popular name of the plant) in the tangle of foliage.

R. fluitans is held in high regard among some breeders of tropical fishes; for not only do many oviparous species favor it as a repository for their eggs (some of the gouramis like incorporate fragments of it in the construction of their nests), but tiny fry are assured of an attack-free, well-oxygenated area where they can find food (live food or substitutes for live

food introduced by the aquarist) and eat it without fear of attack.

The great enemy of *riccia* is algae, and when this is noticed darkening the mass with its fuzzy growth it is of paramount importance to remove the affected foliage without delay. In the main the majority of greenstuff-eating fishes will leave *riccia* alone, but the larger barbs and the scats will not rest contented until they have cleared every portion of it from a tank.



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TROPICAL QUERIES

How can I prevent baby snails being introduced into my aquarium on purchased plants?

Stir a teaspoonful of powdered alum into about a quart of water and leave the plants to soak in this solution for several minutes. Then wash the plants in clean water at the same temperature before placing them in the aquarium. Baby snails adhering to the foliage will not survive this treatment. We must point out, however, that the alum will not penetrate the clear jelly-like capsules packed with unhatched eggs. These capsules must be picked off the plants by hand.

Could I use sulphuric acid to acidify the water of my large aquarium in which I keep a number of angel fish?

Sulphuric acid is quite safe to use to lower the pH value of the water, provided you do not overdo it. Take out about a half-pint of the aquarium water and stir into this a tablespoonful of the acid. Introduce small quantities of this made-up solution into the aquarium every so often. After adding the acid solution always agitate the aquarium water without scaring the fish, and take a reading of the pH value with a pH testing kit obtainable from any well-stocked dealer.

A local stonemason has lots of marble chippings. Would these be too coarse to serve as a planting medium?

Keep marble out of the aquarium. Its effect on water is to make it excessively hard and alkaline.

Would it result in waste of money and time to include plants in a tank destined to accommodate a pair of *Pelmatochromis kribensis*?

Provided the fish are well-fed and the plants introduced have sturdy foliage and a strong rooting-system everything should turn out all right.

A biology student has told me that fish fill aquarium water with poisonous waste products and that the only way to avoid trouble is to change the water at frequent intervals and to keep a filter working continuously. Is this right?

In a well-planted aquarium, not overstocked with fishes, and siphoned periodically to get rid of excessive sediment, the water should stay wholesome enough to maintain the general run of fishes in good shape for years. At the present time too many people are trying to persuade us that old-fashioned methods of fish-keeping do not work. Yet the truth is that they do—and remarkably well at that.

Why is carbon considered a better filtering agent than a good depth of scrupulously washed sand?

There are several reasons but the ones that come first to mind have to do with the absorbent and purifying qualities of carbon and its high porosity. Sand will trap muddy debris but it will not trap bacteria. Carbon or activated charcoal will trap bacteria and render innocuous a lot of the waste products of fish.

The rear half of one of my opaline gouramis has become blue-black. Please can you give me the reason for this change of coloration? The fish is swimming and taking food quite normally.

The males of the opaline and ordinary blue gourami darken to an inky blue when they are in breeding condition, and especially when they are in the presence of a roe-filled female. We do not think you have anything to worry about.

**ANSWER TO QUICKIE QUIZ
GIANT DANIO**

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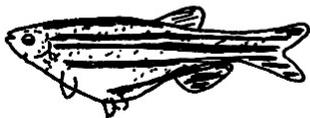


The Aquarist's Notebook



Egg-bound Fishes

FULLNESS of body in a female egg-layer is a well-known indication that the fish is ready to spawn. While a certain degree of plumpness is a good sign an unusually bloated female indicates an egg-bound fish. Many novices are easily taken in by the distended appearance; they imagine that the fish is full of eggs and are perplexed when they fail to obtain a spawning.



The accompanying photograph shows an egg-bound female zebra fish. When all attempts to make her spawn had failed the fish was killed and dissected. The ovaries were found to be distended by a large number of dead, chalky white eggs.

The exact cause of this condition is not known but it is feasible that it is produced by some obstruction in the

Continued First column.

Pitfalls In Cleaning

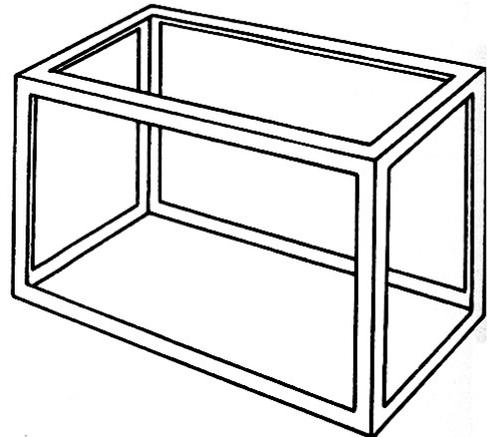
The Aquarium

THERE are two schools of thought about cleaning out aquarium tanks. Most aquarists, including myself, believe that as a rule rinsing out with water is enough, and antiseptics, chemicals, soaps, etc., are rarely necessary and can be dangerous. Others, however, freely use common salt, copper sulphate, potassium permanganate, Lysol, Dettol and other such substances, to disinfect their tanks.

There are occasions when something more than water and elbow grease is necessary for tank cleaning. For instance, when a scrupulously clean tank, free of snails, snails' eggs, *Hydra* and planarians is required for spawning, or when one would like to clean out a tank after an outbreak of some disease to make certain that all the parasites or bacteria are well and truly dead.

A host of chemicals exist which will kill off all the various creatures mentioned, but the difficulty arises in

getting rid of these chemicals from the tank so that not the slightest trace is left behind to harm the fish. This, in my opinion, rules out persistent antiseptics and copper sulphate. I



once cleaned out a tank with Lysol but I could smell it after I had rinsed it and filled and emptied it over 50 times.

The most interesting experience I had was with copper sulphate. I was

Continued Second column.

QUICKIE QUIZ

Find the fish in the text to the right:

Answer on next page.

The first is in **STREAM** and also in **BROOK**
 The second is in **PIGEON** but not in **ROOK**
 The third is in **VEND** but not found in **SELL**
 The fourth is in **UTTER** but not in **TELL**
 The fifth is in **APPLE** and also in **PLUM**
 The sixth is in **GLUE** and also in **GUM**
 The seventh is in **POST** but not found in **MAIL**
 The eighth is in **WORM** but not in **SNAIL**
 The ninth is in **MIST** but not found in **FOG**
 The tenth is in **SANDAL** and also in **CLOG**
 The eleventh is in **EAST** and also in **WEST**
 The twelfth is in **WORST** and also in **BEST**
 The last is found in **MAID MARION**

FULLNESS *Continued.*

oviduct (the tube which leads eggs from the ovary to the exterior). In such a fish, eggs would be retained for too long a period and would ultimately become necrotic (dead).

Another possible sequence of events is that a female fish which has been kept away from the male for too long a period retains her eggs, which ultimately die and the fish becomes egg-bound. The dead eggs may liquefy and ultimately produce a cyst. However, it must be noted that many females (e.g. fighters) will drop their eggs even in the absence of the male, or two females may go through a mock spawning (e.g. angels).

It appears to me that is not a good practice to keep the sexes separated for long periods of time. It is, of course, a good idea to separate the sexes for a week or two before spawning, but at the end of this period they should be brought together in the breeding tank.

If facilities for spawning are not available, or if you change your mind and decide not to breed with them, then do not keep the fish separated for months on end. Bring them together and part them again for a pre-spawning separation at a latter date when you again decide to breed from them.

I breed many species of fishes every year and it sometimes happens that I may separate a pair but find that at all tanks are occupied by other that at the end of 2 weeks no spawning tank is available as all tanks are occupied by other fishes. If, at the end of a month, I find that I still cannot give the pair room I bring them together in the conditioning tanks and lose the spawning rather than risk the female becoming egg-bound.

I have also observed that when fishes that have been separated for 2 or 3 months are brought together, they deliver a large number of useless eggs that never hatch out. This is why I have now made a rule not to keep the sexes separate for more than a month at the most.

ANSWER TO QUICKIE QUIZ
RIVULUS MILESI

When a fish suffers from dropsy its appearance may lead the uninitiated to imagine that it is filling up with eggs. However, as the disease advances and the scales begin to stand out, the condition can be diagnosed quite easily. Dropsy implies the collection of fluid in the peritoneal cavity.

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However, fluid collects not only in the peritoneal cavity but also in other parts as the disease advances. It is this collection of fluid (often termed oedema) in the skin tissues which makes the scales stand out, and not the distension of the abdomen by the fluid collecting in the peritoneal cavity.

That distension of the abdominal wall by itself is not sufficient to cause scale protrusion is obvious when we consider that abdominal distension from other causes, such as filling up with eggs or young, does not cause the scales to project.

The lesson to be learnt then is quite plain; do not be deceived by a plump female fish, the number of eggs she may lay at the next spawning will not necessarily be proportional to her size. There are other things that can cause fullness in fish besides eggs.



CLEANING *Continued.*

treating a fish infected with velvet disease when I accidentally knocked the bottle over and about 200 to 300 ml. of a saturated solution of copper sulphate fell into the 18 in. by 10 in. tank. I rescued the fish at once from this grossly over-dosed water (many thousand times the required amount), but I did not bother to empty the tank; in fact I thought

it would be a good idea to let it stand in order to kill all the parasites.

Now copper sulphates is a deadly poison, so after about a week when I cleaned the tank I took great care to wash it thoroughly. I even stood it under running tap water for a few hours to make certain that all the copper sulphate was washed away.

The aquarium was then duly set up for spawning and a pair of nigger barbs introduced. They seemed happy enough when first put in but were found dead the next morning. To cut a long story short, for about 8 months I struggled to make that tank safe for fish; hours under the tap, weeks of soaking and filling and emptying but no fish could live in it for more than a few days. Copper salts had no doubt been deposited in the glazing compound, so in the end I had to take the tank to pieces and reglaze it to make it habitable for fish.

The substance I use for cleaning tanks is 0.88 sp. gr. ammonia. This is a very strong solution and it must be handled with care and kept out of the reach of children and animals. Never bring your nose or eyes close to a bottle of strong ammonia or serious injury may result. Four or five spoonfuls of this ammonia added to a 18 in. by 10 in. by 10 in. tank is more than adequate. The dose is not critical, as the ammonia is added to a tank filled with water containing no fish or plants. Allow the mixture to stand for a few hours and then empty the tank. Fill and empty the tank five times with tap water and it is then safe for fish.

This is the most efficient and safest way of cleaning an aquarium. The ammonia is powerful enough to kill everything undesirable from the aquarist's point of view and it is very soluble, so it is easily and quickly removed by the changes of the water. Minute traces are harmless to fish and in fact will assist plant growth. Ordinary mature aquarium water contains traces of ammonia, in any case, but larger doses can be toxic.

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Aquarist's Notebook - Volume IV





The Aquarist's Notebook



Swords, Platies, and Mollies

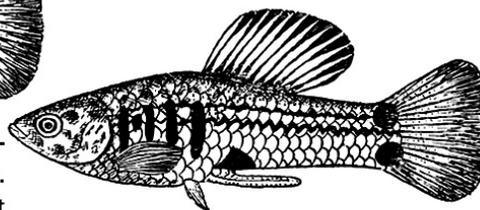
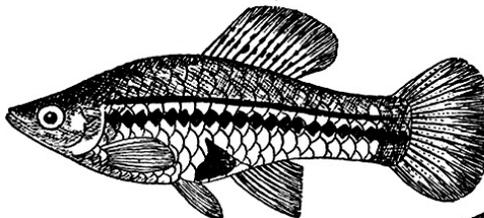
THERE ARE QUITE a lot of articles written on breeding the various egg-laying fish but not so much appears about livebearers. Maybe it is because most people feel there is not such a sense of achievement about

them to work in practice.

I will leave Guppies to the experts and explain how we breed the Swords, Platies and Mollies. First, we try to obtain six young fish from one source and six from another — if possible from people who are breeding in different parts of the country. These fish are then grown

Feeding Fry

ONE OF THE commonest tales of woe that is heard in aquatic circles is how a superb spawning of hundreds of fry vanished mysteriously within a few days of becoming free-swimming. I have investigated scores of cases of this nature and have come to the conclusion that failure to appreciate what is and what is not a 'good' Infusoria culture accounts for a majority of these episodes. Any



this as quite often the fish will produce whether you wish it or not. While this is true, there is still a lot of work involved in breeding good livebearers; if you look round today most of the home-bred fish are very small when mature and also a lot of Swordtails and Platies are very cross-bred. The following ideas in my opinion will produce good fish and over the past few years I have found

up in two different tanks; we try to grow them as quickly as possible by giving as much variety of food as we can. If they can be fed on a good variety about four times per day they will soon grow into mature fish (e.g. for feeding: daphnia, white worm,

Continued Second column.



novice who intends to go in for breeding fish seriously would be well advised to lay aside all fish breeding for some time and study the cultivation of Infusoria.

There are numerous ways of making first-class cultures and most of us have our pet methods. However, what is important is not the method employed but the results obtained. You must somehow or other develop a technique which produces a culture containing thousands of organisms in,

Continued First column.

TROPICAL QUERIES

In an aquarium magazine I read about cured driftwood being used to add charm to a decorative fish tank. What is cured driftwood?

Cured driftwood is driftwood rendered non-toxic to fishes by scrubbing and repeated soaking in clean water. But if you intend to introduce driftwood into your aquarium make certain that the wood is of a suitable kind and not rotting away.

I should like to keep some small exotic frogs in my rather spacious tropical aquarium. Can you suggest any suitable essentially aquatic species?

Specialist dealers in amphibians and reptiles occasionally have *Xenopus gilli* and *X. muelleri* for sale. Neither of these strictly aquatic frogs grows larger than 2 to about 2 1/2 in. Both species are easy to keep in a temperature range of from about the lower to upper seventies (°F.). Bear in mind, though, that these frogs have big mouths capable of gulping down small fishes.

Continued Third column.

INFUSORIA *Continued.*

say, a spoonful or eggcupful of culture and yet the culture should be quite odorless and clear. No strong, unpleasant smell should accompany such a culture and at a casual glance you might mistake it for a quantity of water from a fairly well kept aquarium. By now some of you may feel that this is a slight exaggeration; however, I can assure you that it is not. There is no secret about how a healthy culture is prepared and the process can be quite easily explained on theoretical grounds.

The basis of all Infusoria cultures is some decaying organic matter placed in a quantity of water; up to a point, the nature of this decaying organic matter is immaterial. Anything seems to work and almost everything has been tried by aquarists. Arranged roughly in order of preference, we have lettuce leaves, hay, flour, potato peelings, earthworms and pieces of fish. I have tried most of the above-mentioned and many others and have now standardized my technique by using lettuce leaves. No doubt others have worked out an equally satisfactory method with something else.



Whatever decaying organic matter is employed the first thing that happens in the culture is that a large number of bacteria (quite harmless to fishes or man) begin to feed and multiply on this organic matter. If the water is examined now it will be observed that it is quite turbid and somewhat yellowish in color and may have a faint 'organic' smell or a foul smell resembling rotting eggs. The type of smell depends upon the type of bacteria thriving in the culture.

If you set up your culture in a tall narrow container and it is overloaded with organic material the conditions will be right for anaerobic bacteria (bacteria which do not need free oxygen for growth) to develop,

LIVEBEARERS *Continued.*

oxheart, liver, good quality dry food, freeze-dried foods, spinach, peas, etc.) I would like to say that livebearers especially require some green foods at least twice a week.

When they become sexable, split the fish into males and females, still keeping the two sources separate. As soon as you are sure that all fish have sexed up, introduce the best males

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from source one to the best females from source two and again females from source one to males from source two. You are then starting off with two lots of unrelated stock. We find that when the fish become gravid with the Platies and Swordtails it is best to put one female into a small tank, let her produce her brood and then move her back to the tank she was taken from. If plenty of plant is put into the small tank with her and she is well fed she does not eat her babies and so can be left in peace until you feel she has finished producing.

With Mollies it seems advisable to

whilst if you set up the culture in a shallow container with a relatively large surface anaerobic bacteria will thrive. As many of the anaerobic bacteria produce a gas called hydrogen sulphide (the same one that issues from rotten eggs) it is easy to see why these cultures have a foul smell. Such conditions are unfavorable to the production of a rich Infusoria culture, for Infusoria need oxygen, as well as bacteria which they need as food.

Hence for my culture I use a shallow enamel or polythene bowl about 18 inches in diameter, 6 inches high.

let them stay in the tank with the rest of the fish as when we have moved a gravid Molly the female had had her youngsters then died a few days after going back to the adult tank. Mollies will eat the babies, however, and the only solution is to keep the tank well covered with floating plant and check the tank several times per day when the females look gravid. When you do see the baby Mollies, get them out as quickly as possible.

Once the baby livebearers are swimming around in the small tank they can immediately be moved into larger tanks for growing on. We usually float the small tank in the larger one for half an hour and then let the babies swim out. They can be fed straight away on brine shrimp, micro worm, sifted daphnia and fine dry foods. Within a week or two they will be big enough to eat the normal foods. If this method is followed it should be alright to interbreed for one generation; then, if it is at all possible, bring in new blood as often as you can. What I like to do once I have a good strain going is to keep my females and buy in one or two young males. We usually have two males and about six females in the adult tanks and this gives a continuous supply of youngsters. Although it is more work than if you just go out and get a pair of fish, the final result will not only give great satisfaction to the breeder but will benefit the tropical fish hobby in general.

I have bought a 36 in. by 15 in. by 12 in. tank to fit into a dark alcove in my sitting room. Would two 40 watt clear glass lamps in a hood-type reflector provide sufficient illumination for the plants and fishes?

No, you will need two 60 watt lamps or three 40 watt lamps kept switched on for at least eight hours a day. Better still, buy a 3 ft. fluorescent fitting to take a 40 watt warm white tube.

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A Winter Vacation Scheme

SOME AQUARISTS WHO have, during the winter, become enamoured with tropical fish keeping may be concerned for their welfare whilst they themselves are away on leave. The ideal would be kind neighbors or a time switch to avoid the lack of lighting, oxygenation and filtration during the period of one's enjoyment, but to avoid the inconveniencing of friends and others who might tend to resent the added responsibility such would involve and the heavy expenditure of the latter, the problem can be overcome at little additional expense — in fact, the purchase of two juncture plugs at your local hardware store. The idea is also useful for those who keep an aquarium or two at their offices.

Diagrammatically, the systems most used are as shown in diagram A and B. These diagrams show things as they usually are.

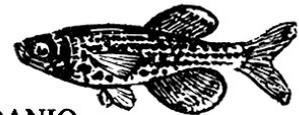
Using one junction plug, System A should be rewired to that shown in the diagram as System C.

Continued overleaf 1st column.

Spawning The Leopard Danio

LIKE OTHER MEMBERS of the danio group, the Leopard Danio delights in swimming in shoals in the upper regions of the tank. The fish do well in ordinary aquarium conditions preferring neutral water; they are very lively, and usually not scary.

The Leopard is the smallest *Brachydanio* to be seen in our tanks. The male measures 1¼ in. in length, and the female is slightly larger at 1½ in.



THE LEOPARD DANIO



Their diet is the same as most community fish but they prefer dried food which tends to float on the water and allows them to use their natural way of feeding by bobbing along the surface.

The males have a silvery body which, when viewed in the correct light, radiates a brilliant golden sheen, the whole body of the fish being flecked with tiny navy-blue spots which are liberally distributed without any distinct pattern being apparent.

The females are slightly deeper bodied and although they have the

Continued overleaf 2nd column.

THE QUESTION CORNER

I want to set up a very special tank for a shoal of cardinal tetras.

Would the use of distilled water bring out their brightest colors and keep them in tip-top condition?

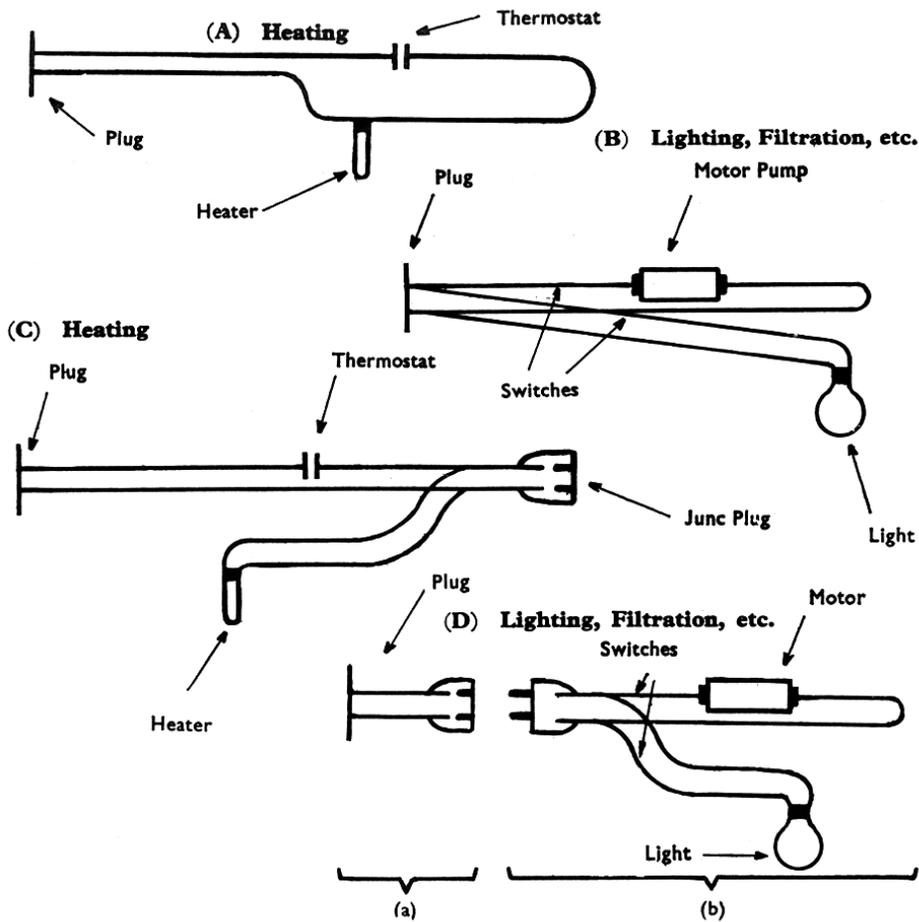
Distilled water by itself does not suit fishes; it lacks essential minerals. If your tap water is not markedly hard, your best plan would be to use a 50/50 mix of tap water and distilled water. This would give you a nice soft water well-suited to tetras.

Would you advise a newcomer to tropical aquarium keeping to spread peat over the bottom of a tank before introducing the washed compost?

A thin layer of peat should not lead to any trouble. But soak the peat before introducing it (dry peat is buoyant and will push its way through the sand) and make certain that the loose peat you buy is pure peat and not some mixture adulterated with fragments of shell or chemical fertilizer.

Some writers on aquarium fishes refer to tilapias as mouth-brooders and others call them mouth-breeders. Which term is correct?

Strictly speaking the term mouth-brooder should be used for those fishes that incubate their eggs in the mouth.



VACATIONS *Continued.*

System B now merely requires the insertion of a junction plug set as shown in the diagram as System D.

System C and D are now for normal use as shown in the diagrams but during absences, the female plug connection of System D is dispensed with, and the portion (b) is plugged into the junction plug of System C, so now the thermostat not only operates the heater, but also the lighting, filtration, etc.

Dependent upon the weather, the extent of the lighting, filtration, etc., will vary but although less than is normally given your fish it is adequate for short absences and more desirable than the alternative, a total absence of the amenity at a time when they are already missing your attention. This is, of course, strictly a cold-weather device as in the summer, the heater is almost never on unless the tank is located in a climate where the evenings are quite cool. 

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same golden sheen, it is not quite so prominent as that of the male. In common with other Danios, they scatter non-adhesive eggs in shallow water among plant thickets—but although prolific breeders they are also avid egg-eaters.

For spawning, a suitable sized tank would be the normal 24 in. x 8 in. x 8 in., the bottom of which should be covered with a clean, coarse gravel and stocked with any feathery type of aquatic plant or nylon spawning mops. Some breeders prefer to use breeding traps in unplanted tanks. These traps enable the non-adhesive eggs to fall through slots or openings small enough to prevent the parents from following and devouring the

eggs. There are various forms of traps. Some are merely clean pebbles or marbles laid on the floor of the tank. Sometimes, however, a spawning fish will wriggle down and become lodged, making the use of this form of trap rather inadvisable. A better method is to use fine wire or nylon mesh ($\frac{1}{8}$ in.), cut to fit the tank. The trap is then lowered on to pieces of slate, one at either end of the aquarium, so that it is raised about 1 in. above the bottom. Care must be taken to ensure that a fish does not try to squeeze its way down between ill-fitting sides. Another advantage of mesh is that the odd plant stalks can be pushed through and made to stand upright thus giving a more natural look and making the fish feel more at home than they would be in a bare tank. Even with these ingenious methods, however, a high proportion of the eggs fungus and fail to hatch. So in the long run the natural method is most probably the best.

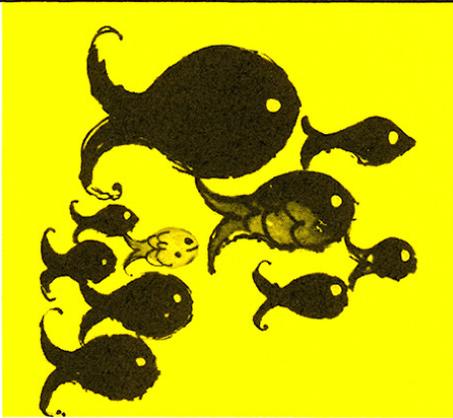
To continue the original method, the tank is then filled to a level of 3 in. with water of an approximate pH value of 7.0. The reason for such a shallow depth is to prevent the fish upending and nuzzling around the gravel for the eggs. The pair intended for spawning should be kept in separate quarters until mating is required. Then, in the late afternoon, the expectant female is placed with the desired male into the breeding tank. The water temperature should be at 78°F (22°C). The pair rarely fail to spawn the following morning but the aquarist should be up to remove the parents before they can devour the eggs.

At a temperature of 78°F, the eggs (a normal batch being between 150-250) will take three or four days, or perhaps even longer to hatch. The fry hang on for two days and are free-swimming on the seventh. They are so small when first hatched that they must be fed on infusoria for the first week, followed by infusoria and sifted brine shrimp for the second. They reach maturity at six months, and can quite easily be sexed at this age.

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THE ULTIMATE BRINE SHRIMP HATCHER

Now Hair This!

FEW AQUARIUM PLANTS are daintier in appearance than hair grass (*Eleocharis acicularis*), which is related to the cosmopolitan sedges widely distributed in Europe, Asia, Australia and the Americas. In the natural state it is commonly found growing along the swampy margins of lakes and in habitually wet ground. Strictly, then, it is a swamp plant rather than a submerged plant.

The filiform stems reach a height of some six to twelve or more inches. They grow in close-packed tufts, each tuft consisting of a few to several stems. The stems, each one seemingly on its own roots, arise from thread-fine runners that travel in all directions under the growing medium. The miniscule elongated-oval brown flower-spike, which is borne on a quadrangular stem, is not produced unless the plant is established on mud raised slightly above, or below, water level.

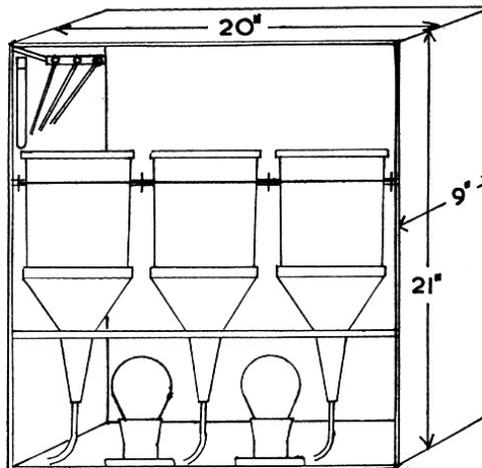
Among the essential needs of hair grass in the aquarium are sufficient light to keep it a healthy green but not so much as to promote a choking

Continued overleaf 3rd column.

THIS ARTICLE deals with the problem of providing a continuous supply of brine shrimp. The equipment described is simple to construct, inexpensive, and a lot of fun to make.

The time taken to hatch brine shrimp eggs reduces as the temperature rises with a limit of 80°F. giving about 24 hours. A full yield cannot be assured in exactly 24 hours so if a somewhat lower temperature is used a full hatch in 48 hours is probably

batch hatches each day. Also, if the cycle is broken by missing one hatch, there will still be some shrimps left from the last batch. After a few cycles, say once a fortnight, the solution is replaced; smell and size of hatch govern the timing.



FRONT VIEW FIG. 4.
BOX SKETCHED TO SHOW DIMENSIONS

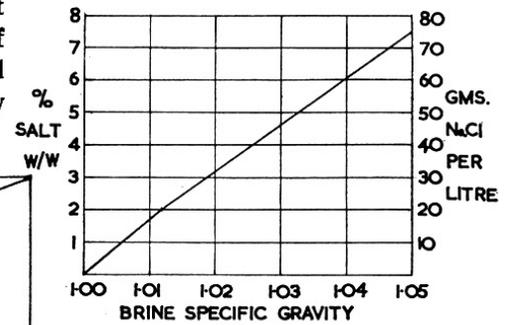


FIG. 1.

We have, I hope, established a case for using three units. There is no doubt that a two-unit assembly could be used at 80°F. but at this temperature the life of the shrimps will be shortened and may increase water-fouling, in any case the extra cost is very little as will be seen later. Having decided on a three-unit hatcher, we require an economical way of keeping the temperature at the desired level in a domestically acceptable unit. To meet this requirement I decided to make a box with a hinged lid and to heat and insulate the whole box rather than the individual containers. The cheapest electrical heater is a bulb and provided that the total

Continued overleaf 1st column.

more practical for fitting in with a scheme for regular daily batches. As the shrimps will live for at least 24 hours after hatching, a 3-day cycle of hatching is practical.

Using three hatchers A, B and C, one is used each day and thus one

BRINE SHRIMP *Continued.*

The hatcher are each constructed from a polythene funnel and a circular transparent plastic storage container (with lid). The container must be a good fit into the funnel. The bottoms are removed from the containers using a jig-saw or a hot knife, and the outsides are coated with

Sealastic to prevent leakage and preferably given a few turns of P.V.C. adhesive tape after pushing firmly into the funnels. The bottom of each funnel is closed with a cork or preferably a rubber bung which has been drilled to take a 2-in. length of glass tubing. The inside end of each tube has previously been drawn out to a small jet by heating in a gas flame. These give fine streams of bubbles which agitate the water. The air control valves are mounted at the top of the box to prevent contamination by the solution which will run back when the air supply is stopped. The lids of the containers should have a small

hours later the temperature should be checked and the thermostat adjusted if necessary. When the temperature is correct, place a quantity of brine shrimp eggs in one container; the next day place some eggs in the second container; on the third day switch off the air pump and allow 2 or 3 minutes for unhatched eggs to settle. Open the door and using, preferably, a fine circular net, catch the shrimps in the first hatcher taking care not to drop brine on to the bulbs. Dip the net and shrimps in warm fresh water to reduce the salt and feed to the aquarium. Add eggs to the third hatcher, close the door and switch on the air. Repeat daily and a constant supply of live food is assured. Some aquarists prefer to syphon off the shrimps.

It is worth while to experiment with different brands of eggs and observe the proportion which hatch. The effects of different brine strengths and borax addition can be investigated. ●

HAIR GRASS *Continued.*

growth of algae to spread among its fragile stems, and clear, soft and neutral to slightly acid water.

The right quality and duration of light (the length of time the plant is exposed to light of the right intensity each day) may be arrived at by experimentation; for size of tank, depth of water, and type of light used all play their part. Clear water is largely a matter of keeping bottom-grubbing fishes out of the tank and excluding any ornaments (man-made or natural) likely to break down into a fine dust. (Any rock or rock-like formation soft enough to do this would be unsuitable—nay, dangerous—to place in an aquarium, anyway.)

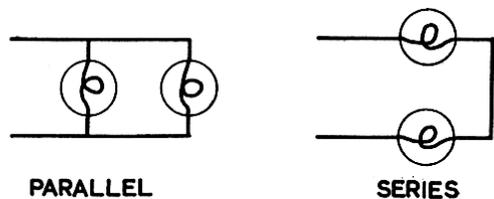
Because of its delicate foilage and shallow rooting-system, hair grass is best suited to a tank housing a pair or collection of smaller fishes. It has a wide temperature tolerance, but flourishes best at a range of from the upper fifties to the middle seventies (°F). Besides its popular name of hair grass, it is less commonly known as needle grass or lesser spike-rush. ●

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hole drilled in each to release the air without allowing salt spray to reach the bulbs.

The hatcher are held in position by a narrow shelf with three holes in which the funnels rest and by elastic bands on cup-hooks which hold the containers against a block mounted on the back of the box, Fig. 2. Long air hoses permit the hatcher to be lifted out for emptying without disconnecting the tubes, Fig. 3. A good clearance should be left above the hatcher to permit netting the shrimps without moving the fixings. Full dimensions are not given as this depends on the size of containers selected. Electrical connections can be made as shown in Fig. 4. A change-over switch which switches off the air blower and switches on the lamp is convenient as it allows the unhatched eggs to settle before netting and illuminates the hatcher. If a separate air-pump is not used a single air valve in the feed line used ON-OFF is easier to use than to carefully reset the individual valves.

To set up the unit, part fill the hatcher with suitable brine, place a thermometer in one hatcher and switch on the heaters and air. 24



PARALLEL **SERIES**
FIG.2 CONNECTION OF BULBS

wattage is kept within the rating of the thermostat, a normal aquarium type of thermostat is suitable. The box was made of 5/8-in. timber and lined with 3/4-in. foam polystyrene sheet. It is important to do this thoroughly in the interest of electrical economy. Don't forget the door. Using 2 x 25 watt bulbs, my unit is switched on for about 40 minutes and off for 180 minutes when the liquid

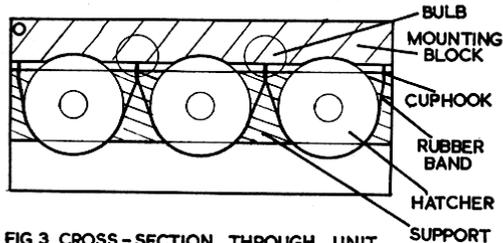


FIG.3 CROSS-SECTION THROUGH UNIT

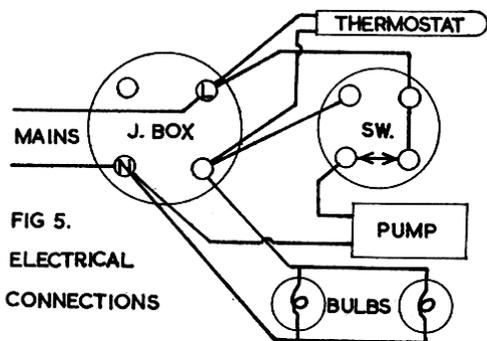


FIG. 5.
ELECTRICAL CONNECTIONS

is 20°F. above ambient. If experiments are to be carried out which may be affected by light it is possible to wire the bulbs in series (Fig. 1) which will dim them considerably and if so connected they could be covered with heat-resistant black paint. In this case the bulb-wattage rating will need to be increased by about x3 to give equivalent heating; the thermostat loading will not be increased by this change.

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Aquarium Safety

EACH YEAR in this country, hundreds of people are killed or seriously injured by electricity in the home. Few of these fatalities are caused by accident, but through ignorance, stupidity and lack of electrical knowledge and know-how. The chief culprit is the man who fancies himself as a do-it-yourself expert, but who has only a vague knowledge of electrical circuits. Electricity is a serious subject and should be treated as such.

Take for example the man who decides to keep tropical fish. He purchases a tank from his local pet shop, fills it with water and decides to fit a heater and thermostat. Here his troubles really begin. Mixing water and electricity is tantamount to mixing gasoline and fire. Fish tanks in this modern era are heated electrically, but too few aquarists take the elementary precautions necessary for absolute safety.

Incorrect wiring could lead to a "live" tank, so a check should be made with a "neon tester" before the earth lead is connected. A "neon

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THE SILVERTIP TETRA

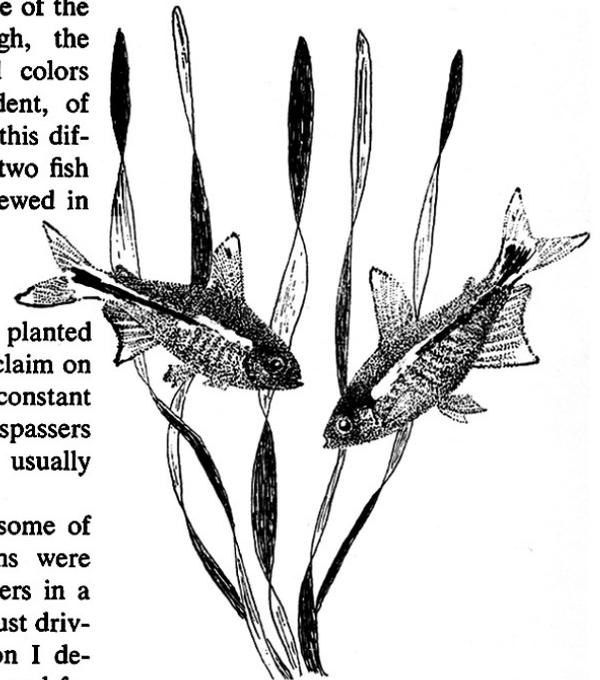
THE SILVERTIP TETRA is an attractive fish which grows to about 1½ in. in length; the body color is golden brown with silvery flanks. A black bar extends along the lateral line from below the dorsal fin into the central rays of the caudal fin; the fins are golden and are tipped with pure white. There are two golden patches in the caudal fin, one each side of the black bar. Naturally enough, the males have more intensified colors and this is much more evident, of course, at breeding times but this difference can be seen easily if two fish are compared in a jar and viewed in daylight.

On placing the fish in a planted tank, each male stakes out a claim on a particular thicket and is on constant guard against other male trespassers and various skirmishes are usually taking place quite often.

After settling down again some of the more colourful specimens were chasing the more drab members in a rather different manner than just driving off trespassers. Thereupon I decided to separate some males and females and attempt to spawn them. Half a dozen of each sex were put into separate quarters for a week or two and a spawning tank prepared.

A 24 in. x 12 in. x 12 in. tank was filled with rain water and a large bunch of anacharis, about a dozen stems, was weighted down at one end.

The temperature was set at 78-80°F., and the tank was left to settle down over the period of conditioning the brood fish. I usually adopt this routine because I have often found that on putting in a pair of fish I suddenly notice a colony of snails sitting waiting for the eggs! I therefore leave the



spawning tank for a week for things to appear.

By this time I had a number of conditioned fish (the mosquito larvae had appeared in my water butt at just the right time), and I decided to put a pair in the tank in the morning.

Continued overleaf 2nd column.

SAFETY *Continued.*

tester" is a screwdriver with a built-in neon bulb—when the finger is placed on the metal tip and the blade on to a clean metal surface, the smallest electrical discharge is indicated by the bulb. Having found that electricity is present, the next step is to put off your main lighting switch. If the light remains on the tester it will indicate that the fault is on the heating circuit or vice versa. Now for the remedy. In the heating circuit the most likely causes will be chipped or cracked glass covers of either the heater or thermostats, perished rubber stoppers or badly made joints. Make sure that joints are thoroughly insulated and situated as far as possible away from the water. The chief cause of electrical leakage in the lighting system could be the moisture on the lamp-holders caused by condensation. This can be eliminated by placing a piece of glass between the water and the lighting unit. An added protection can be afforded by binding the lamp and lampholder with insulation tape at the point where they meet. The main socket should be positioned away from the tank. If this is not possible arrange for it to be placed far enough above the tank to avoid danger from water spillage.

In conclusion, when handling the tank in any way put off your main switch. There is a great danger if you should neglect this simple precaution. One of those large stones if dropped against the heater with the electrical supply on CAN KILL. The hood, complete with lighting assembly making contact with the water and your body CAN KILL. Water splashed on to a hot bulb with supply on CAN KILL. A cable cut by the edge of the lighting hood CAN KILL. So make certain. Water is a conductor of electricity and can be lethal. If in doubt consult a qualified electrician. Be especially careful where a cement or stone floor is concerned. Should your tank be situated in a shed or garage, a tank that would only give a mild shock indoors CAN KILL under these conditions. Fishkeeping is an interesting and fairly cheap hobby, but it can be expensive enough to cost your life.

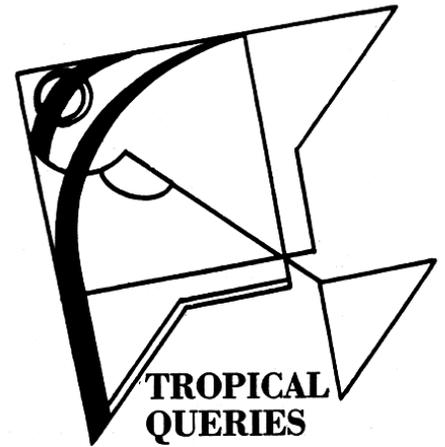


SILVERTIP *Continued.*

After a few minutes, during which the fish found their bearings, the male lost no time in renewing his acquaintance with the female and was soon chasing her all over the tank but finally both ended up in the plants and assumed a side by side attitude, heads up almost vertically and trembled violently with eggs being expelled and fertilized immediately. After an hour or so the female hid in the plants and took no further part or interest in the proceedings; the male kept on swimming round the tank looking for her to no avail but neither, to my surprise, seemed to be taking an unhealthy interest in the newly laid eggs. They were removed at this stage and placed in another tank to recuperate.

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hatching period would take (2-3 days plus three or more to reach the free swimming stage seemed to be a fair guess), I decided to try another pair the next day and so get a few more eggs and a larger number of fry to start off with. The next pair followed the same routine but I forgot to remove the adults and by the time I remembered, I assumed the damage had been done and left them in the tank, intending to try later with another pair. A week passed and I was looking in the tank when I saw to my surprise a few fry amongst the leaves of the plants, and also a number of much bigger fry! Allowing for the fact that in every hatching there are fast and slow growers, the bigger were so much larger that they must have come from the first pair's spawning. Out came the adults pretty smartly and the fry were fed on the usual initial foods, liquid food, fine powdered food and brine shrimp. They are now growing quite quickly and I still can't understand why they were not eaten before as anything edible was snapped up extremely rapidly by the parents. ●



Are gouramies short-lived? I have never been able to keep any species alive for more than a few weeks to a few months!

Gouramies are no shorter-lived than any other popular species. Even the species with the shortest life-expectancy, such as the dwarf and croaking gouramis, should live for at least eighteen months to two years. The quickest way to shorten the life of any gourami is to keep it with boisterous and/or bullying fishes in a thinly planted tank maintained at a temperature in excess of 76°F (24°C) for the greater part of the year.

How can I tell when my pair of *Pelmatochromis kribensis* are ready to spawn? I have a guaranteed pair in an 18 in. by 12 in. by 12 in. tank furnished with deep sand, plenty of plants and an overturned flower pot, but all the fish seem interested in is in keeping out of sight.

Most of the small cichlids are retiring by nature and it is advisable to respect their need for privacy. You will know when they are about to breed by the female's bloated sides and intensified colours and the pair's marked comings and goings into and out of and around the flower pot. But bear in mind that the fish do not like their movements spotlighted by a bright light.

I have a flat concrete roof over a brick outhouse. If I run some plastic guttering to carry rainwater from this roof into a barrel would this be safe to use in my aquariums?

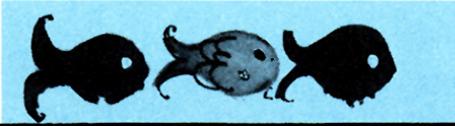
Provided the concrete is well-weathered, that is to say has been exposed to the action of wind and rain for a long time, all should be well. But furnish the container with a moveable cover, with a hole in it to take the down-spout, to prevent birds and gusts of wind depositing anything in it likely to pollute the water.

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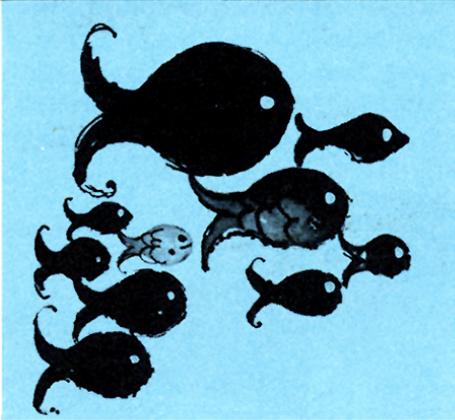
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The Emperor Tetra

FEW TROPICALS ARE more deserving of praise and attention than the emperor tetra, that is heavier in the body than the general run of smaller characins we know and has no adipose fin. This fish is native to Colombia, and was given the formal name of *Nematobrycon palmeri* by C. H. Eigenmann, a distinguished American ichthyologist, more than half a century ago. But be this as it may, it did not reach the tanks of hobbyists until the early 1960s. Not surprisingly it achieved instant success as a home aquarium fish. The reason is not far to seek; for, apart from its outstandingly handsome appearance and peaceful disposition, it is quite hardy within its temperature range of from 68°F to 86°F and is easy to feed on anything alive or dried. Furthermore, breeding it has no special difficulties.

The body of the male is a silky olive on the back shading through beige to ivory white on the underparts. A velvety black band extends from the blunt snout to the root of the tail, where it narrows and con-

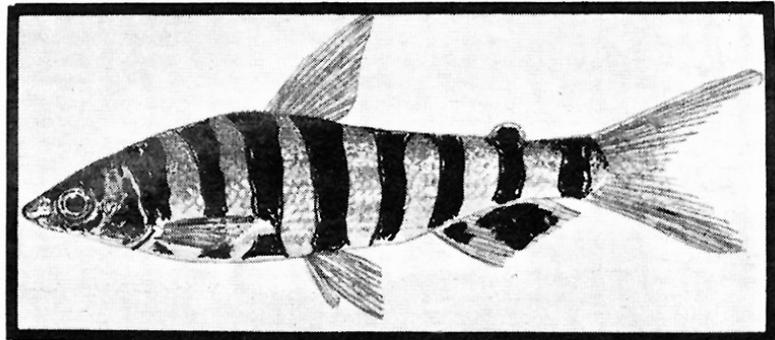
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THOSE RABBIT-NOSED FISHES

THE genus *Leporinus* is widely distributed over most of South America east of the Andes. It is represented to ichthyologists by about twenty species, and to aquarists by about seven species. None are small fishes: they range in nature from about 5 to 14 in. or more. Not unnaturally, the larger species make an important contribution to the diet of the native population.

rivers and streams where they move about unhurriedly, feeding on or near the gravelly bottom on a mixture of animal and vegetable matter.

One or two species have bred in captivity, but little is known about the spawning procedure other than that during the nuptial drive the female scatters her eggs in the plants. Furthermore, nothing is known about how to tell the sexes apart; for differ-

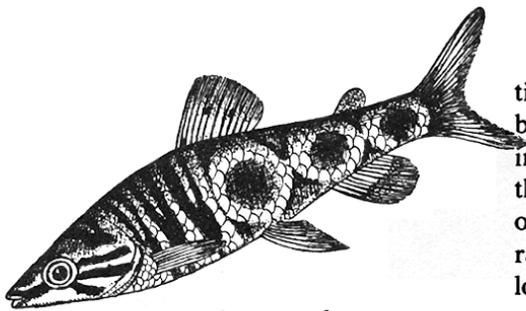


The body is elongated, more rounded in all parts than compressed, and covered with scales of moderate size. The dorsal and anal fins are placed midway between the sharply conical head and the narrow tail. The caudal fin is well developed and is quite deeply forked. An adipose fin is present. The generic name of *Leporinus* is in reference to the rabbit-like snout. The mouth is small. It is characteristic of anostomids to swim in a head-downward position; some only slightly off the horizontal; others at an angle of about forty-five degrees. In the wild state they inhabit clear

ences in coloration or shape of the fins in the different species appear not to exist, or at any rate are not to be found described in the various reference books.

We must bear in mind, though, that in some fishes all the usual signs of sexual maturity concomitant with normal growth and proper development — even the reproductive faculty itself — are lulled into quiescence or abolished permanently by the restrictions imposed by aquarium life. Yet for all that it is heartening to know that a number of aquarium fishes that

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LEPORINUS *Continued:*

once bred rarely or not at all (the angel fish and the neon tetra, for instance) will do so reasonably freely today. The explanation for this is, of course, that the more we become interested in a species or group of closely related species, and the longer we have them around for study and experiment, the more we learn about their ways and special needs.

Because of their fondness for green food, an aquarium for any of these fishes is best furnished with plastic plants and some slivers of non-calcareous stone. In general they do not appear to be faddy about the quality of water they are placed in, or the temperature, provided the former is neither pronouncedly acid nor alkaline, and the latter is kept within a range of from 70°F to 80°F. What is important, however, is a good-fitting cover glass; for all species of *Leporinus* are accomplished jumpers, and when in the mood they can project themselves through a narrow aperture. Therefore, apart from the consideration of green food in their mixed diet, little else is required to satisfy their requirements except a tank suited to their size.

EMPEROR TETS *Continued:*

tinues like a dark sword on to the extended middle rays of the trident-shaped caudal fin. Posteriorly this black band is edged along the top with fugitive tints of metallic red to blue. A narrow black line above a sulphur-yellow bottom margin is present in the long-based anal fin. The outer rays and points of the caudal lobes are dark too. As though this is not sufficiently attractive to look at, the dorsal fin is sickle-shaped with a dark leading edge, and a green-blue sheen shimmers on the gill-covers and shoulders. Perhaps the most distinc-

tive feature is the eye, for this has a black pupil and a shining blue-green iris. The female is noticeably smaller than the male — he attains a length of about 2-2½ in. — and the middle rays of her caudal fin are not prolonged beyond the web of the fork. Her body colours, however, are similar to those of the male, but lack some of their depth and iridescence.

The emperor tetra is not a shoaling species, but if two or more are introduced into a tank they invariably indulge in spirited chasing every time they meet. If both sexes are present it is always the male who does the driving. Sporting takes place in all levels of the water, and there is a continual coming and going in the plants.

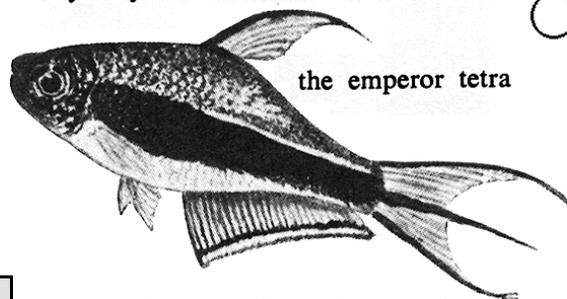
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The spawning procedure of this species follows the general pattern of other egg-scattering tetras. That is to say, there is a lot of fin-spreading on the part of the male, followed by wild chasing. These bursts of activity always end in the plants, where the amber-tinted eggs are laid. The eggs are not strongly adhesive, and many of those that fail to adhere to the vegetation will hatch satisfactorily lying on the bottom, provided conditions are right. The fry are quite large, as fry go, and infusorians followed by such things as brine shrimps, micro worms, and sifted *Daphnia* suit them well.

A pair of emperor tetras will chase and lay eggs even in a thickly populated community tank, but to breed them or, put in another way, raise a number of fry to adulthood, the following points must be observed. First, a fairly spacious tank is necessary. Nothing smaller than an 18 in. by 12 in. by 12 in. will do. The tank, plants

and compost must be scrupulously clean. It is worth the effort to try to obtain a calcium-free compost, that is, say, a fine silica of granite grit. Plants with lacy or feathery foliage are the best to use.

The brood-fish may be brought into prime breeding condition in a community tank by feeding more and richer food than usual. Alternatively, they may be transferred to the tank



the emperor tetra

set aside for spawning and then kept separated for a month or two by a glass divider. Separation of the sexes combined with extra attention to their diet will almost always result in a female filling with roe or spawn, especially if she can see the male displaying through a clean glass screen.

The temperature of the breeding tank should be raised to about 78°F after the fish have been placed in it. Removal of the glass divider early one morning should set them off. If they do not spawn as planned, then just repeat the procedure outlined above all over again. For, sooner or later, unless there is something very unusual about them or the tank they are inhabiting, they will spawn. It is of paramount importance to remove the spawned-out fish from their eggs as quickly as possible, for like most fishes, the emperor tetra is an avid eater of its own eggs and fry. Ordinarily the eggs incubate in two days, and the fry tend to flit and play in the plants rather than swim in open water. With a plentiful supply of the right sort of food, they grow rapidly and show patches of colour within the space of ten weeks.

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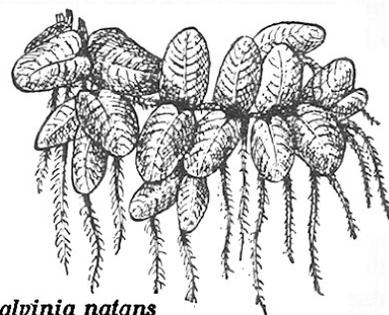


The Aquarist's Notebook



Salvinia

ONE of the most interesting of our tropical floating plants is *Salvinia*. But it can be viewed with disfavour at times because it cuts off so much light from plants below it. However, it is easy to remove from any aquarium so that just a few of the



Salvinia natans

plants are left and it does have some virtues. Among these is the mass of root-like appendages that hang down into the water. These brown feathery growths are not roots but modified leaves, adapted for underwater living. At each node of the stem there are three leaves, two of which are the floating ones, and the other is divided into the brown threads that look so much like roots.

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FEEDING TIPS

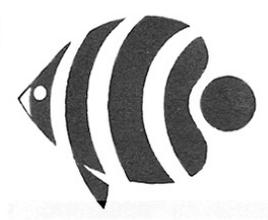
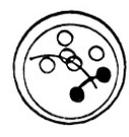
FOR THE BREEDER

I HAVE written several articles on breeding various types of tropical fish, but feel that it is more easy to breed fish than to rear them. Thinking along these lines I thought it may be a good idea to write just about feeding and perhaps it will encourage other aquarists to send in their opinions that we may all benefit.

Firstly, I start feeding the young fry on a little egg yolk. This is done by boiling an egg for 20 minutes, then mashing the yolk with a little water in a cup. I put a very small amount of this mixture on to a spoon and pour it into the young fry. If kept in a fridge the egg will keep fresh for about a week. Another method if you haven't many young fry is to put a small amount of the egg yolk in a handkerchief or some other suitable material and just squeeze a small quantity of this into the fry.

After the fish are a few days old I try to introduce some brine shrimp to them; it is quite easy to see if they are able to take this as the stomachs swell up and look quite red. As soon as they can take the brine shrimp, I also feed them micro worms. After trying several ways to breed micro the following is the method I find most successful. The micro dishes which can be purchased are the ideal containers, as the worms crawl up the sides of the dishes (which are grooved) and can be taken off easily by the small brush provided. I start the culture by mixing one of the in-

stant hot oat cereals with a little boiling water and then add just a small quantity of milk. This should be made very stiff indeed as it seems to last much longer. Spread the mixture in the micro dishes and inoculate this with a small amount of micro worms.



I purchased one culture of micro 8 years ago and have not had to buy any more since then. The cultures are best remade every 3 weeks or otherwise they start to go off.

I continue with these 3 foods plus fine fry dry food, feeding them alternately and giving them at least 4 meals per day until the fish are about 4 weeks old and as they are bred in 18 in. x 10 in. x 10 in. tanks, they are then removed to larger growing up tanks.

At this stage the above foods are no longer given and I start feeding the fish about 3 times per day with as much variety as possible. Live food seems the very best for making the fish grow quickly. The first choice in my opinion is live daphnia which must be graded and I do this by pour-

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SALVINIA *Continued:*

In the shade of these submerged threads fish fry, and other small water creatures, can take refuge. For some kinds of fishes the *Salvinia* is a perfect top cover when breeding for they love to spawn there. Bubble-nest breeders frequently incorporate the plant into their nests to make them stronger.

Salvinia is a water fern and produces spores at the base of the submerged leaves at times. Very little appears to be known about the development of these spores at present, and this plant would be a good subject for research by anyone with the necessary equipment.

Ponds and other forms of stagnant water are the habitat of *Salvinia* which is why it does so well in aquariums. It must have plenty of light, though, for it is used to bright sunshine. It is found in Central and South America in the tropical areas.

When grown in partially shaded conditions this plant develops much smaller leaves. That is why, when we purchase large-leaved plants (that have probably come from a greenhouse) and place them in our moderately-lit aquarium, we are disappointed to find the plant deteriorating — as we think. It is merely a natural reaction. Many of the forms of *Salvinia* described under different names are merely shade varieties.

The ordinary aquarium is not the best place to grow *Salvinia* for itself, though it does fairly well there. In a wild state it prefers fairly shallow water that is cloudy with decaying plant particles and lots of infusorians. Our clear water aquariums are a compromise.

Temperature range is 68 to 78 degrees F., which suits our tropical fish conditions, and a neutral pH value is best. Where extra top light can be given, and where a cover glass is used to ensure humid conditions above the plants, the *Salvinia* will thrive in most aquariums — though usually with the smaller leaves.

If you can site your aquarium in a greenhouse, and allow them a fair ration of sunshine, these plants will multiply very rapidly. Then they become so crowded that eventually they are overlapping each other, but the plants underneath will not be doing so well.



TROPICAL QUERIES

I have just taken possession of a 4 ft. tank and would like to know whether it would be better to have it covered over with a single sheet of glass or with three or four smaller pieces of glass, placed end-to-end.

A single sheet of glass is tidier looking, but it has its drawbacks. For one thing, it is awkward and heavy to move about. For another thing, if you crack it a replacement is far from inexpensive. So, all in all, we recommend a cover made up of more than one piece of glass. It makes for a happier household if the aquarium can be attended to without difficulty.

*Can you tell me how to keep and breed the livebearing half-beak (*Dermogenys pusillus*)?*

This interesting species flourishes best in slightly brackish water kept at a temperature of about 72°F (22°C). A level teaspoonful of sea salt to every gallon of aquarium water is about right and will not inhibit the growth of, or destroy, plants. Plants are essential because the half-beak is easily scared and unless it has cover is liable to dash itself against the sides and damage its protuberant lower jaw. Food is taken at or near the surface. The best foods for it are fruit-flies, mosquito larvae, *Daphnia* and tubifex worms, which will be snatched as they wriggle through the bottom of a perforated worm-feeder. Dried flake foods are usually taken. In common with all livebearers, the female drops young every now and again. Unfortunately broods are small and the fry rather delicate. It is best to separate the fry from parent fish at the earliest opportunity.

The temperature of my tropical aquarium goes up and down in every 24 hours. Will this fluctuation harm the fish?

A slight variation of temperature in every 24 hours does fish no harm. It is an abrupt change in temperature that brings about trouble.

FEEDING TIPS *Continued:*

ing the *daphnia* through a fine soup strainer. If the fish can be fed on *daphnia* at least once in 2 days, then given any of the following foods they will grow very quickly indeed. Other foods being white worm, and good quality dry food (and most of the makes on sale at present are very good). We often purchase 2 types so that there is some slight variation in the diet. Beef heart is an excellent meat food, which we boil for about 2 hours very slowly and then mince it small; given this way it does not seem to cloud the water. I have tried feeding it raw but prefer to boil it.

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Another good meat food which does not cost anything if you have chicken for dinner is the liver from it. This, once again, is boiled but not for so long and it is so soft you can just crush it with a fork.

Green food at least once a week seems another important factor. Either crushed peas after being boiled (2 are enough for an average tank) or spinach which we purchase in tins, either creamed spinach as given to babies or purée spinach. We have not found our fish to take to cabbage or lettuce.

Although it does not cover feeding, the other essential thing seems to be keeping the growing-up tanks clean; if possible some fresh water should be added at least once a week.

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Cleaning Tips

REGULAR CLEANING of an aquarium prevents the not uncommon sight of the tank which has been allowed to become so dirty that to render it viewable again, the tank has to be stripped down and set up again. Such a major job can be prevented if the aquarium is given regular attention, and the tank can flourish for several years without any full scale stripping down. Although an air operated aquarium cleaner does a useful job for weekly cleaning, a more thorough cleaning is necessary every couple of months. Such an operation need not take very long if the necessary equipment is ready, and the results can bring back that fresh sparkle to the jaded aquarium.

For the person with more than one tank, two cheap plastic buckets, which are reserved for aquarium use only, are a good investment. Other necessary items are a pair of scissors, a couple of newspapers, a nylon mesh aquarium net, a pair of planting sticks, an 8 ft. length of rubber tubing of about 1/2 in. bore and a scraper for

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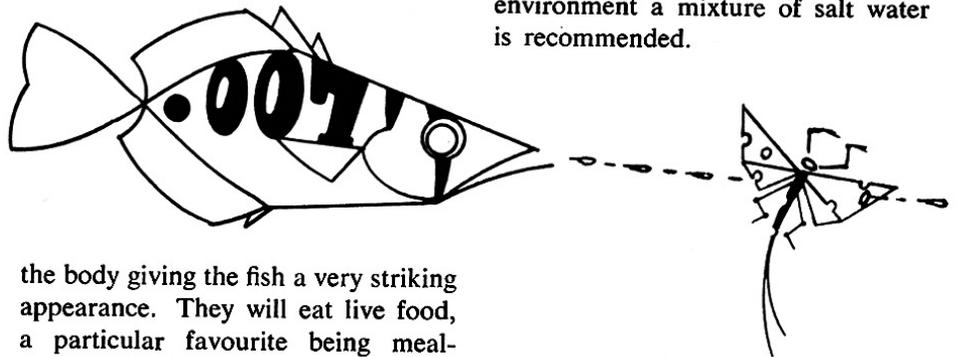
SOMETHING ABOUT

ARCHER FISHES

THE ARCHER FISHES are a small family of fishes known as the *Toxotidae* of which there are five species. They inhabit the seas around Java, and they obtain a length of about 6 inches. The colour of the archer fish is usually silvery-grey with six black bars running vertically down

so that they provide a constant supply of food as the flies hatch. The crysalids can be bought for a few pence at most fishing tackle shops in both summer and winter.

A temperature of 72-75 degrees usually proves satisfactory. As it inhabits brackish water in its natural environment a mixture of salt water is recommended.



the body giving the fish a very striking appearance. They will eat live food, a particular favourite being mealworms which are knocked into the water by shooting drops of water to a distance of 3 or 4 feet with great accuracy. Many types of insects are taken, and in winter when they are very scarce, a good idea is to place a tray on the surface of the water containing the crysalids of the house fly

Unfortunately nothing is yet known of either sex determination or the breeding habits of the archer fish, but it gets along well with both its own and other species and is thus an excellent addition to any community tank.

TROPICAL QUERIES

Is it true that some cichlids are called earth-eaters (Geophagus sp.) because they feed on mud?

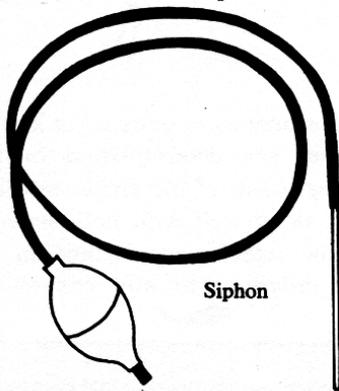
The earth-eaters are so-called because they have the habit, shared by several unrelated species, of sifting mud for crustaceans, mollusks, and the like, which they include in their natural diet. But they will not waste much time doing this if other food is sludge more readily available.

What is the most satisfactory way of acidifying water naturally: with peat placed in an external filter, or with peat placed under the planting medium?

The least troublesome way, though it may take a week or more before any change in the pH value is noted, is to fill the filter with moist sedge peat. A layer of nylon wool on top of the peat will keep it free from And do not forget to renew the peat every now and again.

CLEANING TIPS *Continued:*

removing algae growths from the aquarium glass. Before beginning, I warm about 1¾ gallons of rain or tap water to about 80°F, and place this in one of the plastic buckets. This is later used to top up the tank. I begin by placing the papers on the floor under the tank, and by switching off the aquarium heater, to avoid any risk of electric shocks. I then begin to siphon the water from the tank with the rubber tube, into the empty bucket. When the siphon is going I pass the submerged end over the whole base of the tank, removing any sediment or mulm. In the front unplanted area of the tank I also remove about ½ in. of the gravel with the siphon tube, into the bucket of dirty water. This is the reason for the rather wide rubber tubing, as narrow tubing is quickly blocked by the gravel and this means continual pinching of the tube to release the blockage. Of course the wider bore of the tubing also speeds up siphoning. To keep the free end of the tube in the bucket, the handle of the bucket can be rested over the tube to keep it in place, without compressing it. A tube which does not have too thick walls can be pinched to slow



down or stop the flow of water, when necessary. The end of the tube in the tank should be kept on the move with the intention of removing all of the mulm and the necessary amount of gravel, before the two gallon bucket is too full to carry.

Having removed some water and gravel, the next task is to remove the rocks, if necessary, and give these a light scrub, if they are heavily coated

with algae. It is probably better not to scrub them too clean as they might look rather garish in an established tank. The front glass of the tank can now be scraped clean of algae with the scraper. Some people would suggest that this job is done before the base of the tank is siphoned, but if it is, a lot of mulm is stirred up in the

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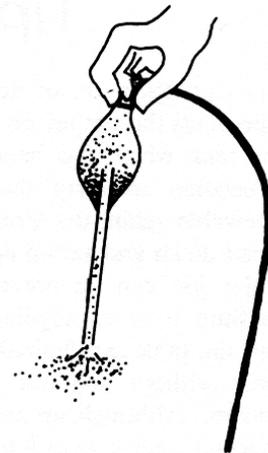
water and one must wait some time before being able to siphon out the dirt, after it has settled. I don't scrape the glass in the back or ends of the tank as any algae here does little harm and helps to make the tank look less synthetic and more natural. An interesting experiment can be done at this stage if a glass of aquarium water is taken out and compared with a similar glass of fresh tap water. Although the aquarium water may look clean and clear, when compared with fresh water it will probably show a brownish coloration if the tank has been in operation for some considerable time. This is one of the several reasons for regularly changing some of the water in any tank.

With the water level lowered, I then deal with the plants, starting off by removing most of the floating plants. Here the nylon net is useful in cleaning out large and illusive patches of duckweed. I then root out extra plants which have multiplied too much. Old and decaying leaves and long shoots which trail over the water surface and cut out the light, are snipped off with the scissors. Top parts of the shoots can be planted as cuttings, with the planting sticks, and used to replace older plants removed. The rocks, if they have been removed, can now be replaced.

Having reached this stage, I leave

the tank and deal with the gravel removed by the siphon tube. After draining off the dirty tank water and mulm, I spray a strong jet of water from the bathroom shower hose, into the gravel in the bucket. This is repeated until all the dirt, and possibly any empty snail shells, have been washed away. Be careful not to block up the drain with gravel which could wash out of the bucket. The cleaned gravel is then returned to the floor of the tank, in handfuls, and spread out evenly using the planting sticks. By now the temperature of the water in the bucket (and in the aquarium) will have dropped and should be ready for use in filling up the tank. If the bucket is placed on top of the tank, the clean water can be siphoned into the aquarium without too much trouble.

This is also a good time to check



the filter and to see if it needs fresh filter wool, charcoal, peat, filter resin, etc. Having attended to this, I switch on the filter as the water in the aquarium will be slightly cloudy after these operations. Don't forget to switch the heater on again. All that remains is to clean up the room in which the tank is situated and then to sit back and view the aquarium, which should have taken on a new lease of life and which should instill into its owner that special thrill which is reserved for the keen aquarist. 

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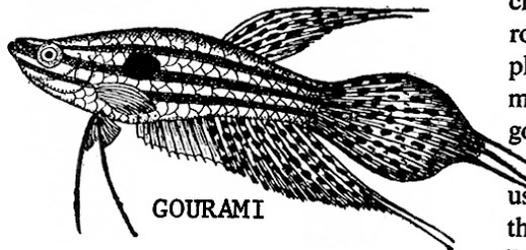
The Aquarist's Notebook

BREEDING HABITS

OF AQUARIUM FISHES

THE VARIOUS METHODS of breeding among fishes is a constant source of wonderment especially to newcomers to the hobby of fishkeeping.

Many of the fishes from tropical regions have unusual breeding habits and one of the most interesting types is the nest builder. The labyrinth fishes such as the Fighting fish, Gouramis and Paradise fish are such



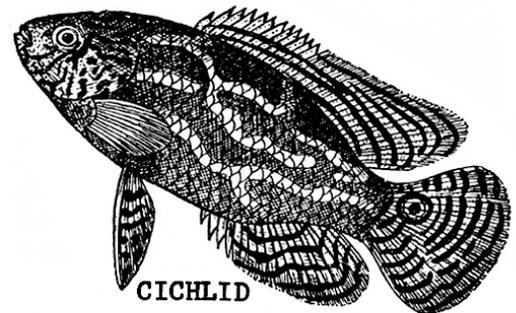
GOURAMI

kinds. The males of these are capable of making a nest of bubbles at the surface of the water. The bubbles do not break and form a compact bunch which is guarded and occasionally replenished by the male. Once the nest is completed the male encourages a female under the nest and then wraps his body over it when the eggs are shed and then fertilised. The fish then pick up the eggs and blow them into the bubble nest. When the female has finished laying she is chased away by the male who then tends the nest, replacing any eggs which fall. Once the fry hatch he also tends them carefully until they are large enough to care for themselves. With the nest builders it is usual for the male to do all the protection and the females usually take no further part in the hatching and

rearing of the young.

Many of the Cichlids make a form of nest by cleaning out a small hollow in the bottom and then tend the eggs carefully when they are laid, sometimes removing them to a fresh clean nest or hollow. Some of these types will both care for the eggs and young showing great paternal care. Other Cichlids lay their eggs on carefully cleaned surfaces, such as pieces of rock or the large leaves of water plants. They then tend the eggs, removing any which are infertile or are going mouldy.

Another very interesting and unusual method of breeding is found in the *Haplochromis* species such as the Egyptian Mouth breeder. When the eggs are laid and fertilised the female takes the eggs into her mouth and keeps them there until they hatch. The female does not eat whilst the



CICHLID

eggs are hatching, often about ten days and even then the young are kept in the mouth for some days but may be released occasionally. For about a week after they are free swimming

Continued overleaf, 1st column.

An Algae Tip

THE problem of algae in the aquarium is one which faces the aquarist sooner or later. The usual answer to the problem is to adjust the light which enters the aquarium, or to use one of the available aquarium algae-killers. Both of these methods are certainly effective but the latter is rather expensive over a period if one keeps several aquaria.

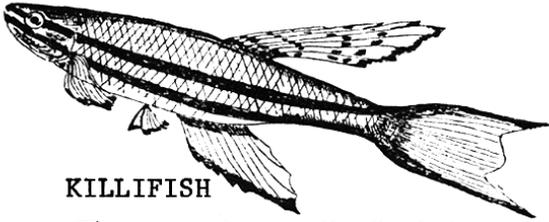
The problem arose recently in one of two aquaria which decorate the entrance hall of a large secondary school. One of the two tanks, both of which were set up under seemingly identical conditions, produced an unsightly growth of algae, while the other one was almost free of algae. The question of light, both artificial and natural, entering the tanks, was investigated and was found to be identical in both tanks. Several other causes were dismissed and the problem remained.

A visiting horticultural expert was asked for his views on the problem and he immediately came up with the suggestion that the temperature in one tank was a few degrees higher than in

BREEDING HABITS *Continued:*

they may return to the safety of their mother's mouth when danger approaches.

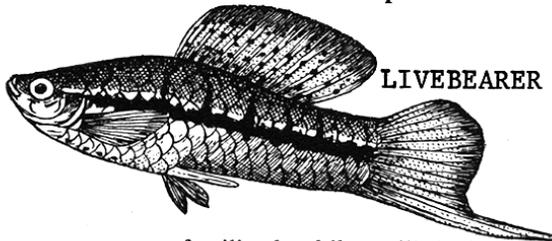
Another method of breeding is found among the Killi-fishes. Many of these fishes live in small ponds in very hot regions where these ponds can dry up completely during a long drought. These fishes lay their eggs during the rainy season and when the pools dry up the eggs remain in the mud or earth at the bottom and do not hatch until the rains come again.



KILLIFISH

The parent fish usually die during a prolonged drought and so the species is able to survive by fresh specimens hatching out from the eggs which may have remained in the dry bottom of the ponds for some time before the required moisture arrives to enable them to hatch.

Many species of tropical fishes are live bearers when the young are fully formed inside the body of the female until they are sufficiently developed to be able to have a completely separate existence. Such well-known species as the Guppies, Platys, Sword-tails and Mosquitos fish are among the livebearers. In these species the



LIVEBEARER

eggs are fertilised whilst still inside the body of the female and the males can be distinguished by the strange formation of the anal fin which is capable of being pointed forward to expel the sperms into the female. Among the live-bearers there does not appear to be much paternal instinct as many of the young ones can be eaten by their parents and no apparent interest is taken in the well-fare of their progeny. 

TROPICAL QUERIES

What size tank is needed for keeping an arowana?

As large as can be accommodated in your home. Depth of water is not very important, for the fish keeps near the surface. What is important, however, is to see that the aquarium is kept well covered, for the fish is an accomplished leaper.

Is it true that Vallisneria can stand an extraordinary wide range of temperature?

Vallisneria spiralis, the best-known species, will stand a range of temperature from the lower forties to the nineties (°F). But there are other vallisnerias indigenous to the warmer parts of America and Asia that are only suited to a tropical aquarium.

Would it be possible to breed the dwarf gourami in a 16 in. X 8 in. X 10 in. tank?

The dwarf gourami will spawn in a 16 in. X 8 in. x 10 in. tank, but a larger one is needed for the fry which, in the initial stages of their lives, call for all the swimming space in clean, well-aerated water you can give them.

I have bought an underwater banana plant. Please give me some information as to this plant's successful cultivation in the tropical aquarium.

The roots of this plant, which is known to botanists as *Nymphoides aquatica*, should be buried in a compost of coarse sand or fine grit enriched with some clay. If the plant is without roots, then it is advisable to cover the banana-like tubers with compost, where root-formation will soon take place. Small plants and those without much in the way of roots and foliage should be started in about 4 to 6 in. of water. Plenty of bright top light is necessary, winter and summer alike, and a temperature of about 75°F. (24°C.) is as good as any.

I am a beginner in this fascinating hobby of tropical fishkeeping and would like to ask you a question. Every time—or so it seems—one of my two-spot gouramies takes in air, it expels it again with a sort of cracking sound. Is this a sign of disease or some deformity of the gills?

So long as your gourami looks in good color and is swimming normally, do not worry. Gouramies often eject bubbles of air through the gills after taking it in at the surface. This release of air is often accompanied by grating or cracking sounds.

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ALGAE *continued.*

the other. This was investigated and it was found that the tank which was kept a few degrees warmer than the other, was the one which produced the unsightly growth of algae.

As the difference in temperature was only a few degrees, the thermostat of the affected tank was adjusted so that the water in both tanks was at the same temperature. This happened a few weeks ago and now both tanks are looking identical in freedom from algae, except for the remains of the algae in what was formerly the warmer tank. The problem, which had remained for a long time, was solved in a few seconds with a screw driver.

I have tried this solution with another tank and it has again solved the problem. Should any of your tanks have a problem of excess algae, check the temperature and see if it is much above 75°F. If so, it is well worth trying the temperature a few degrees lower for a period to see if it will solve the problem. It is such a simple solution considering the problems of adjusting light, water hardness, p.H., and should be at least as safe as using chemical means.

Obviously the higher temperature favors the growth of some species of algae and the few degrees difference seem to be critical. 

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A Garage Setup

THE PROBLEM which always arises sooner or later is where to put some more tanks. Often the garage is rejected on two counts: too narrow and too cold; both of these snags can be overcome to a great extent as I have proved.

The width can, of course, only be reduced by using narrow tanks which can be bought if only very small tanks are required but in my case I wanted 5 or 10 gallon units. I decided to make my own frames about 5 ft. 6 ins. long, 8 ins. deep and 6 ins. wide; with one at floor level and another at eye level it was possible to fit five such tanks by the garage wall. The next step was to buy some 1 in. x 1/8 in. x 1/8 in. angle iron, borrow a small electric welding set and, after a little practice, five satisfactory frames were produced.

The top four tanks and the shelf above have clips fitted underneath to hold fluorescent tubes. A 1 in. x 1/8 in. flat strap iron was welded across the center at the bottom, back and front and a 1 in. x 1/4 in. strip of plastic was bolted across the center at the

Continued overleaf

THE PYGMY BARB

A CHARMING LITTLE fish worth looking out for is the dwarf or pygmy barb. Apart from its attractive coloration and peaceful ways, its hardiness, constant activity, and lack of interest in the plants as a much-relished item of diet (a failing with a number of barbs) makes it well suited to a decorative tropical aquarium. It is native to eastern India and Burma and has a history as an aquarium fish dating back to the early 1900s.

The general color is greenish grey, whitish on the underparts. The large scales are shining silver to gold. There is a black spot behind the head and a similar marking near and at the tail base. The sides are adorned with some blue-black vertical bars, that sometimes disappear and are sometimes very pronounced. The head and flanks reflect metallic violet, green and blue lights. The anal fin is pale red, the ventral fins a shade darker, and the caudal and dorsal fins a greeny yellow. The pectoral fins are clear. The sexes are not readily told apart, except by the slightly heavier body of the female and the brighter garb of an amorous male. A temperature range of from about 70°F to 75°F is quite satisfactory, but a temperature above 76°F is recommended for breeding.

The breeding procedure is typically barb-like. The brilliantly tinted male drives the swollen-sided female all over the aquarium until the excitement engendered by the chase culminates in the expulsion of milt and ova. Spawning often takes place if conditions are right (temperature, planting

and lighting) in a community tank, but naturally the eggs will be eaten as they are released by all and sundry of the tank's inmates.

To raise fry, then, a likely looking pair of fish should be placed in a well-lighted, snail-free tank generously furnished with weighted bunches of fine-leaved plants to catch the eggs, and, after spawning is over, removed to another aquarium. At a temperature in the upper seventies or low eighties (°F), the eggs should incubate inside two days. About two days later, the fry will be on the move and snapping up tiny live or dried food.



For a planned spawning, separation of the sexes for a week or two is advised. If the fish are introduced into the prepared tank (which need not be larger than the regular 18 in. by 12 in. by 12 in. size) last thing at night in all probability egg-laying will take place on the following morning, if the light is good.

At the present writing, the pygmy barb is known under the formal name, *Barbus phutunio*. But to return to more mundane but equally important things. The pygmy barb will accept dried food readily, tends to play behind the plants until it becomes accustomed to its surroundings, and ordinarily has a life-span, given good conditions, of some three to four years.

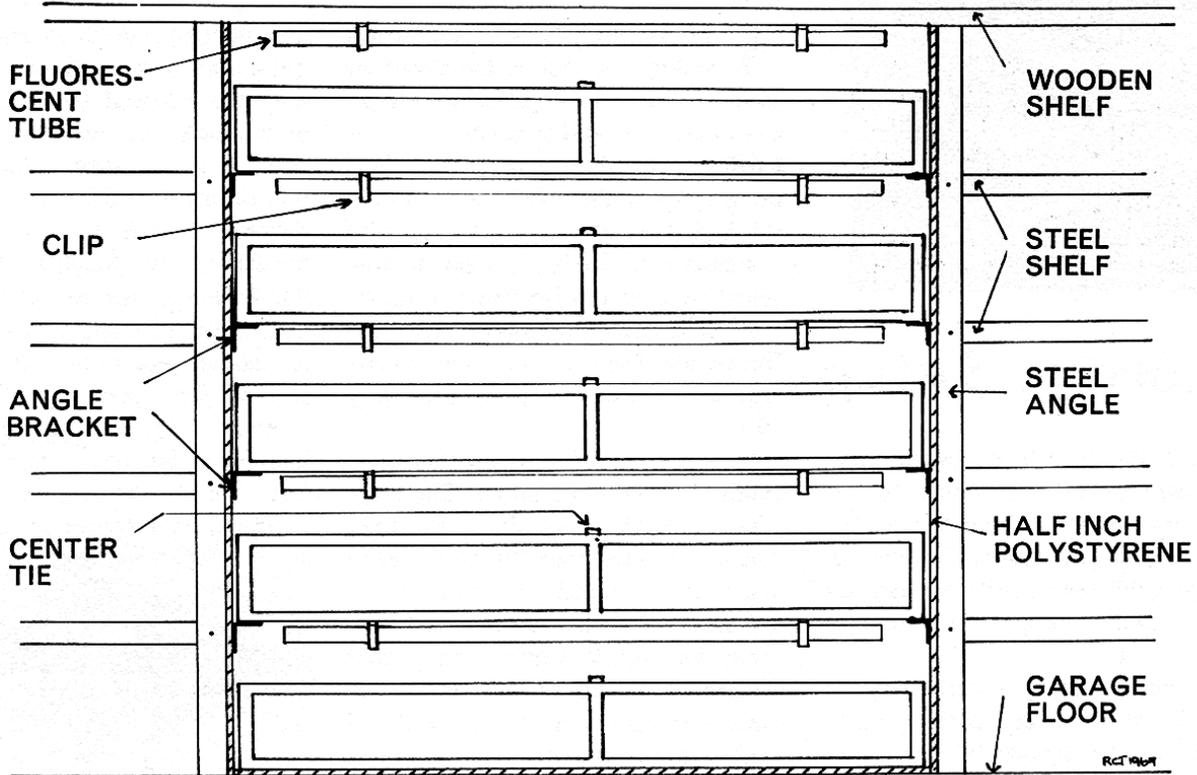
GARAGE *Continued.*

top. A small slot was cut at each end at the top to enable the glass to enter the frame; these slots were useful for air lines and heater cables. The frames were given an undercoat and one coat of good gloss paint before glazing. Normal aquarium putty was used. After glazing another coat of paint was applied. Cover-glasses were

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several secondhand 5 ft. tubes were available so as these gave too much light I reduced the load to 40 watts each.

Due to the canal-like form of the tanks one thermostat was fitted at the center of each tank which controls two 50 watt heaters placed at the center of each half. This arrange-



A BREEDING ASSEMBLY FOR THE GARAGE. DOORS NOT SHOWN.

fitted to each half of the tanks using suitable clips to ensure drainage of condensation, the edges of glass was arised (i.e., the sharp edges were taken off), by rubbing the glass at an angle over a piece of emery cloth stuck to a board. Finally, the edges of the cover glasses were bound passepartout fashion with plastic tape taking care not to stretch it as it was applied.

The next problem was to heat-insulate the assembly. I decided to use ½ in. expended polystyrene so pieces of this were cut to fit under the bottom tank and over the area of the wall. Support for the tanks was arranged by fitting 6 in. wide steel shelf

units each end of the tanks with a timber shelf joining the top and 5 x 6 in. lengths of angle were bolted to each to suit the desired tank heights. For stability the tops of the shelf units were screwed to the wall. Polystyrene insulation was fitted to each tank-end. Two lightweight doors were made from ⅛ in. hardboard with 2 in. x ½ in. framing glued and pinned on; the space inside the frame was filled with ½ in. polystyrene glued on. Make sure that the glue does not dissolve the polystyrene. Finally, 5 ft. 80 watt fluorescent tubes were installed in the clips. The tubes are generally run for 8 hours each day at 40 watts. No doubt it would be simpler to use 4 ft. 40 watt tubes run normally but

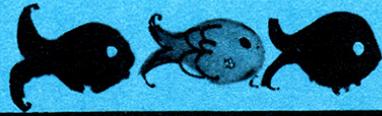
ment is convenient for my normal use of the tanks with a center celluloid partition sprung into place.

The assembly only takes just over 7 in. of the width of my garage and I have 10 tanks and several useful shelves. In nearly two years' use no leaks or other problems have arisen and the tanks have been very successful for breeding and plant propagation. 

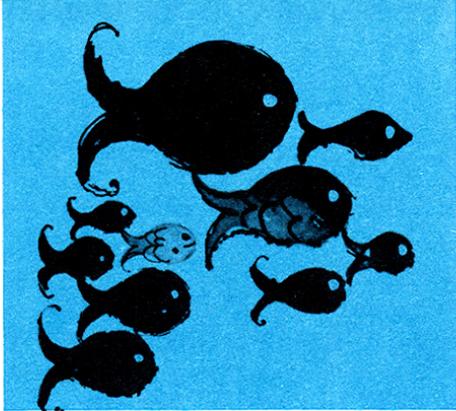
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The Flagtail

ONE OF THE most interesting features of the flag-tailed characin (*Prochilodus insignis*) is the manner in which its mouth can turn back to form a sucking disc. This enables it to clean up great quantities of algae; but it is not likely to replace the *Plecostomus* or the sucking loach as a popular algae-eater suitable for the home tank, for its basically vegetarian requirements give it a fondness for plant life that doesn't stop with the removal of the lower algal forms. In other words, it is a plant nibbler!

The adult fish in its native waters (Guiana and the central Amazon basin) is an undistinguished specimen, except for its size, which at 12 inches or over makes it suitable for food. The young *Prochilodus insignis*, however, is very colourful and does well in a tank if the conditions are suitable. The greenish sheen of its back pales from a yellowish color on its side to the palest pink sheen of its belly. Dark longitudinal streaks and spots mark its flank towards the caudal fin. The dorsal, ventral and

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A TANK FOR THE WALL

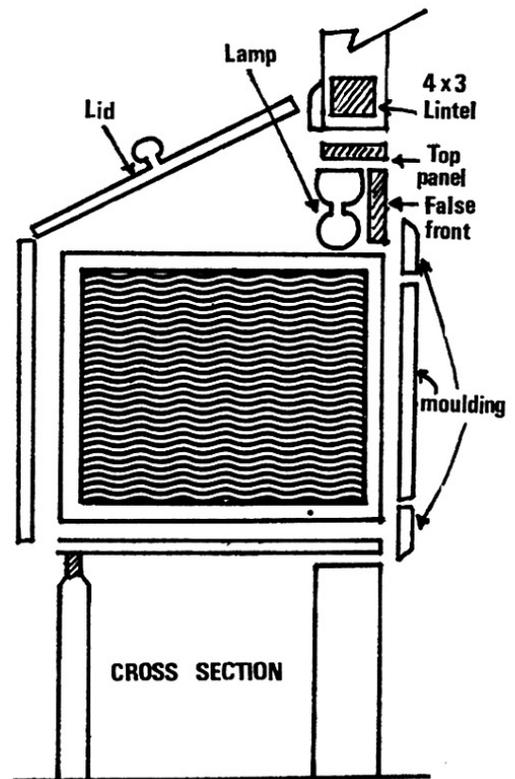
MY STORY starts about three years ago when a friend gave me an old 16 in. tank complete with various bits and pieces (one of a pair he had just received from another pal, such are the ways of friends). I was at that time in the middle of renovating an old 1900 house to 1960 standards, and the idea of keeping fish had but rarely occurred to me. After due thanks, the tank was placed in the shed to be investigated at a later date. Nothing, but nothing was to come between me and my "5 year" plan to improve the family living quarters.

Work progressed apace till the day dawned when the hall was stripped, re-wooded and ready for paint and paper, leaving only the lounge, as yet unused, to receive the diligence of blowlamp and scraper. My thoughts turned to an old 16 in. tank languishing in the garden shed and an idea began to germinate. My mind went forward in time to the day when both hall and lounge would be finished. Mental pictures of a modern lounge began to form, chair here, sideboard there, bookcase in that corner, aquarium where . . . ? Jumbled with these picturers were proposed color-schemes for the hall which, I might add, is rather large, some 20 ft. by 7 ft., a Victorian legacy of all show at the front.

The solution to "where" was staring me in the face and I would kill two birds with one well-aimed stone.

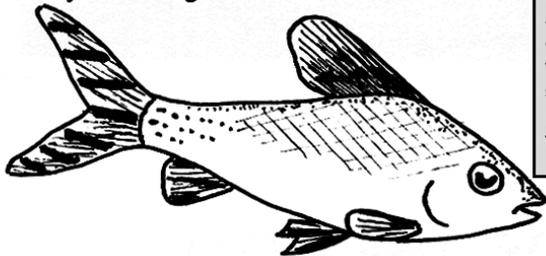
Why not place the aquarium in the hall and knock a hole through the wall into the lounge. The hall would take the bulk of the aquarium and benefit considerably from a very interesting feature, whilst I could sit in the lounge and either watch T.V. or swivel my chair and view fish.

My wife was horrified at the thought of gaping holes in walls, especially when I became more ambitious and talked of a 30 by 15 by
Continued overleaf, 1st column.



FLAG-TAILED *Continued.*

pectoral fins are a yellowish-red. The deeply cleft tail and the anal fin are marked with dark bluish stripes on a yellowish ground.



A member of the family Anostomidae, the flag-tailed characin is both an active swimmer and a splendid jumper. It must therefore have both a large tank and a well-covered one, decorated, in view of the likely absence of plant life in the tank, with cork bark or rockwork to provide the fish with some refuge. Plant food is essential to its well-being and it needs to be supplied with cooked spinach and lettuce. It will also take live foods such as *Tubifex* worms and *Daphnia*. A temperature of 74-80°F is suitable. 

WALL TANK *Continued.*

15 in. tank. However, I won her round and assured her the house wouldn't tumble down about our ears.

First Job was the hole and this proved quite easy. I marked a rectangle in pencil on the hall side of the wall some 20 in. by 36 in. and using door and floor as a guide repeated this on the lounge side. The plaster was then chipped away and removal of the bricks commenced, the top course was taken out first and the 4 in. by 3 in. wooden lintel duly inserted and wedged in place; removal of the rest of the bricks followed with an easier mind. A base of ¾ in. block-board some 33 in. by 15 in. was then inserted and wedged in place with two uprights of the same material. A further piece across the top, some re-plastering and the job was complete. I now had a neat hole some 32 in. by 20 in. lined with block-board with a shelf projecting into the

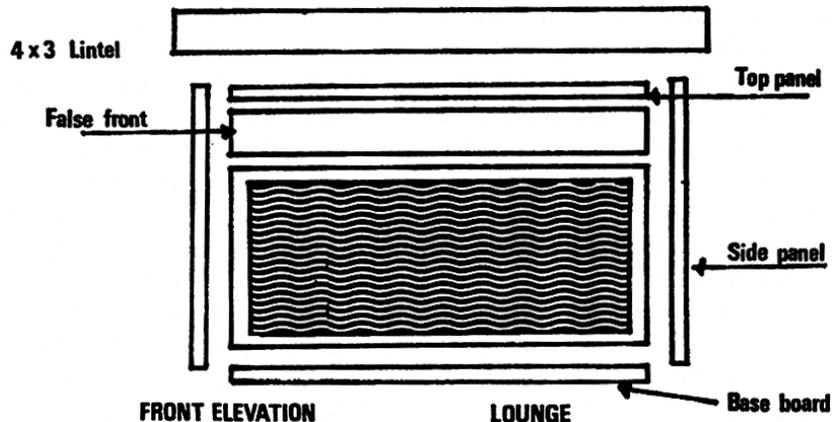
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hall. The base was given further support of a piece of 2 in. by 1 in. edge on and two legs cut from 1 in. dowel. The empty tank was placed in position, the front flush with the lounge wall and, after insertion of a false front, frame with 2½ in. moulding giving a picture effect. Round the back I built two side frames of 2 in. by 1 in. covered in hardboard, these are some 21 in. high at the wall, sloping to 18 in. at the front and screwed to the base and side panels. A further piece of 2 in. by 1 in. across the back and almost resting on the tank top formed a rough frame and this was

through steel conduit in a channel cut in the plaster to a plug base screwed inside the hood. A fused plug leads to a block of cable connectors wired to light, pump and heater. The light and pump have separate switches screwed to the underside of the base-board, whilst the heater has a two-pin plug inside the hood.

The pump was put in after the aquarium had been in operation for a couple of months, as I was hoping to manage without filtration, and hangs from a joist under the hall floor.

Planting was a problem for two reasons. First, the usual horseshoe of plants at the sides and along the back was out as the aquarium is viewed from both sides. I am overcoming this by keeping the center third of the tank clear of plants and gradually filling up the ends with short plants at the front, i.e., lounge side, and taller ones to the rear. Secondly, as we now know under-gravel filtration is excellent but some plants do take ages to either become acclimatized or



covered with a sheet of 7 mm. plywood which has a hole some 28 in. by 11 in. cut in the middle for viewing. The whole makes a suitable hood with a lift-off lid and hides wires, airlines, etc., with room for servicing. Incidentally, the ply back is fixed with dome topped screws to facilitate easy removal should the occasion arise,

Electricity proved very convenient as I have a cable under the floor supplying a plug in the lounge, this was cut and a spur inserted and run

give up the ghost. I have at the time of writing three strands of *Bacopa*; they have been there two months and I'm still waiting to see if they will fill in the empty space allotted to them or die on me. An old rustic once told me it takes three years to establish a garden; my underwater plot has two and a quarter to go. 

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A PRIMER ON THE GUPPY

TODAY GUPPIES are wondrously beautiful, both in coloration and finnage. Yet up to the beginning of the 1930s, some seventy-one years after the species was first described for science (from specimens collected in Venezuela) by the German ichthyologist, Wilhelm C. H. Peters (in 1866 it was re-discovered, so to speak in Trinidad by the Rev. Robert John Lechmere Guppy, from whence the fish's popular name), the average aquarium-bred specimen bore a close resemblance to the shorter-finned and less resplendent wild guppy (*Poecilia reticulata*), that ranges in the natural state from northern most South America to the Lesser Antilles. Different forms in colour and finnage occur in different localities.

In 1934 a Swedish breeder produced a gold guppy. Concomitant with this development there was a great leap forward in Europe and America in the production (in the tanks of the geneticist and the serious hobbyist alike) of new and improved varieties. Needless to say, the gold guppy played an important part in the development of new strains. Inevitably, the Second World War put a stop to much experimentation (though the first albino guppy was produced in America in the early 1940's) but hardly had the guns stopped firing in 1945 than guppy breeders here and abroad were hard at it again, selecting, cross-mating,

and inbreeding with even greater enthusiasm than before.

The life span of a normally healthy female is not more than eighteen months to two years. She is pregnant for most of this time. The signs of advanced pregnancy are a bulging and increasingly darkening abdomen. Just before the young are born she frequently takes up a tail-down position in the upper or lower levels of the



water. Thirty and more young are delivered at a time but usually first and last broods are always small. From one fertilization up to eight broods may be delivered within the space of a year.

Continued overleaf, 2nd column.

QUICKIE QUIZ

Find the plant in the following:

The first is in SNOW but not in HAIL
 The second is in PAN and also in PAIL
 The third is in BLANKET and in SHAW
 The fourth is in BAT but not in BALL
 The fifth is in TRUMPET and in FLUTE
 The sixth is in SWEET and also in CUTE
 The seventh is in ROBIN but not in GULL
 The eighth is in DRAB and also in DULL
 The ninth is in COOL as well as in HOT
 The tenth is in NICHE but not in SLOT
 The last is in KNIGHT and in KNAVE.

Answer next page.

SPATTERDOCK

THE SMALLER GROWING nuphars — the genus is widely distributed across the temperate and tropical world — are plants of considerable charm. And among the finest species for cultivating in the tropical aquarium is *Nuphar sagittifolium*, better known in this country (its country of origin) under its popular name of the Cape Fear Spatterdock.



The leaves of this plant are a beautiful fresh green, ruffled along the edges and tissue-thin. They attain a length of about 8 in. and a width (at the widest part) of about 2½ in. They are roughly elongated arrow-shaped, with a deeply indented (cordate) base, a prominent midrib, and a rounded tip. They are held erect on short stems.

Continued overleaf, 1st column.

SPATTERDOCK *Continued.*

Plants grown from seeds are easier to establish (but harder to come by) than plants bought as cuttings (division of the rhizomatous rootstock is still the commonest form of propagation). But provided a healthy cutting is obtained in the first place, there is every chance of its settling in satisfactorily. For the guidance of the beginner, let me say at once that a healthy cutting is one that is firm to

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the touch and green for most of its length. The possession of some strong white root near the crown (the portion of the rhizome where the leaves begin) is an added advantage. A cutting showing a lot of brown in the rear half should be rejected at sight; for excessive browning is indicative of an overwhelming decay.

It is of paramount importance to plant a spatterdock (any spatterdock) in a pot of soil. Soil provides a spatterdock with the nourishment it requires to make proper growth. Further, soil appears to prevent or arrest the creeping sickness of decay. The best sort of soil to use is a sifted garden soil that has not been treated with a chemical fertilizer for a year or two. Better still, if you can procure it, a non-fibrous loam.

The seeding plant or length of severed rhizome should be set in the rooting medium with the growing point just above the washed grit, which must be spread over the soil to prevent any muddying of the water. To make the more sure of success, the plant should be started off with only an inch or two of water above the leaves.



**ANSWER TO QUICKIE QUIZ
SPATTERDOCK**

GUPPIES *Continued.*

Well-fed adult guppies take very little interest in their young, but ill-nourished or erratically-fed guppies are quick to feed on newly dropped fry. It is of particular importance, then, to take every precaution against cannibalism. A thick tangle of plants will, understandably, give the fry, which seek the surface and the light a few months after birth, excellent cover. Alternatively, a female may be placed in a breeding trap, which is a sort of loosely constructed box all but totally submerged in the aquarium. As the fry are born they spiral down and out of the slit or slits in the bottom of the box to safety. Naturally, no other fishes should be present in the rearing aquarium. The size of the breeding trap is important. Common sense demands that it should not restrict the movements of the female too closely. And to go back. Unless a female is placed in a breeding trap some nine days or so before her abdomen becomes noticeably distended, it is advisable to leave her undisturbed; for any sort of shock received when she is in an advanced stage of pregnancy will almost certainly result in her death or the delivery of still-born or deformed or weakly fry.

Although guppy fry will grow quite well on a diet of dried food alone (flour-fine to begin with), they will grow fastest and best when a liberal supply of micro-worms, brine shrimp, and later, tiny Daphnia and gnat- or mosquito-larvae is offered. The latter is a favourite food of the guppy in the natural state, and for this reason the species has been introduced into many parts of the tropical world to help in the fight against malaria.

To get the best out of guppies it is essential that they are given plenty of swimming space in clear water, freshened up every so often with new water drawn from the tap and preferably boiled first to precipitate any existing calcium bicarbonate; for it is generally believed that guppies thrive best in water low in calcium. In a word, they do best in a soft neutral to slightly acid water. Generous

planting will help to keep the water healthy. Plants ideally suited to a guppy tank are those with finely divided or lacey foliage such as *myriophyllum* or Indian fern. An 18 in. by 12 in. by 12 in. tank is a suitable size for a pair or trio. But if breeding for sale or exhibition is intended, then several tanks are necessary for rearing and sorting the fry and for keeping the sexes apart until they are required for mating.

Sexing is possible in about twenty-eight days. At this age some of the rays of the anal fin of the rapidly maturing (sexually) male begin to lengthen — to form a stick-like appendage or gonopodium. Also, a young male, uncoloured, may be recognized by the fact that his anal fin begins further forward on the ventral surface than that of the female. The specialist breeder pays great attention to heredity in guppy, and endeavours to work out a breeding program which is likely to accentuate characteristics most desired or admired.

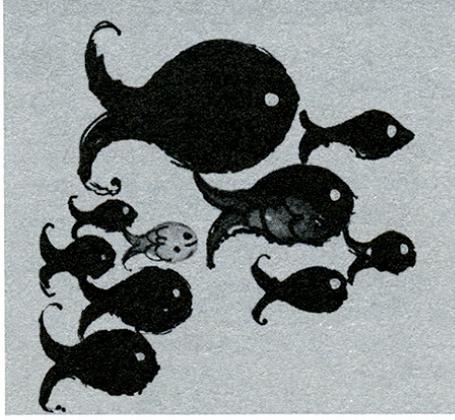


Size is usually passed on from the females, and large females should be chosen for mating to selected males. If virgin females are kept isolated from the males for about five months the chances are that their fry will grow into more magnificent fish than fry obtained from half-grown or poorly developed females. In general the colors and finnage are passed on through the male. But the finer points of breeding and the intricacies of inheritance in the guppy are too involved and too many to treat of here. But there are books on the subject: and these make fascinating and informative reading.

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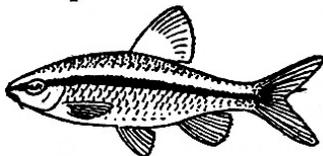


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Cherry Barbs

FOR THE ORDINARY aquarist with a community tank, a pair of Cherry Barbs (*Barbus titteya*) is a worthwhile addition. The Cherry Barb is a fair-sized fish which is not only very peaceable, but also very hardy and easy to keep.



The cherry barb, *Barbus titteya*

"Titteya" is the native name for the fish, and its natural habitat is the inland waters of Ceylon. Cherry Barbs imported from these regions lack the intensity of coloration displayed by the latter probably being due to the good care lavished upon them by their "foster parents."

When not in breeding array, male and female are somewhat similar, both sexes having a light brown background colour, with a deeper rich brown line running the length of the body. Above this line can be discerned a pale golden stripe. The fins

Continued overleaf, 2nd column.

AN EXCELLENT

AQUARIUM PLANT

THIS PLANT, SOMETIMES called the Japanese Nasturtium, comes from the more northerly parts of Russia, China, and Japan, so it is definitely not the plant to use in a tropical aquarium, for there it usually fades away. At temperatures between 60 and 68 degrees F. it does particularly well, but it can tolerate lower temperatures.

Cardamine lyrata is closely related to our native Lady's Smock, which has pale mauve flowers, and always grows in damp ground. *C. lyrata* is very beautiful, with gracefully branching stems, bearing round leaves that are mainly alternate, but sometimes opposite. The leaves are light green and snails find them irresistible. Therefore, be careful that there are no snails in a tank where the plant is growing.

The stems rise from a creeping rhizome and also develop some roots from the lower leaf axils. The main roots develop from the junction of the stem and creeping rhizome, and therefore propagation is fairly simple. One waits until a sufficient number of stems have grown, and then lifts the plant. Cuts made halfway between these rooted nodes will provide a number of young plants. A leaf allowed to rest on moist soil will root also, but the atmosphere must be kept humid.

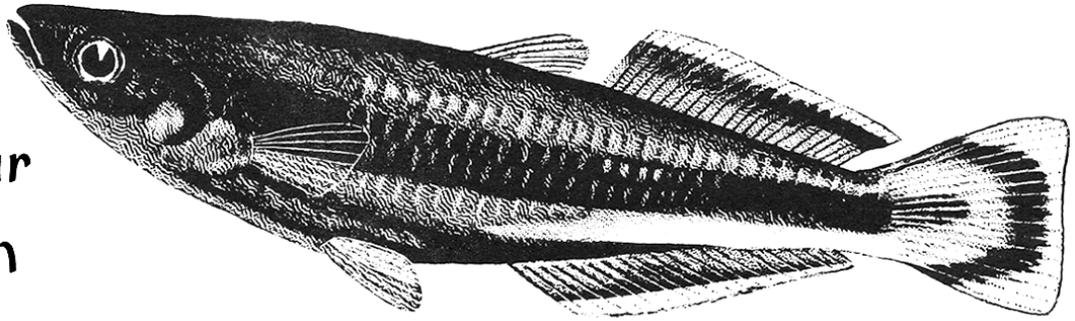
When growing in shallow water, so that some foliage rises above the sur-

face, the lead character changes and blooms can then be produced. The emergent leaves are compound, with a terminal leaf like the underwater
Continued overleaf, 1st column.



The Japanese Nasturtium

The Madagascar Rainbowfish



THIS FISH is not very well known yet, but when it becomes more easily obtainable it should be popular. The body is greenish and fins and tail have some red on them. Its size is 1½ to 2½ inches long, and it is a peaceful though lively dweller among other fishes.

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NASTURTIUM *continued.*

form, and two or three pairs of smaller narrower leaflets among the stem. A number of white flowers can appear on long stems. If this plant is grown on marshy ground in the open air during summer plenty of seeds will develop. Sprinkled on to a muddy seed pan, with the soil just awash, these seeds should germinate easily if the atmosphere above them is kept close.

Some loam below the sand, or a mulm-loaded form of old sand, will form a good compost for growing fine specimens of this plant, but great care should be taken to see that the water temperature does not rise above about 68 degrees F.

Placed in front of a dark rock in a cold aquarium, this plant, with its brilliant green rounded leaves, can look very charming. To keep it bushy continual pruning of the growing point is necessary. This causes it to branch and improves its appearance considerably. 

The most important thing to know about this fish is that it will not tolerate acid conditions for long. Neutral to slightly alkaline water suits it best; about 7.3 to 7.4 pH. Its temperature range is 76 to 78 degrees F., for it comes from Madagascar—a hot country.

Providing food for this fish is simple for it will take dried food readily but live food of some sort should be given regularly. Once every one or two weeks will do, and the easily prepared brine shrimps are excellent for them.

CHERRY BARB *continued.*

of both are of a brownish hue, turned reddish in the male where they may also be edged with black in some specimens.

However, when in breeding garb, any similarity ends abruptly. Then, the male flushes up to a deep ruby red, the central line disappears and he positively glows as he spreads his little, fan-shaped fins to splitting point while he circles round his intended mate.

For breeding purposes, the standard 24 in. by 8 in. by 8 in. tank will suffice. The use of pure rainwater is recommended, but I have been quite successful in using one third rainwater to two thirds tap water. The temperature of the water is best kept around 78°-80°F. (26°-27°C.).

The Cherry Barb likes to spawn in plant thickets so the best method is to cover the floor of the aquarium with small, well-washed plants, such as young Broad-leafed Indian Fern, gathered into clumps; with, perhaps, a number of *Ambulia* or *Cabomba* in the rear corners.

The pair intended for spawning should be placed in the tank about

Breeding these fishes is not difficult provided that you supply a separate tank. Plenty of surface plants, or bottom plants that spread along the surface in bunches should be used, and a water depth of about 8-9 inches.

Normally the parents can be left with the eggs and babies, but occasionally this is dangerous. The baby fish are of a size that can take newly hatched brine shrimps so bringing them up is easy. Since the popular name is so descriptive, it should never be necessary to refer to it by its scientific name, *Bedotia geayi*! 

two hours before dusk, to enable them to become acquainted with each other. If all goes well, spawning should have been completed sometime the following morning, and the aquarist should be on the scene early to remove both parents as soon as their intentions stray from that of the heart back to the dominant stomach. Cherry Barbs are avid little egg-eaters and will soon devour a good spawning if left to their own devices.

The fry will hatch in about 24 hours and for the first week should be fed on infusoria. By the second week brine shrimp can be given; this can then be followed with micro worms, graded daphnia and dried food.

When the fry reach a length of one-quarter inch they can be placed in roomier quarters to allow for growing-on. Any fouling of the water by uneaten food, waste, etc., can be held in check by the addition of a small species of *Corydoras*, which is completely harmless to the fry. 

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Egeria

BECAUSE it is known by two Latin names: *Egeria densa*, and *Elodea densa*, there is sometimes a little confusion about this plant. It is not a cultivated version of *Elodea canadensis*, but a separate species that comes from Argentina. It has brittle stems that branch easily, and these can grow to several yards long.



Continued overleaf, 1st column.

THE "HOW-TO"

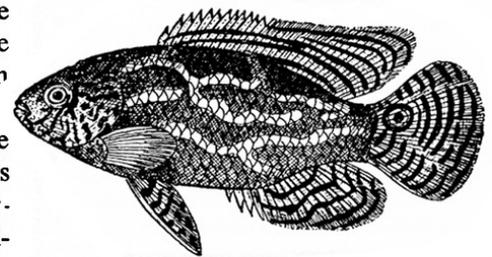
WITH OSCARS

THIS SOUTH AMERICAN CICHLID is found extensively in Paraguay and Brazil. In its native waters it attains a considerable size, but in the aquarium it seldom reaches more than about a foot. For its size, the oscar—scientifically known as *Astronotus ocellatus*—is reasonably well-mannered, but small ones are unsuited to a community tank because they always seem to attract the unwelcome attentions of other fishes, that chase after them and usually succeed in frightening them away from food.

A tank for a pair should never be less than 3 ft. long and 4 or 5 ft. is better. The bottom should be carpeted with a thickish layer of well-washed coarse sand or fine grit. Some pieces of lime-free rock may now be introduced into the aquarium to furnish shelter places and decoration. In common with lots of other cichlids, the oscar will tear out plants that grow from the bottom, but floating plants or plants that will grow floating, such as *Elodea densa*, are usually left alone. The most satisfactory temperature is about 78°F (26°C), but a variation of a few degrees either way does no harm.

The body of the oscar is well-fleshed and elongate-oval in shape. The scales are small and have this unusual feature, that they do not reflect metallic lights. This lack of glitter results in the fish having a singularly beautiful appearance, like that of fine suede or velvet. The

ground colour may be anything from pale beige through olive to a rich chocolate brown. Over this is spread a marbling of orange, grey-green, black, and ivory-white. In the base of the caudal fin there is an eye-spot, or ocellus, of dark brown to black in an orange field. Similar ocelli may be present, almost always are, in the



spinous dorsal fin. Otherwise the fins are greyish olive with or without lighter or darker markings. Nearly always the sexes of well-grown specimens may be distinguished by differences in coloration: the male being the handsomer of the two. This is most noticeable during courtship and spawning. Occasionally though the sexes look alike, or nearly alike. Young fish are not so well-coloured as adults. And breeding size is not attained until the fish reach about 6 to 9 in.

Behaviour before spawning is typical of most of the larger cichlids, or let's say of the cichlasomas, to which genus the oscar is closely related. Interlocking of the jaws is a feature of

Continued overleaf, 1st column.

OSCAR *continued.*

the courtship, as is also the spreading of the unpaired fins. The female gives as much as she takes, but is less aggressive in her love-play and occasionally has to be protected from the onslaughts of the male. It is usually the male who make the first advances, who rushes at the female with jaws agape, and initiates the exchange of nibblings and body-pressings.

The large and adhesive eggs are laid on a smooth surface as, for instance, the base of the aquarium after the sand has been moved away, or on top of a flat stone. But before this stage of the breeding procedure is reached, the spawning site is cleaned by the male. Sometimes he is assisted in his task by the female. And about this time, too, both sexes develop a nipple or spawning tube from the vent.

EGERIA *continued.*

It will grow in ornamental pools very well, and I have had some in a garden pond that frequently has one or two inches of ice on it during the winter. There it thrives mightily, producing thick dark green whorls of leaves, closely set on the long stems.

In a tropical aquarium—to which it should be adapted slowly if it comes from outdoors—the colour of this plant is pale green, the whorls of leaves are smaller, and are spaced more widely up to the stem. A typical reaction of any plant that is getting too little light. Nevertheless, it will thrive under tropical conditions.

In a cold aquarium, with plenty of light, it displays its qualities rather better than in warm water, which is surprising since it comes from a warm area. If the longest section just above a bud is cut off just above that bud, and stuck into the gravel as a cutting, it will soon produce roots, and anchor itself well.

This is probably one of the most adaptable of all plants for the aquarium. It prefers hard water, but will grow almost anywhere. The only complaint I have heard about it is that it requires trimming so often to keep it within bounds. 

It is not uncommon for a pair of oscars to quarrel during or just after spawning. This unhappy state of affairs usually results in the eggs being eaten by one or both fish. Therefore, if more than two spawnings come to nothing, commonsense dictates that the next batch of eggs laid should be separated from the parent fish.

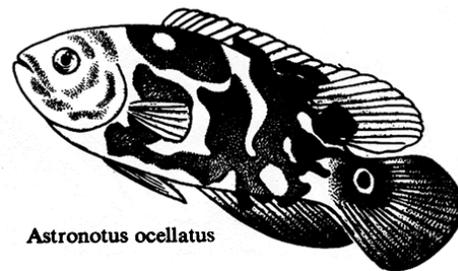
If the eggs are placed in another tank any change of temperature must be avoided. And another thing, it is

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of particular importance that the water in the hatching tank is clear and soft. A subdued light and gentle aeration are two more pointers to success.

A sharp look out should be kept for any eggs that turn white or fluffy. These must be removed at once. It is not difficult to do this with the aid of a needle fixed to a short length of cane, or a fine-pointed forceps. The period of incubation is three to four days, and as soon as the fry have become free-swimming an unfailing and generous supply of small livefood is called for. Rotifers, micro worms, freshly-hatched brine shrimps, and tiny *Daphnia* are well-suited to their needs.

It would take too long to describe in any detail the behaviour of a perfectly matched pair intent on raising a family, and at this point it should be mentioned that the fish does not breed very easily. But one thing is certain, and that is that the two fish take it in turn to fan the eggs (to prevent dirt settling on them) and generally watch over them. As soon as the fry are free-swimming, they are taken on exploratory tours of the tank with, usually, one parent (the male) in the lead, and the other parent bringing



Astronotus ocellatus

up the rear. Sometimes, but not always, newly hatched young are moved to depression after depression hollowed out in the sand.

By nature the oscar, known, also, by-the-bye, as the velvet cichlid, marble cichlid and peacock-eye cichlid, is carnivorous and will not thrive unless it is fed on livefood or suitable substitutes for livefood. Snails, earthworms, maggots, woodlice, cooked heart, washed liver and raw lean steak are all eaten with relish. But for all that, the oscar is not strictly carnivorous, and dried food is usually accepted.

For the rest, the oscar, once it has settled down, soon becomes remarkably tame and is, without question, one of the handsomest, longest-lived (upwards of eight or nine years) and endearing of all the larger tropical aquarium fishes. It was first made available to aquarists in 1929. 



"Are you looking for an experienced assistant?"

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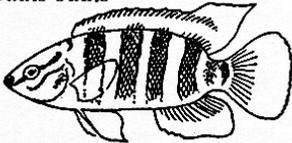


THE MOSQUITO FISH

Badis, Anyone?

THE Nandidae group of fishes, native to South America, the West Indies, Africa and India, comprises several species, few of which are known to the majority of aquarists. Probably the most common of the species is *Badis badis*, a fish indigenous to India, which attains a maximum length of 2½ inches.

Badis badis



It is not an easy fish to describe as it has the ability, characteristic of a "chameleon", to change colour, although its usual body coloration varies from a dull red to a bluish-black, usually crossed with wavy vertical lines. It is an extremely temperamental fish, certainly not to be trusted with fishes smaller than itself, or with fish having long flowing finnage, examples being the Angel Fish (*Pteriohyllum scalare*), the Pearl Gourami (*Trichogaster leeri*) and the

Continued overleaf, 1st column.

THE NAME, MOSQUITO FISH, has been applied to more than one species of fish which decimate the mosquito larvae population in the course of satisfying their appetites. In various parts of the world the name can apply alternatively to the Guppy, *Gambusia affinis*, the Medaka or Rice Fish (*Oryzias latipes*) and *Heterandria formosa*. In the U. S. however the name "mosquito fish" is synonymous with the *Heterandria formosa*, a fish whose natural habitat is the south eastern states.

68°F but when purchasing these fish it should be remembered that most dealers tanks are nearer the 75°F mark and therefore any change to the lower temperatures must be gradual.

Normally the mosquito fish is not a good candidate for the community aquarium as the males are liable to become tasty snacks for other tank inhabitants. A dozen of these tiny fish can be kept quite happily in a small tank and if this is done no harm will come to them. The most energetic action that will be seen will be the

The mosquito fish, *Heterandria formosa*



Because of their size (males average 5/8 in. and females 1¼ in.) and their ability to withstand temperatures between 50 and 90°F, these fish make ideal inmates for small unheated tanks which are maintained at room temperature (60 to 70°F). The ideal temperature for *H. formosa* is around

males in mock battles, with bodies arched and dorsal fins spread.

As the mosquito fish are a plain, dark olive lined with various dark brown markings, a touch of colour can be added to the tank by introducing some White Cloud minnows

Continued overleaf, 2nd column.

FIND THE FISH

Answer to FIND THE FISH

Badis badis

The first is in BORROW but not in LEND;
The second is in SAVE but not in SPEND;
The third is in DAWN and also in DUSK;
The fourth is in IVORY but not in TUSK;
The fifth is in SULTAN and also in SHAH;
The sixth is in BOTTLE but not in JAR; The seventh is in GAMMON and also in HAM;
The eighth is in DYKE and also in DAM;
The ninth is in RIBBON but not in LACE;
The last in in KISS but not in EMBRACE.

BADIS *continued.*

Siamese Fighting Fish (*Betta splendens*). It is, almost exclusively, a carnivorous species, tubifex, white worm, shredded earthworm and other meaty foods being accepted with great relish.

It is quite a simple fish to breed, this being done in a manner similar to the cichlids. The male is distinguished by his slimmer appearance, and his intenser coloration. For best results both fish should be separated and conditioned for a period of 7-10 days on the foods mentioned above, the breeding tank being set up to include slightly acid to neutral water, pH 6.8. A flower pot with the bottom knocked out should be placed in one of the rear corners, in which the fish will probably spawn.

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After the usual preliminary courtship, which commences with vigorous chasing by the male, the female will eventually be drawn into the flower pot to lay her eggs, where-upon they will be fertilized by the male. Upon termination of spawning both parents should be removed, and a few drops of a 5 per cent. aqueous solution of methylene blue added to the water in order to assist the fight against bacterial growth.

Hatching occurs within 72-80 hours, and after absorption of their yoke sacs the fry should be fed the normal foods—infusoria, brine shrimp, sifted daphnia, and finally small white worms or chopped tubifex. The ultimate result should prove to be a good number of saleable fish which, in turn, will further serve to popularise the species amongst a greater number of aquarists. 

MOSQUITO FISH *continued.*

(*Tanichthys albonubes*). These fish are ideal companions for *H. formosa* as they are not aggressive, are suited to the lower temperature range and their bright colours contrast with the dark colours of the mosquito fish.

H. formosa are livebearers and therefore no special requirements are necessary for their propagation. The parents will not eat the young and al-



though the fry are small at birth, raising them does not present any difficulty. The gonopodium of the males is much larger, in proportion to the body, than that of most other livebearers and in some cases is equal to half the body length. Males will continually chase their mates breaking off only to feed or joust with another male.

In a well planted tank, with plenty of floating vegetation, the mosquito fish will reproduce "ad infinitum". The female does not drop all the young at once, like other livebearers, but will drop between 1 and 4 fry each day for about eight days. When the females are seen to be gravid, daily inspections of the floating plants are advisable and eventually some fry will be found. After the initial batch, the fry will increase in number every day until the female has completed the delivery.

The fry can either be left with their parents or removed to raising tanks but if there are more than two adult females in the breeding tank it is advisable to remove the fry or over population will quickly occur.

Adult fish should be fed on small flake foods, grindal worm, sifted daphnia and brine shrimp, while the fry will do well on powder foods, micro worm and newly hatched brine shrimp. Given adequate feeding and not subjected to overcrowding the fry will be sexually mature in 12 to 16 weeks. 

Tropical Queries Answered

My 3 ft. tropical aquarium is lighted by two 25-watt lamps and my greatest problem is brown algae. Also, very few of the plants I have introduced from time to time stay alive for long. Please tell me what to do to overcome these difficulties?

Your greatest need is a higher-intensity light for a longer day. In a word, if you allow 40-watts of ordinary electric lighting for roughly every square foot of bottom area; and keep this lighting switched on for at least ten hours a day, then you should see a marked improvement in the appearance of your freshly and, we hope, generously planted aquarium within the space of a month or two.

Up to the time of writing I have been supporting my cover glass on two iron wires hooked at the ends over the top angle bars of my aquarium. But last night a friend told me that there is nothing I can do to stop drops of water impregnated with the metal falling into the aquarium and poisoning the fish. What is your opinion?

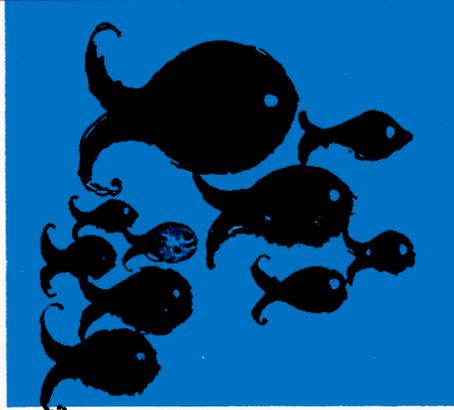
It is not a good thing to have metal in contact with aquarium water. But there is a way out of your difficulty. Just insert the wires inside lengths of plastic or rubber tubing. This will safeguard the wires against rust and the fishes against metal poisoning.

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HOW FAST IS A FISH?

The Glass Fish

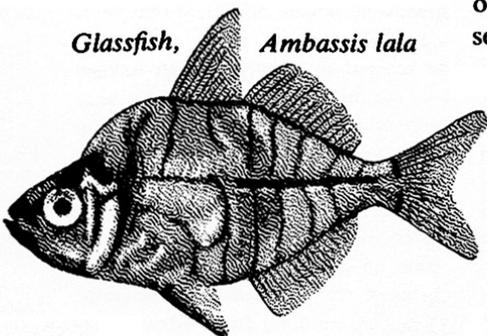
THE NEARLY TRANSPARENT BODY of this fish has given it the name of Glassfish, but there are times — if a strong light is shone on to it from the front — when the surface glints

SOME catfish swim clumsily and seem relatively slow, even when they are frightened. Barbs and tetras on the other hand, dart about a tank bewilderingly fast. One moment the fish you are trying to net is stationary in one corner of the tank. The next moment it is stationary in another corner, after moving so suddenly that you could not follow it with your eyes. Such fishes give an impression of great speed. How fast do they really move? The answer can be got from cine films.

The illustration shows a series of outlines traced from a cine film of a seven-spot barb (*Barbus lineomacu-*

latus). The fish is seen from above, swimming off after being startled. The film was taken at the high speed of 64 frames/second but only alternate frames have been traced, so each outline shows the fish 1/32 second after the one before. At the start of the film the fish was stationary with its body straight, in position I. When it was startled it bent its head and tail to the right (position 2) taking only 1/32 second to do so. After another 1/32 second it had bent the other

Glassfish, *Ambassis lala*

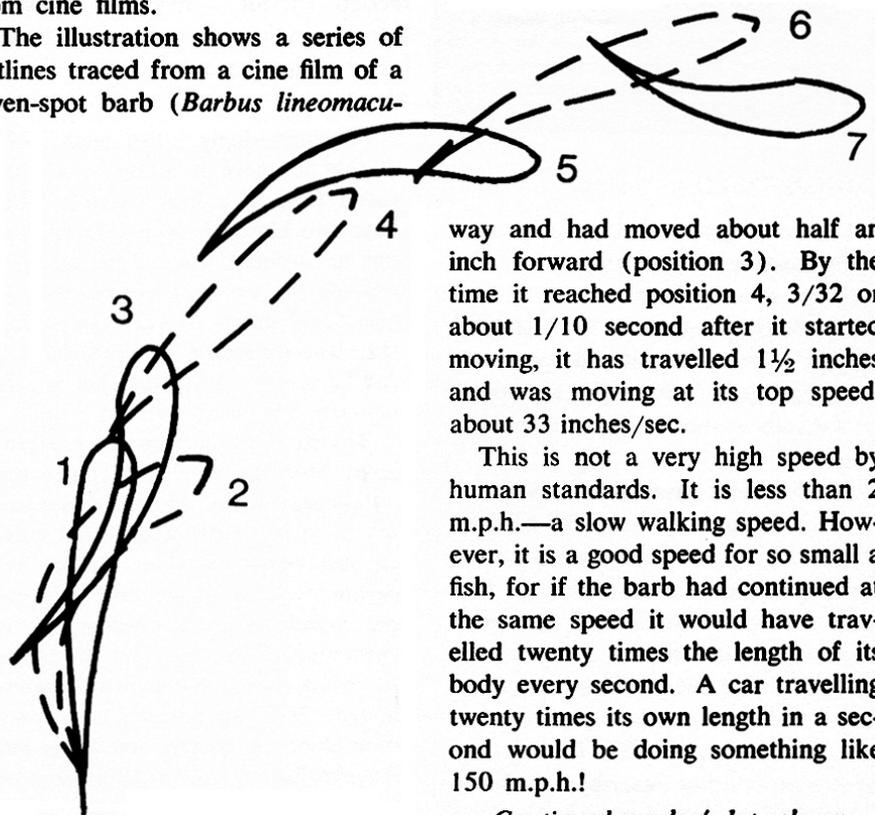


with a nice metallic tint; gold in the male, and silvery for the female. The fins are all yellowish-red, with an edging of sky blue in the case of the male.

Although it can reach a length of 2½ inches in the wild, our aquarium-reared specimens rarely achieve this. The fishes are compressed laterally (from side to side) so that when looked at head-on they become more difficult to see.

Continued overleaf, 1st column.

The illustration shows a series of outlines traced from a cine film of a seven-spot barb (*Barbus lineomacu-*



way and had moved about half an inch forward (position 3). By the time it reached position 4, 3/32 or about 1/10 second after it started moving, it has travelled 1½ inches and was moving at its top speed, about 33 inches/sec.

This is not a very high speed by human standards. It is less than 2 m.p.h.—a slow walking speed. However, it is a good speed for so small a fish, for if the barb had continued at the same speed it would have travelled twenty times the length of its body every second. A car travelling twenty times its own length in a second would be doing something like 150 m.p.h.!

Continued overleaf, 1st column.

GLASSFISH *continued.*

This species is found in clear fresh water, and therefore does not like slightly foul water. If placed in a densely planted old aquarium they will respond by showing much more activity. Sometimes they sulk and appear to be shy. A slight trace of table salt should be added to the water.

They can be kept in a communal aquarium, provided that the other inmates are also small and peaceful. Like many other fish they prefer live food to dried, but it should be always of a small size, like brine shrimp. Temperature range is 65 to 76 degrees F. with a rise to 80 degrees for breeding. The eggs are laid in the roots of floating plants, and the water should be kept shallow, about 4-6 inches, when breeding. 

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FISH SPEED *continued.*

The acceleration of the barb is just as impressive as its top speed. In position 2 it is hardly moving forward but by position 4, 1/16 second later, it is travelling at top speed. It has accelerated from rest to top speed in a distance about equal to its own length.

Readers who have taken an interest in space travel may know the method of describing an acceleration as so many gravities, or so many *g*. If I drop a stone down a well, its speed increases as it falls. It increases by 32 ft./sec. for every second the stone falls. In other words, the stone has an acceleration of 32 ft./sec./sec. This is sometimes described as an acceleration of 1 gravity, or 1 *g*. It can be worked out from the film that between positions 2 and 4, the barb had an acceleration of 1½ *g*.

This would be a marvellous acceleration for a car. Of all cars, the ones with the highest accelerations are the strange ones which are used for Drag racing. The best of them can reach 200 m.p.h. in ¼ mile from a standing start. This is an acceleration of 1 *g*, which is less than the acceleration of the barb. Still, I wouldn't back my barb against a car for any race over a course of more than a few inches.

The comparison with cars is really rather misleading. It is perhaps more realistic to compare the barb with other small animals. A locust, for instance, is about the same length as my barb. When it jumps, it kicks itself into the air with an acceleration of about 15 *g*. This makes the fish look distinctly sluggish.

Big fishes can swim faster than small ones, but not quite in proportion to their size. My barb is just over 1½ inches long, and can get up to a speed of twenty times its length per second. Other fast fishes of similar size, such as young trout, can do the same, but a trout a foot long can only manage ten times its length per second (about 7 m.p.h.). When a 1-foot trout is startled it accelerates faster than the small barb (up to 4½ *g*).

Not surprisingly, a fish needs more muscle to drive it along at a high speed than at a lower speed. Fish have two kinds of swimming muscle, one for ordinary use and the other to provide the extra power needed for occasional bursts of very fast swimming. The difference between the two can be seen in most fishes but is particularly obvious in herring.

The part of a herring that is eaten, apart from the roe, is of course the swimming muscle. Most of it is white but there is a strip of deep red muscle just below the skin. Recent experiments have shown that only the red muscle is used when a fish is swimming slowly but that the white muscle is used in bursts of fast swimming. The experiments have only been done on dogfish and tunas but the conclusions are probably true of fishes in general. The top speed, which can be maintained for only a second or less, is the maximum speed

at which all the muscle working together can drive the fish. The speed of about four lengths per second, which can be kept up for a long time, is the speed at which the fish can be driven by the red muscle acting alone. There is many times as much white muscle as red muscle but it is all needed at the top speeds because high speeds are very expensive in terms of energy. It can be calculated that if a fish doubles its speed, it needs six or eight times as much power as before to drive it along.

The two kinds of muscle work quite differently. All muscles depend on oxygen but whereas the red muscles have to be supplied with oxygen as they work, the white ones work on a principle of swim now, breathe later. This is part of the reason why the top speed cannot be kept up for long. The white muscle soon needs a rest, to give the blood time to bring it the oxygen that is owed to it: it cannot go on working if the debt gets too big. The gills are big enough to keep the red muscle constantly supplied with oxygen, and that is why a fish can swim for ages at the lower speeds at which only red muscle is used. Fantastically large gills would be needed to supply enough oxygen for the highest speeds, if the very large white muscle could not develop on 'oxygen debt'.

Oxygen debts are not a peculiarity of fishes. Men could not run short distances so fast if we could not develop an oxygen debt which is made up as we recover, panting, afterwards. However, we differ from fishes in that we use the same muscles for a sprint as for a marathon.

To finish, here is a speed record. The highest fish speed that has ever been measured, so far as I know, is 44 m.p.h., done by a 5 foot tuna. I do not know how accurate that measurement was, but you will certainly not see speeds like that in your aquarium! 

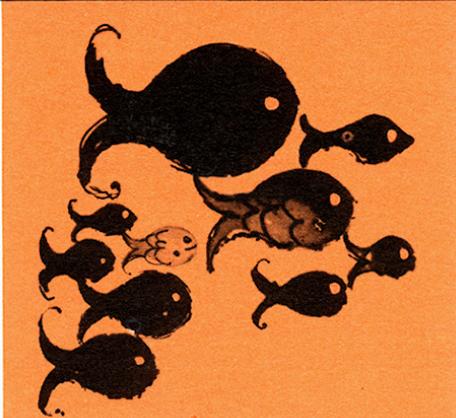
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BREEDING THE

GIANT DANIO

Bacopa

THIS PLANT HAS suffered from being re-named a number of times. Perhaps this is because it grows wild in the U.S., where it is common near the southern parts of the Atlantic coast. There it can be studied by many people, and they all appear to have had a go at naming it. Some of these names are *Herpestis amplexicaulis*, *Monniera amplexicaulis*, and *Bacopa caroliniana*.

It is a marsh plant, and therefore needs lots of light to grow properly. When grown above water the aerial leaves are somewhat thicker. Because it comes from the warmer parts of America it should do well in warm water, but I have grown it in a cold aquarium that never dropped below 58 degrees F.

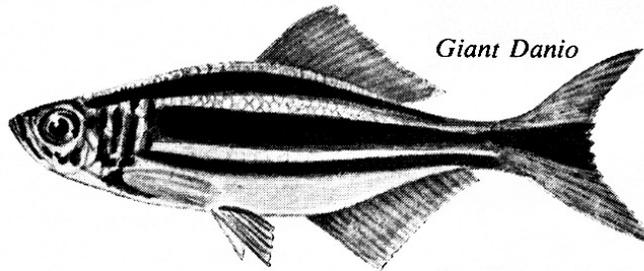
A tropical aquarium is often recommended as the proper place for it, and there, providing that the light is strong enough, it will grow reasonably well. It will tolerate a temperature rise up to about 72 degrees F., but above that it becomes very soft and sickly. Its best temperature range is

Continued overleaf, 1st column.

Danio *malabaricus*, commonly known as the giant danio, has long been one of the most popular of tropical aquarium fishes. The reason is not far to seek. It is attractively colored; it is peaceful; it is hardy; it is active; it is easy to keep. Moreover, it is not difficult to breed.

always the female is paler in coloration and larger in the body than the male. This is certainly true of the fish when a couple are ready to spawn; for then the blue and reddish tints of the male become greatly intensified and the female displays bloated sides.

The regular 24 in. by 12 in. by 12



Giant Danio

It is of the carp tribe. That is to say it is a member of the widely distributed family *Cyprinidae* and is found in the wild state in the coastal freshwaters of Malabar (hence its trivial name) and western Ceylon where, according to the best writers on aquarium fishes, it attains a length of about 6 in. In the aquarium, however, it rarely exceeds 4 in., or, perhaps, 4½ in. at most.

The basic coloration is greyish olive above and silvery white flushed salmon pink below. The sides are striped with blue and yellow, or gold. The middle blue stripe extends as far as the fork of the caudal fin. The head and shoulders are marked with gold and silver overlaid with blue blotches and bars. The fins are red fading to diaphanous grey. Almost

in. aquarium tank is not too small to spawn a pair, though a three-foot tank is better. As a rule the sticky eggs scattered by the female, as she is driven all over the aquarium by the male, come to rest in the submerged vegetation (bunched plants with feathery foliage such as myriophyllum or Java moss (*Vesicularia dubyana*) are recommended), but some-

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FIND THE PLANT

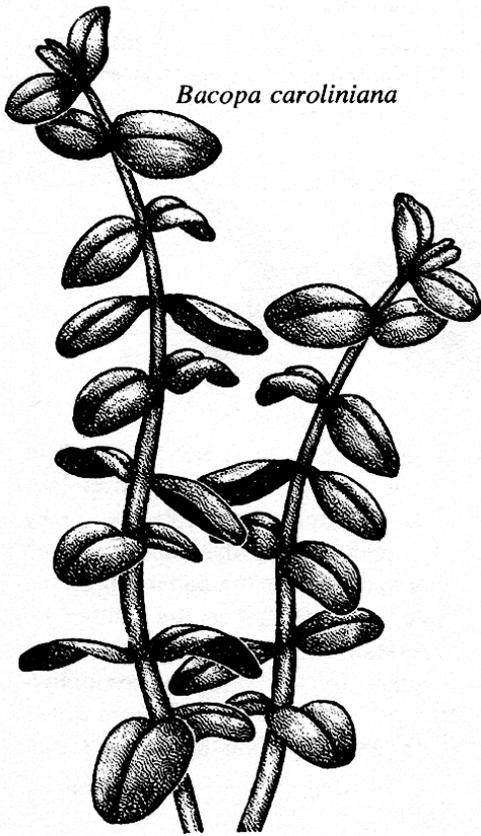
- The first is in GRIN but not in SMILE
- The second is in INCH and also in MILE
- The third is in CREAM but not in MILK
- The fourth is in COTTON but not in SILK.
- The fifth is in SUNSHINE and also in RAIN
- The last is in TAXI and also in TRAIN.

Answer on next page.

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BACOPA continued.

63 to 68 degrees F., so that for an aquarium kept as cool as this it is admirable.



Bacopa caroliniana

Contrary to the usual practice a number of cuttings can be bunched together for rooting. I have done this, and then transplanted them out separately, but the roots are badly tangled. If separate plants are required they can be inserted singly in the first place.

DANIO continued.

times during the excitement of the chase (the male is a persistent and vigorous driver) the female will release eggs before she reaches the plants. If, therefore, the floor of the aquarium is carpeted with a layer of well-washed small pebbles, on which the bunched plants are weighted down, there is the chance that the eggs that do not end up in the plants will end up in the interstices of the stones, where the fish cannot get at them. (Remember that *D. malabaricus*, like most other oviparous fishes, is an avid eater of its own eggs, and must be removed from the aquarium as soon as egg-laying is over.)

It is always a good plan to separate the sexes for a month or two before breeding is attempted in order that they may be brought into first class condition. During this conditioning period the fish should be fed to repletion on the most nourishing possible food such as wheat germ, chopped earthworm, and raw lean steak.

The fish keeper with some experience will know, intuitively, when to bring a pair together. But the comparative beginner must wait and look for the signs mentioned above, that is the brighter colours of the male and the fuller sides of the female, before any attempt is made at spawning. It is best to place a conditioned pair in the tank set up for breeding last thing at night.

Whatever the temperature before (ordinarily a range of from about 68°F to 75°F suits the giant danio very well), it is essential now to raise it to the upper seventies or lower eighties (°F). In most cases the stimulation provided by a higher temperature, combined with a good light (natural or artificial) will result in chasing on the following day, though a few hours may elapse before any eggs are laid.

Answer to **FIND THE PLANT:**
RICCIA

The eggs hatch in about two days. The glass-like fry cling to the sides of the aquarium and the plants for the next few days before they become free-swimming and begin searching around for food. For the next nine days or so a proprietary fry food may be given or, if the aquarist has the expertise to prepare it, infusoria. Drip-fed infusoria is, perhaps, the most satisfactory way of bringing on fry fast, yet without the danger of fouling the water. Commonsense will determine when the fry need larger food such as brine shrimps or micro worms or a fine-milled dried food. As the fry increase in size their colours



"I share it with my neighbour"

will begin to show. Also, they tend more and more to move about in a shoal. They are a pretty sight seen swimming in clear water against a background of fresh green plants.

The giant danio is an ideal fish for the more spacious aquarium and mixes well with such beauties as the silver shark, the elegant rasbora, and the Australian rainbow fishes. Of supreme importance, too, is the fact that it is not hard on the plants and does not demand anything special in the quality of the water.

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THREE AQUARIUM SHARKS

THE GREAT FAILING of the red-tailed black shark (*Labeo bicolor*) is the animosity it displays toward members of its own kind. Whereas one red-tailed black shark

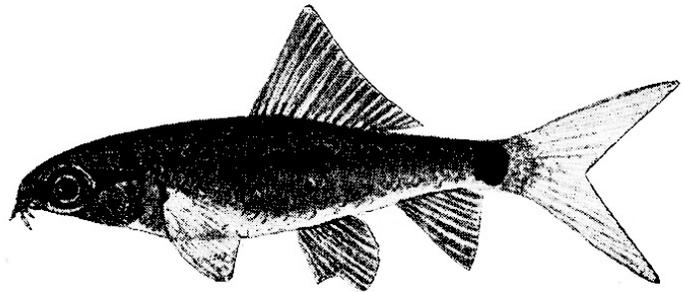
nearly so pugnacious, and two or more may be kept in the same tank with every chance of a satisfactory relationship. For the sparring they frequently indulge in seldom, if ever,

Hairgrass

THIS IS A marsh plant, usually known as Hairgrass, or Needlegrass, for its leaves are thin and hair-like. It has a creeping rhizome branch that progresses just below the soil or sand surface, throwing up small bunches of leaves at intervals.

There are both submerged and aerial types of this plant. Below water it is like the drawing, but when in very shallow water it throws up flower-stems tipped with tiny flowers. In deep water it can develop very long leaves, sometimes up to 18 inches long, but in aquariums it is rarely so generous.

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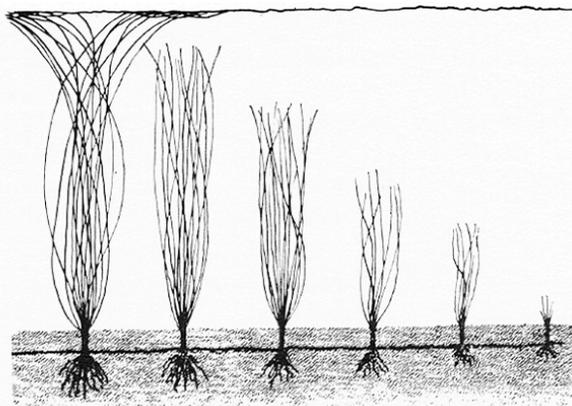


in a community aquarium is not out of place, two red-tailed black sharks will almost certainly fight every time they meet, with the result that one of them — the weaker of the two — will become sadly reduced in spirits and health and soon die. But the red-finned shark (*L.erythrura*) is not

results in torn fins or bruised bodies.

L.erythrura is a more elongated or streamlined fish than *L.bicolor*. As a rule, young (small) specimens are paler coloured than adults. Adult coloration is blue-grey to grey-brown on the sides and silvery white on the

Continued overleaf, 2nd column.



FIND THE PLANT

The first is in GRIN but not in SMILE
The second is in INCH and also in MILE
The third is in CREAM but not in MILK
The fourth is in COTTON but not in SILK
The fifth is in SUNSHINE and also in RAIN
The last is in TAXI and also in TRAIN.

The answer is overleaf.

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HAIRGRASS *continued.*

Although it will grow in tropical as well as cold water conditions it appears to do best at moderate temperatures. In Holland it grows as a wild plant, and they have strong frosts there, so it will be seen that this plant could be very useful in a cold aquarium. It requires a very strong light.

A minor snag with this plant is its fragility when handled. The specimens usually on sale are about 3-5 inches long, and consist of innumerable plants bunched together. If this bunch is floated on water, and the bunch gently teased apart, it will be seen to consist of dozens and dozens of plants, many of them joined by the creeping root stem.

With infinite patience these can be separated out, and planted in fine sand. Make sure that the root stem is just buried but that the bunches of leaves are not placed too deeply. Given careful and patient attention like this, hairgrass will thrive and produce dense thickets of the beautiful thin leaves. 

Answer to **FIND THE PLANT:**
RICCIA

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SHARK *continued.*

belly. A black line extends from the snout, through the gold-rimmed eye, to the gill-cover. A black blotch or bar is present on the rear of the caudal peduncle. The fins, with the exception of the pectorals, are a fresh brick red. At full size the red-finned shark may measure as much as 5 in. But fish this size are exceptions rather than the rule.

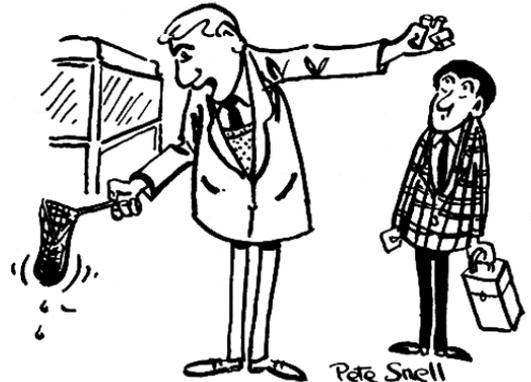
L.erythrura, like other members of its far-flung genus — *Labeo* spp. are found in Africa as well as in tropical Asia — is a lively species, and, if it is to keep in good shape and live for upward of four years, as it will do if conditions are right, should be given plenty of food. It eats anything, that is anything eaten by an omnivorous fish. It is particularly fond of algae, and will turn over on its back or side or head to reach almost inaccessible growths on plants or fixed objects. But it is essentially a bottom-searching fish.

The aquarist is more likely to keep the red-finned shark alive and healthy if he places it in an aquarium well furnished with plants behind which it can retire every so often. But it is not too retiring a fish and is never out of sight for long.

Top aquarium authorities do not agree on the quality of water that suits this species best. Some say it flourishes best in alkaline water; others say it should be given soft and acid water. But I can say from personal experience that any water, provided other non-faddy fishes will live in it, will do. A temperature range of about 72°F (22°C) to 78°F (26°C) should be maintained.

Aquarists who tell me that they can never keep any of the sharks (*Labeo*) for more than a month or two are usually too inexperienced in fishkeeping — tropical fishkeeping, that is — to know that the body shape at the time of purchase is of

particular importance. The ventral surface of the red-finned shark is flatter than that of the red-tailed black shark, but both species should show good lines and plump sides. A hollow-chested fish that swims in a jerky or sluggish manner or with the head tilted down should be left alone. Colour is not a reliable guide to the physical condition of these fishes; for in the underplanted tank of a dealer not a few *Labeo* spp. assume subdued tints.

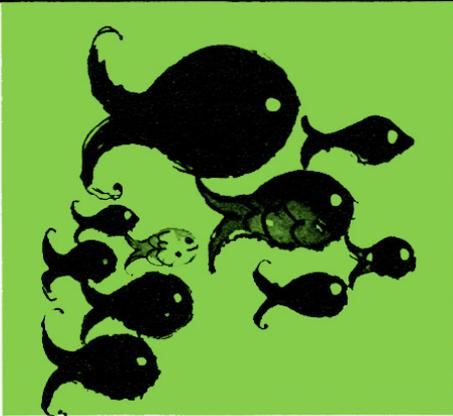


"Did you say two piranhas, sir?"

L.erythrura is found in the natural state in eastern Thailand (probably but not certainly over most of the Mekong river system), and was introduced to tropical aquarium keepers in 1956. A *labeo* likely to be confused with *L.erythrura* is *L.frenatus*. It has red fins and black markings on the snout and tail, but is rather spindle-shaped, and its general coloration is bronzy brown to light olive. It is smaller than *L.erythrura*, peaceful, and, as Professor Sterba points out, an excellent eater of algae. 



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A GARDEN IN YOUR AQUARIUM

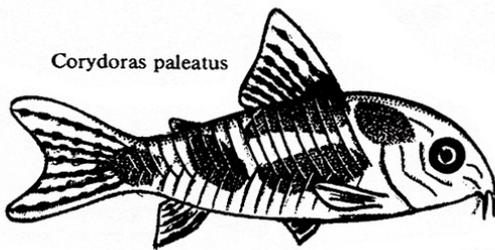
“SOME OF MY TROPICAL FISHES appear to be sick. I have only seventeen fish in the tank, and about a dozen nice plants, but I have to clean out the bottom each week. What is wrong?”

Nearly all readers will have heard some variant of this question at one time or another, and will know that there is not just one answer — but many. Too much food and too few plants are among these answers. But it is not the answers as such that I wish to deal with here. It is, rather, the fundamental approach to aquarium keeping. In the question above is implied a wrong approach, and it is typical of the loose thinking that is becoming more prevalent lately.

Corydoras paleatus

Corydoras paleatus from northern Argentina and southern Brazil has a life-expectancy of upwards of 10 years and is remarkably resistant to disease — parasitical, at any rate. It is said on good authority that the bony plates that cover the sides afford excellent protection against attack. It also has the all-important virtue of a gentle disposition: even

Most beginners acquire an aquarium to keep some fish, and when they seek advice everyone talks about fish, water temperatures, food, and lighting. Just occasionally, as a sort of afterthought, plants may be mentioned; but never with sufficient emphasis.



Corydoras paleatus

A friend of mine who keeps a tropical fish shop quoted me the question that opens this article, and told me that similar questions crop up in his shop regularly each day. He was of the opinion that matters in this respect were getting worse, and that until there was a different approach to the subject there would be very little change.

livebearer fry are safe in its company. And one can happily say it never grows too large for the average tank; two-and-three-quarter inches is about maximum size. And, since it does not burrow deeply into the compost — well-rooted plants are left undisturbed. Furthermore, it has a range of temperature extending from the

The approach he suggested was: “Make an ornamental water garden in the aquarium with lots of plants, and employ a few fish to fertilize the plants.”

In that suggestion lies the complete answer to keeping a balanced acquar-

Continued overleaf, 1st column.

VALLISNERIA SPIRALIS—TORTA
Use about four dozen of this type of plant.

Continued overleaf, 2nd column.

CORYDORAS *continued.*

lower sixties to the upper eighties (°F). Finally, unlike the general run of catfishes, it can be bred.

A female in breeding condition not only looks markedly bloated but her ventral region assumes a bright pink hue. Even out of breeding condition she is not too difficult to tell apart; for size for size she is the heavier-bodied of the two and her dorsal fin is usually rounded whereas that of the male is pointed.

A rather abrupt lowering of the temperature of the water from the regular 75°F to about 65°F often, but not necessarily, supplies the stimulant to promote spawning. The spawning procedure is interesting.

Firstly there is a lot of unaccustomed activity in all levels of the water during which the male initiates chasing but is later led or encouraged by the distended-sided female. Then the fish begin to look around for suitable spawning sites. The glass sides of the aquarium or smooth stones are favoured places. They will be made meticulously clean. There is some diversity in mating positions, but almost always the female sidles up to the excited male and nuzzles against him as he turns over on his side. After each brief encounter the female swims away carrying some eggs between her close-pressed ventral fins. She plonks them (they are sticky-coated) on the prepared surfaces. It is not unknown for the parent fish to eat their eggs, but cannibalism is not a common practice among this species.

The fry break free after about 48 hours and drop to the bottom. There they ferret about in the mulm or interstices of the compost for their first food: tiny living organisms. As these are quickly exhausted the aquarist should make every effort to keep up a supply of suitable substitutes such as micro worms, brine shrimps or chopped tubifex. Later, that is as the fry increase in size, the usual graded dried foods may be given. 

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GARDEN *continued.*

ium in good health, whether tropical or cold water. Where there are a lot of plants, growing under a good light, they will eat up the dissolved minerals in the water faster than a few fish can produce them, and will keep the pH balance neutral, too.

But if this balance is reversed — so that there are more fishes and fewer plants, in the way that many people try to keep an aquarium — then it becomes obvious that the plants will become soured and acid, because they are smothered by the dirt from the fish, and then the water becomes foul and acid.

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Is it impossible to say that X number of plants should be used for each fish kept, because fish and plants vary so much, but my pet shop friend has his opinion about this too. He maintains that there should be a minimum of six plants to each tropical fish kept. That when a tank is planted with a proper balance it should be possible to see half of the fishes only at any one time, because the plants would be so dense that they hid the rest.

With a densely planted aquarium the types and numbers of infusorians that live in the water, and help to keep it pure, are increased tremendously for they multiply among the plant leaves easily, being comparatively safe from the fishes.

Each kind of plant harbours a slightly different sort of population of infusorians, and because of this there should, where possible, be five or six kinds of plants at least. These should rarely be planted in groups of less than half a dozen, so that these various infusorians will have a base from which to multiply.

What I consider to be a minimum number of plants for the normal 24-

inch tropical aquarium would be about seven dozen. Say, four dozen of the *vallisneria* or *sagittaria* types; two dozen of a more fancy type such as *hygrophila*, or *ludwigia*; and about a dozen more plants that can be used either singly or in small groups, such as the many kinds of *cryptocoryne* or sword plants.

These can be arranged according to the likes of the aquarist, but my suggestion is that the *vallisneria* types should be divided in half and used in the rear corners, densely, with a double row right across the back. Set the *vallisneria* about ¾ inch apart each way, starting in the back corners, and working forward so that you eventually achieve a nice semi-circle, thin at the middle back.

The two dozen fancy kinds can then be split to make a dozen in the rear centre (in front of the thin line of *vallisneria*), with another half doz-



HYGROPHILA POLYSPERMA
This can be included among the two dozen fancy types.

en in each of the two front corners, each kept in its own group. These could well be three different kinds of plants. Set all the plants slightly apart in their groups. Planting a number together in the same hole results in decaying plants.

The *cryptocorynes* or sword plants can be used as dot plants or small groups in the remaining centre front of the aquarium. The whole effect then should be luxurious and should look most effective. 

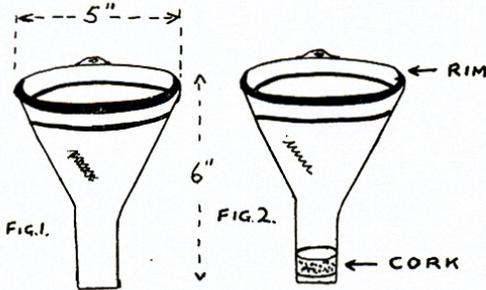


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Brine Shrimp Hatcher

HAVING TRIED hatching brine shrimp in an ordinary jar submerged in the tank with not very much success, (the eggs would always build up in a heap on the other side of the jar, not giving a very high hatch-yield), I decided to have a go at making a small hatcher, giving a good hatch. After several ideas, I came up with the following. I bought a plastic funnel, measuring 5 in. diameter by 6 in. deep (fig. 1) the type for filling paraffin oil into a heater.



FUNNEL

The next job was to plug the bottom of the spout with a cork taken from a medicine bottle (fig. 2). I then took a piece of 1/2 plastic air line and made a tight ring joining it with

Continued overleaf 1st column.

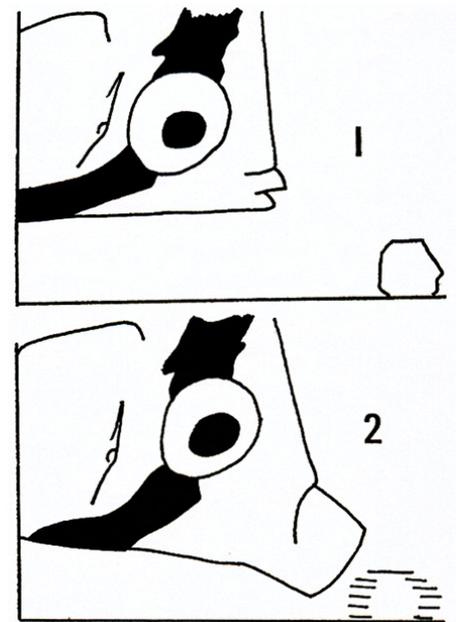
HOW AN ANGELFISH EATS

YOU HAVE PROBABLY often watched angel fish feeding, but have you ever seen exactly what happens when they take a mouthful of food? Of course not, for it happens much too quickly. One moment the food is there and the next it is gone, leaving you at most with the impression that you have seen the fish's lips jerk forward to take it.

Movements that are too fast to see can, of course, be recorded by high speed cinephotography. The four drawings which illustrate this article have been traced from four successive frames of a cine film taken at 64 frames/second, which is four times as fast as the films taken by an ordinary amateur cine camera. The fish is a good-sized angel fish about 2 1/2 inches long, which was a most cooperative model. Close-up photography at high speeds needs bright lights, especially if depth of focus is important, but this fish fed obligingly under photographic lights so strong that they heated the water in the aquarium at an alarming rate. The temperature once rose 6°F in a short photographic session.

The food in the picture is a piece of the white of a hard-boiled egg, chosen because it shows up better in the film than ordinary flake fish food. The fish became tired of eating egg before I tired of taking photographs, but turned out to be willing to eat tiny cubes of cheese spread, which is just as photogenic.

In frame 1 the fish is approaching the food with its mouth still shut but, in frame 2, only 1/64 second later, the mouth is wide open. The lower jaw has, of course, been swung down to open the mouth, but at the same time the upper jaw has shot forwards, stretching out a fold of transparent skin which was previously tucked



away out of sight inside the head. The open jaws and the skin form a tube which sticks out quite a long way in front of the fish. The food is blurred because it has started moving towards the fish, which is sucking it into the tubular mouth.

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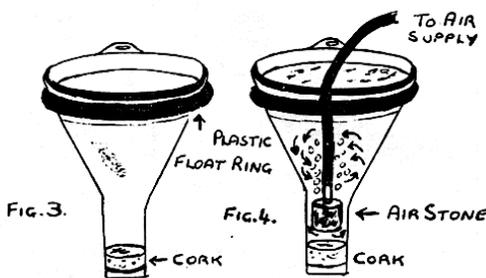
ANGELS *continued.*

In frame 3 the mouth is still wide open and the food is travelling faster. It can be seen through the transparent skin even after it has gone into the mouth. It can be calculated from the length of the blur that the food is moving at about 10 inches/second. In frame 4 the mouth has closed again with the food inside but the upper jaw has not yet moved back to its normal position, so the fish looks as if it has a beak.

If you suck a drink up a straw you do it by expanding your lungs, and your cheeks are pulled in by the suction. Angel fish, of course, have no lungs, but they have stiff cheeks, containing bones which are hinged along their top edges to the main part of the skull. They suck food into their mouths by swinging these cheeks outwards, and also by forcing the floor of the mouth downwards.

HATCHER *continued.*

a plastic plug. This ring fits under the rim of the funnel (fig. 3) and acts as a float. Next the air-stone was fitted into the spout (fig. 4) and the funnel filled up with salt water submerged into the tank, and connected to the air supply. The shrimp eggs are then introduced.



I have found that I am now getting a much higher yield of shrimps. The eggs naturally slide down the sloped sides of the funnel and are then immediately forced back up again by the air-stone, always keeping the eggs circulating. This method is cheap and effective, and well worth a try.

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The upper jaw of the angel fish moves in quite a complicated way. It moves forward as the mouth opens and stays forward until after it has closed. All its movements are automatic. When the lower jaw is swung down to open the mouth it pulls on the upper one in such a way as to make it shoot forward and make the mouth into a tube. When the cheeks swing out to suck the food in they move a knob of bone which acts as a catch. This locks the upper jaw in the forward position and prevents it from moving back, even the mouth has closed, until the cheeks have swung back to their normal position.

The barbs, the toothcarps and the acanthopterygians (of which the angel fish is one) have upper jaws which protrude as the mouth opens and stay forward after it has closed. The internal machinery that makes this happen is much the same in all acanthopterygians, but different in barbs and different again in toothcarps. The differences make it seem likely that protrusible jaws have evolved separately in these three groups of fishes.

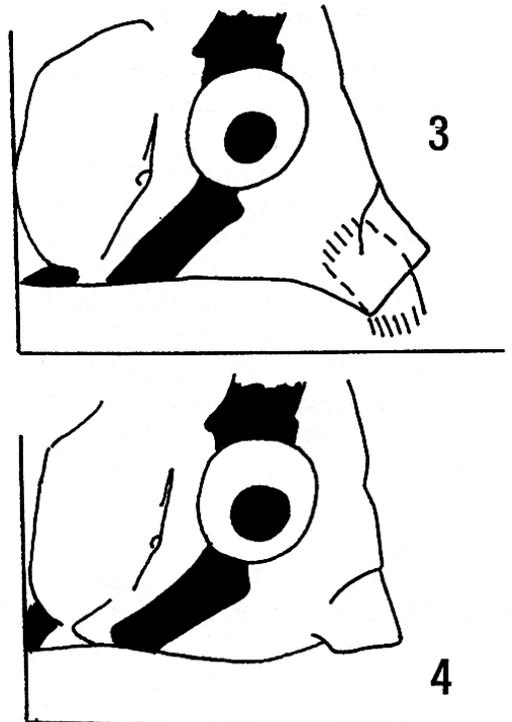
Something rather similar has evolved in *Corydoras* and its relatives, whose lips form a tube when the mouth is open and fold down against the underside of the head when they are out of use.

Not only have protrusible jaws evolved several times, but the fishes that have them have flourished tremendously. The acanthopterygians not only include such familiar freshwater groups as the cichlids and perches but also so many marine fishes that they total more than half the fishes of the world. The barbs

and toothcarps between them include a very large proportion of all freshwater fishes. It is hard to escape the conclusion that there is something specially useful about protrusible jaws.

One suggestion that has been made is that a fish will have a better chance of catching its prey if it can shoot its mouth suddenly out in front of it on the end of a tube. An objection to this is that the tube is usually quite short. Another suggestion applies only to feeding from the bottom. A fish must get its mouth close to the food before it can suck it in. Look at the tracings from the cine film again.

In frame 2 the upper and lower jaws are both near the food, but if the upper jaw had not protruded it would still be a long way from the food. The fish might have to stand on its head to get its upper jaw near enough. Fish

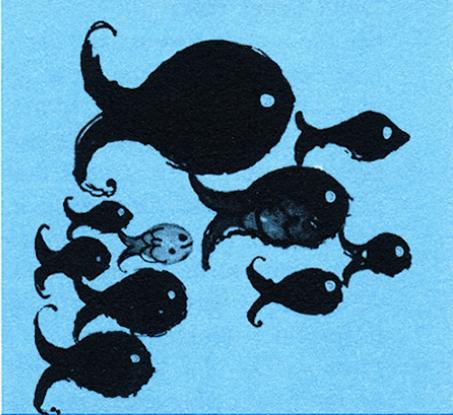


like tetras and Australian rainbows, whose jaws are not protrusible, seem to have to tip themselves up at a very steep angle to take food from the bottom.

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Vacation Tips

TRYING TO FIND an experienced aquarist to look after your fishes during your absence is just about as easy as finding digs when carrying a trombone, but don't worry, just follow our suggestions and we can assure you that your well-deserved vacation isn't marred!

1. Check all electrical equipment—examine for any signs of worn or frayed electric flex and renew where needed; see that the screw connection in the power plug are tight. If in doubt, throw it out and renew.
2. Slowly lower the aquarium water temperature to around 70°F (21°C) in the week preceding the holiday. Unlike man, fishes are 'poikilo-thermal creatures' and adopt the temperature of their surroundings. If water is at a high temperature then the metabolism of the fishes is quickened, they eat and excrete more.
3. In planted aquaria, prune the plants severely. During the

Continued overleaf 2nd column.

FUN WITH MONOS!

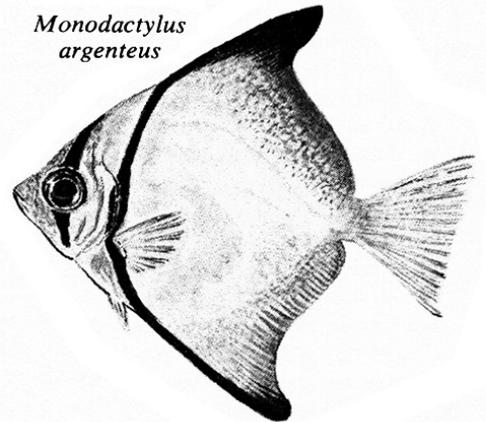
THIS BEAUTIFUL species, popularly known to the tropical aquarist as the Malayan angel fish or mono, and to the zoologist as the fingerfish or silverfish, is extensively found in the coastal waters and estuaries (some ascend rivers) of Africa (except in the north), India, the Malay Archipelago, and northern Australia. It is a member of the widely distributed family *Monodactylidae*.

Monodactylids are characterized by a deep and strongly compressed body (roughly disc-shaped), almost invisible ctenoid scales that extend onto the elongated dorsal and anal fins, small ventral fins, and a small head and mouth. They are gregarious by nature and move in shoals.

M. argenteus is said to reach a length of some eight or nine inches, that is in the natural state, but captive specimens usually stop short at about half this size. It flourishes well in a properly cared for aquarium provided there is ample swimming space in well-aerated water (giving a neutral to slightly alkaline reaction) and a temperature in the neighborhood of 75°F (24°C). Like most active fishes—it is seldom still—it is a hearty eater, with a marked partiality for vegetable food. (And here I think it necessary to observe that in order to limit the damage this fish can do in an artistically planted tank, it is a good plan to include a goodly proportion of, say, bruised fresh

lettuce or cooked spinach in the diet.) No one who has had much experience with *M. argenteus* can argue that it is a finical feeder, and the large specimens I used to keep many years ago were fed almost exclusively on uncooked porage oats (shaken in a fine-meshed wire strainer to rid them of dust), mashed table greens, and whole or chopped earthworms. Food is rarely, if ever, taken from the bottom.

Monodactylus argenteus



The Malayan angel fish is quite suited to life in a community tank, but it is necessary to warn those who have not kept this fish before that, after it has reached a length of about two inches, if not before, it develops a tendency to chase after, and chevvy, smaller and less vivacious companions. I have heard it said that *M. argenteus* is a shy and timid fish. True

Continued overleaf 1st column.

MONOS *continued.*

enough: but only at the start; for once it has settled down in a new home it quickly becomes very bold.

A point worth raising which has to do with the care of this fish is the question of salt. Salt—that is, seasalt or non-ionized kitchen salt (a teaspoonful to every gallon)—is a refinement that many Malayan angel fish can do without. Yet it cannot be over-emphasized that the sort of conditions the fastidious like to provide for scats will suit *M. argenteus* very well too.

The appeal of the Malayan angel fish lies in its shape, its darting movements, now in the upper levels, now in the middle levels, and in its really splendid coloration. The body is olivaceous above shading through palest beige into silvery white dusted with gold below. Under a bright light the silky sides show a fugitive sheen of sea-green, or blue. A black marking extends from the nape, through the large eye, to the gill-cover; another dark marking sweeps down in a graceful curve from the front of the dorsal fin, across the hind-edge of the gill-cover, to the anterior margin of the anal fin. The soft portions of the dorsal and anal fins are canary to orange-red, the dorsal with a splash of black at the tip. The caudal fin is yellow. Recognition of a Malayan angel fish in good physical condition is not difficult. Almost always the sides look more convex than flat. (Never buy a fish with a pinched-in appearance above the vent.) Then the eyes: these should be full and bright. Although strength of color is a desirable feature in this species it is not always a sign of sparkling health: many a moribund fish will display intensified markings as its body dies.

Before you release newly-purchased Malayan angel fish into your aquarium always float the plastic bag they are in in the water for about ten minutes to allow the two temperatures to equalize. (Although this precaution against an abrupt change in temperature applies to all newly acquired

fishes, it is of supreme importance to see that it is adhered to in the case of *M. argenteus*, which is a temperature-sensitive species). And one more thing. In order to make the transfer of the fish from one type of water to another as smooth as possible, submerge the bag very gradually before you let the fish out.

Although *M. argenteus* has been known to tropical aquarists since 1908 it has not, up to the present writing, been bred in captivity, and I do not know what secondary sexual differences, if any, exist. 

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TIPS *continued.*

- hours of darkness, they give off carbon dioxide; thinning out the plants will reduce the amount of this to a harmless level. It will also ensure you don't return to a jungle.
4. Fishes can go for long periods without food; up to 2 weeks won't harm them provided that they have been fattened up beforehand. However, if you think there is a risk in leaving your fishes without food or if you are lucky enough to have a month at a time away, take note of the next two tips.
 5. If you must have a well-meaning relative or neighbor in as caretaker, be sure to leave written instructions; what seems simple to your trained mind might be complicated to them.
 6. If you decide not to subject your fishes to total abstention from food, place each day's rations in a spill of twisted paper with

full instructions. Hide all other fish food. The uninitiated often think we aquarists starve our fishes and will only feed more the minute our back is turned. Don't tempt them!

7. See the tank is cleaned and serviced last thing before you go and, above all, ensure it is well topped up. The amount of evaporation is surprising. Check that you have allowed for a drop in water level if internal thermostats and heaters are fitted. Allow for at least one inch drop in level per week's absence.
 8. Place a 'Do Not Remove' sign on the power plug supplying the tank and put a spare set of fuses near it. We once had a neighbor who removed the plug to use a vacuum cleaner. The house was spotless on our return but that is more than we can say for the fishes.
 9. If your tank isn't covered, then cover it temporarily with some 'cheesecloth' obtainable from your butcher. If the aquarium is in a sunny location, shade the sides and top with tissue paper secured by adhesive tape.
 10. Don't feed heavily a few minutes before you depart on the mistaken assumption it will last them over the holiday. Uneaten food will only pollute the water. Give a small portion of food, preferably live *Daphnia* (no tubifex); if it has to be dried food then be sure to siphon off any left uneaten.
- Finally, have a nice time, secure in the knowledge that your precautions will help to ensure you return to a tank full of leaner but healthy fishes and the water will be as clear as I hope your holiday weather will be.

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Water Wisteria

THIS USEFUL plant, *Synnema triflorum*, is really amphibious for it will grow in swamps as well as below water. In Thailand it grows as a weed in the rice fields. In aquariums it has been found most adaptable for it grows readily and is very ornamental.

The plant develops leaves of varied shapes, sometimes narrow, and often broad, but always well-lobed and divided. The main stem may reach a



foot in height, and the leaves can be as much as six inches long. Being light green above and lighter green below, these leaves give the plant a

Continued overleaf 1st column.

A BEGINNER'S EGGLAYER

THE NEWCOMER to fishkeeping usually starts off with a community collection containing both livebearers and egg-laying species—livebearers for their colors and hardiness, egg-layers for their flowing fins and gracefulness.

After the livebearers' fry are noticed, the aquarist is bound up with the prospects of breeding his fishes and during the first few months the livebearers bear the brunt of the breeding phase. When this novelty wears off (the aquarist having found that there is more to breeding the livebearers than just letting them get on with it!), the idea of trying to propagate the egg-laying species comes as the next logical step to take.

The choice of what to breed is very wide—barbs, characins, cichlids, labyrinths, killies and so on. However, certain species may be ruled out for the newcomer as being "specialist" species and usually the novice is exhorted to start with a simple, hardy fish for his first attempt. This is often one of the egg-scattering types and most reference books recommend, paradoxically, a fish right at the end of the alphabet, the Zebra Danio, *Brachnydanio rerio*. This active fish, with its blue and gold horizontal stripes, is often included in a basic collection so how do we go about spawning such a fish?

The first step is to determine the sexes prior to isolating them for con-

ditioning, and this is fairly easily done (Fig. 1.) The females are usually more plump and when viewed "head on" there is a distinct bend in the stripes (almost like a waist) just in front of the anal fin. Another pointer to the sex of the fish is that the outline

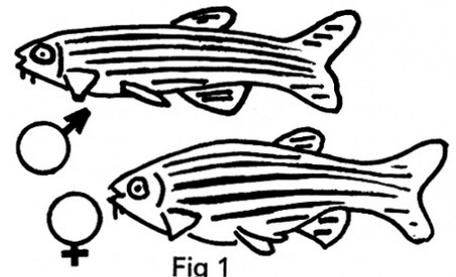


Fig 1

of the female's body is more curved, even humped, between the snout and the dorsal fin. The male is usually much slimmer and his stripes are more evident in his fins; also, as the fish matures the males can be seen chasing the females and showing off their fins.

The sexes should be isolated and kept in separate tanks; they should be fed generously with live foods—*daphnia*, *tubifex* and mosquito larvae are readily taken. This "conditioning" period can take up to ten days or a fortnight, during which time the females fill up with roe, the males take on their breeding colours and the aquarist must turn his thoughts to preparing the spawning tank.

The Zebra Danio is a very active
Continued overleaf 1st column.

WISTERIA *continued.*

most distinguished look in any aquarium.

When seen from above it will be noticed that a well-formed plant is roughly rosette in style because of the leaf pairs sprouting alternately along the stem. Fine short hairs cover the leaves and stem. Any parts of the plant that grow above water have leaves that are smoother and more regular in shape.

Propagation of this plant is easy, for shoots grow from the leaf axils near the plant base. These can be used as cuttings. In addition, parts of the stem, and the leaves also, will quickly grow roots. Even leaves floating on the water surface have been known to produce roots.

If you wished to grow a quantity of this plant then a special compost could be used. Use about ten parts of coarse sand to one each of peat-moss and clay. Mix this thoroughly before use and well cover it with some of the sand. In this way you will avoid clouding the water when it is slowly syphoned in. I have found that the plant grows almost as well when planted straight into old mulm-ridden compost.

The temperature range of Water Wisteria is from 75 to 85 degrees F., but it will not die if there is a temporary drop in temperature. The pH value should be slightly on the acid side of neutral—perhaps 6.5 to 7.0, and soft water is preferred. Should you wish to develop the above-water type of vegetation, then make sure that you use a cover-glass on the tank for it requires a humid atmosphere.



ZEBRAS *continued*

fish and does a fair amount of driving and chasing of the female during spawning, therefore a reasonably sized tank should be used, an 18 in. × 10 in. × 10 in. being the smallest for comfort, a 24 in. × 12 in. × 12 in. much better. As well as being an active fish the Zebra is also a spawn eater, so to ensure that there will be offspring from the spawning, steps must be taken to prevent the fish from getting at their own newly-laid eggs.

The method I use achieves the desired result in saving the eggs and also has one or two other bonuses.

Next time spring cleaning comes around "acquire" a yard of redundant nylon or terylene curtaining and you have the perfect egg screen. A first bonus is now apparent—any ordinary, set up tank can be used for spawning without any need for shallow water, marbles or any other paraphernalia, although any other fishes must be removed! The *modus operandi* is as follows:—

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The material is draped in the top of the tank so as to give a water depth of about 2-3 inches as swimming room for the adult fishes; it may be necessary to weight the material slightly to keep it below the surface. The conditioned pair, or pairs, are put into the shallow water above the netting. If this is done when one has time to watch events, the male will be seen to drive the female up and down the length of the tank, pressing his body against hers in an S-shaped curve and trembling violently; under this stimulation the female releases her eggs which are immediately fertilized by the male. Due to the very shallow water depth the eggs fall quickly through the curtaining into the tank below before the adults realize it, and are thus saved (Fig. 2(a)).

If a number of conditioned fish are spawned together as a shoal, i.e. several males and females, a positive rain of eggs can be observed falling through the screen.

After spawning has been completed, the females having lost their plumpness and the males their attention in the females, the adults can be removed and another bonus of this method becomes apparent. There is

no chasing the spent fish with a net, no upsetting the planted tank dislodging eggs to be eaten by fish awaiting their turn to be netted—you just simply lift out the netting and all the fish are caught in one go! (Fig. 2(b)).

Meanwhile the eggs hatch, usually within 36 hours depending upon the temperature, and the fry can be seen hanging on the glass and plants like

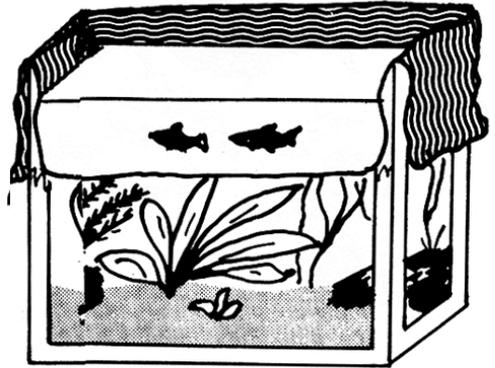


Fig. 2a. During spawning

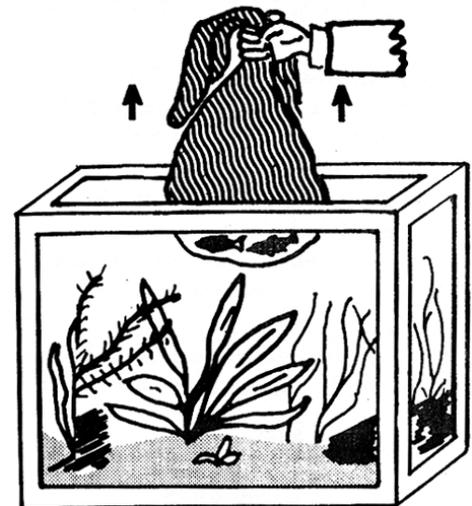


Fig. 2b. After spawning

tiny splinters. After a further day or two they become free-swimming and look like tiny, horizontal, shining lines on the move.

Food at this stage must be small; green water is excellent and *infusoria* may be cultured or liquid fry food can be given (take care not to pollute the tank!). Growth is rapid and soon newly-hatched brine shrimp, screened *daphnia* and mashed *tubifex* can be added to the fishes' diet.

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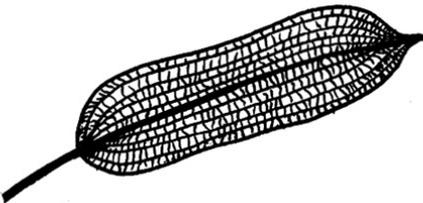
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GETTING UNDER THEIR SKIN

Lace Plants

NATIVE TO THE Island of Madagascar, *Aponogeton fenestralis* is probably the most unusual and beautiful of the Aponogetons. It is generally imported as a tuberous root-stock, with few, if any shoots. Those obtaining the plant in this form can either plant it in the aquarium and hope for the best or place the tuber in a separate container of warm water, until it shows signs of sprouting. Having thus induced the tuber to produce leaves, it can be planted. Planting



should be done preferably in a mixture of soil and gravel, as the plant does not always thrive in a plain gravel medium.

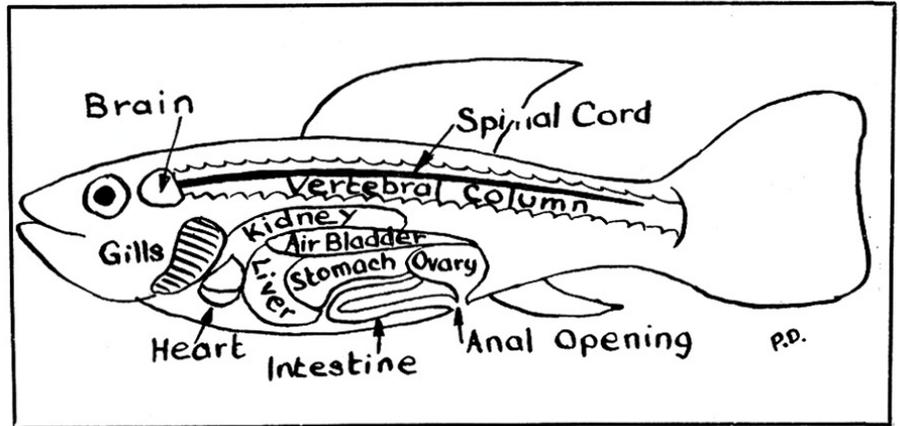
The leaves, when mature, can reach a length of from 15-18 inches and 3-4 inches wide. They are characteristic in that they possess no mesophyll, i.e., the area between the

Continued overleaf 2nd column.

WE ARE APT TO TAKE our fishes for granted. We feed them, breed them, raise them, maybe show them, give them away or just ditch them when we feel like it. Some of our fishes may be able to consider themselves fortunate in their surroundings and general standard of living conditions, while it is quite certain that others, if pressed for an opinion, would hold quite the op-

portunities and representing one step in the ladder of evolution which produced aquarists, both the good and the bad.

The common shape of fishes is longish with two pointed ends kept apart by the back-bone, but of course the backbone is not only there to keep the ends apart, but also to get in the way when you are eating a kipper. The backbone or the axial vertebral



posite view. I am thinking particularly of those that are ill-housed, overcrowded, under or over fed or merely raised to provide live food for the more favored big cichlids.

Whatever may be the lot of aquarium kept fishes, nothing will alter their absorbing interest which repays detailed study over and over again if you are prepared to give them enough of your time. Fish play a pretty important roll in the scheme of things forming a part of the staple diet of

column affords protection for the main longitudinal nerves and blood vessels and forms a foundation for the bony cage-like structure which gives the fish its shape as well as providing an anchorage for muscle tissue and caudal fin etc. The body cavity containing the vital organs is housed within the bony cage in the lower anterior part of the body.

To survive at all a fish requires to extract oxygen from the water which

Continued overleaf 1st column.

LACE PLANT *continued.*

it does by taking water in through the mouth and passing it backward over the gills and ejecting it again. The gills are broad and flat and a dense red, formed like a fringe, containing numerous finely divided blood vessels. The heart pumps blood to the gills where it passes along the fine blood vessels through which oxygen is absorbed from the water. The blood stream is then distributed to the different parts of the body and the oxygen is used up for the production of various forms of energy, after which the blood returns to the gills for re-oxygenation.

The gills are provided with protection externally by the operculum or gill cover and internally with gill rakers to prevent the passage of food through the gills themselves. The gill rakers are in the form of a row of short, stiff rods on the inner face of the gill arches and when food and water are taken into the mouth the gill rakers retain the food until it is brought against the opening of the gullet and is swallowed. Under normal conditions the front of the gullet is kept closed to avoid taking unnecessary water into the stomach.

Food passes down the gullet into the stomach which may be a U-shaped organ or merely a sac of quite small size. The stomach walls contain gastric glands for digestion and vary greatly in character depending on the normal type of food eaten by the particular variety of fish. From the stomach food passes to the intestine in liquid form where the goodness in the food is assimilated and passed for absorption by the blood, which in turn circulates it through the body for the production of tissue and energy. The length of the intestine varies greatly, being dependent on the staple diet of the fish. Species which feed almost exclusively on other fishes are provided with very short intestines, whilst vegetable eaters have a lengthy intricately coiled intestine to provide a far greater area of absorptive surface. The intestine termi-

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nates directly at the vent for the expulsion of waste matter.

The heart is situated behind and below the gills and is provided with three or four chambers to take care of the circulatory system of the blood. Fish are provided with an air bladder to control their buoyancy, which is arranged to be neutral in most species. The action of the air bladder is quite delicate and surprisingly quick in effect, which is easily demonstrated.

If a fish is placed in a closed container with a piped connection and the pressure is increased by blowing, the fish will tend to sink for a short while until the compensation mechanism comes into operation and the air bladder restores the equilibrium. When the pressure is released, the reverse will be seen to happen. In some fishes the air bladder is used as a secondary means of respiration and the walls are well endowed with a network of fine blood vessels to absorb the oxygen. Fish may gulp air into the gullet for this purpose particularly if the oxygen content of the water is low. The anabantids also have a dual breathing mechanism as in addition to the gills they are equipped with a labyrinthine organ for storing atmospheric air. 

SKIN *continued.*

intersecting veins is completely devoid of tissue, thus giving the interesting lattice effect of this species.

In my experience, the plant does not normally do well in the mixed collection as its requirements are

specific. Ideally, it should be kept in a separate aquarium at about 65-70° F. It will be found that if the plant is exposed to higher temperatures (75-80°F) for any length of time, it will begin to lose its leaves and eventually die. It is probably for this particular reason that many aquarists have trouble when including it in the average set-up. I have found filtered rainwater most suitable, although tap-water not exceeding pH 7 can be used. A little peat present in the growing medium or in a porous container, will ensure the slightly acid conditions desirable for optimum



growth. The water should also be partially changed every 2-3 weeks, although plants will remain in fair condition if these changes cannot be made quite as often. A rough guide to the time when a water change is needed, is when the young leaf shoots first appear. In a healthy plant they will tend to have a slightly pinkish hue, while a plant in need of fresh water produces shoots of yellowish or white coloration. This is of course a rather "Rule of Thumb" method, but one that seems to hold true, with this species at any rate. In spite of this guide, it is advisable to make the water changes regularly and before the plant takes on a "tired" appearance. 

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THE BLACK-LINE TETRA

extending along the lateral line from behind the gill case right along to the base of the caudal peduncle, where it enlarges to a diamond shape.

All the fins are colourless except for a slight white line on the anal, and they have no difference in size between the male and female to assist in establishing the sex of specimens, although the tail of the male seems more deeply forked. With ripe adults, however, sexing is not usually a difficult task at all as the females are very noticeably deeper in the body, and when full of roe are visibly distended in the belly region.

Black-line tetras are not big fish, and settle in quite well in community tanks, not being aggressive or timid but holding their own with almost all species in competition for food. These fish are not showy in colour but by their almost constant activity at or about mid-water they call a lot of attention to themselves.

Like other small characins from time to time they flash about at each others flanks with lightning-like rapidity apparently indulging in mock fighting. It would appear from this that they are biting each others fins,

Continued overleaf

BEGINNERS, and indeed, old hands who want to be sure of getting results for once, should try their hands at spawning what is probably the easiest of all egg-layers, the black-line tetra (*Hyphessobrycon scholzei*).

Black-line tetras are not exactly the most beautiful fish in the world, but they are very smart with their silvery flanks and the black horizontal stripe

The AQUARIST Crossword

1		2			3		4			5		6
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8									9			
		10		11		12						
13	14			15	16		17				18	
19						20		21		22		23
			24		25		26					
27		28								29		
					30							
31							32					

Answer next page.

- CLUES ACROSS**
- Words could be mightier than these fish (6).
 - The "get rich fly-by-night" sort of fish (6).
 - This one is found in steel as well as water (3).
 - Insect (3).
 - Catchment for water (4).
 - A hen-like fish? (8).
 - Owens (3).
 - Subtraction (9).
 - Colorful cichlid (9).
 - Father, on losing her? (3).
 - Type of fish generally (8).
 - Meteorological force (4).
 - Type of water so often used (3).
 - At rest, they add color to your tank (6).
 - Often used for a double effect (6).

- CLUES DOWN**
- An act performed when one of your fish does not appear (6).
 - Natures own angler (6).
 - Marine version of above? (4).
 - Kill (4).
 - Grain (3).
 - Too big for our tanks (6). 9. Sounds correct on paper (5).
 - Maker (3).
 - With first, can be more than useful (3).
 - Just as essential to them as water (3).
 - Long period of time (3).
 - National Takeover (1, 1, 1).
 - Egg (3).
 - Sir (6).
 - Found in plants (3).
 - Bag like, often containing liquid (3).
 - Useful addition to your tank (6).
 - Don't lose it (6).
 - It is on us (4).
 - Time will show it as a singular thing (4).
 - Tanks look nicer like this (3).

but no damage to each other ever seems to be done. However, they are somewhat suspect in company with larger, slower moving fish. Angel's trailing ventrals and Leeri Gourami's feelers are particularly tempting to them, but they are no worse in this than any other fish often recommended for the community tank, and they can certainly be trusted as far as can, say, Black or Flame Tetras.

Actually, it is generally a good idea from an aesthetic as well as a practical view to keep small characins to themselves or with other species of similar size and temperament. A tank full of black-line tetras, if space can be provided, is really a delightful sight. There should certainly be no difficulty in obtaining a tank full of them if a pair of them is purchased initially. However, since these fish are usually offered by dealers at a very small size, it is probably safer to purchase four youngsters and grow them on, when at least one pair should be obtained.

Having ascertained that a true pair is selected they should be brought into condition by as frequent feeding as possible. Of course, live food is quite definitely preferable if available, but they can be got to breeding stage by the judicious and frequent use of one of the better dry foods, and some scraped liver or horse flesh. Black-line tetras, whilst they have comparatively small mouths, have a useful set of dental equipment and they can cope with fairly bulky food if it is friable and they are given sufficient time at it.

Conditioning of the sexes is best carried out separately if tank space will allow, as males will tend to harass

females if kept together, prolonging the build-up of good roe.

The breeding tank should now be set up. One of the beauties of this little characin from the breeder's point of view, is their almost total indifference to water conditions for reproduction.

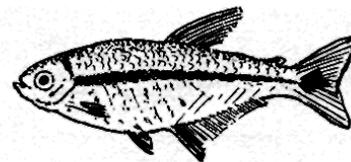
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Water hardness in my part of the world is high, (about 150 P.P.M.), yet black-line tetras will spawn in it readily. It usually gives a highly alkaline reaction. These conditions must be totally opposed to those normally enjoyed by the fish in the wild, yet to see them driving it would appear to suit them down to the ground. It really doesn't appear to matter at all. Provided water that will support fish life is supplied, black-line tetras will almost certainly spawn in it.

Best results, in terms of prolific results at least, are obtained in my experience by packing three-quarters of the breeding tank with fine-leaved plants such as najas, *myriophyllum* or *cabomba*. If these are not available, however, almost any plant in fair profusion, *vallisneria*, *hygrophila*, or what have you, will serve as a spawn receiver. If even these cannot be obtained, a spawning medium of nylon floss or even teased out balls of nylon knitting wool will serve almost as well.

Water temperature is not critical, either, and should be in the upper seventies to the lower eighties, with eighty probably being the optimum figure.

Depth of water should be about six inches, as shallow water is definitely stimulating to most egg-scatters. Probably they would spawn in a brim-full tank, but some effort must be made. Select your female, or the fattest one if you have a choice, and



Male black-line tetra

put her into the breeding tank. Give her a couple of days to settle down to the unaccustomed surroundings and lack of space. This is one rule that does seem necessary, as the only time I have ever known black-line tetras fail to spawn was when they were introduced simultaneously to the new breeding tank. They can be nervous in these conditions although I expect some aquarists have had success with this method. The male fish is best put into the tank last thing at night, when spawning will almost certainly take place next morning at first light. Spawning is not usually very prolonged, some three or four hours, and if things have been arranged so that it occurs on a day when the aquarist is at home the parents should be removed as soon as the female looks noticeably slimmer.

The eggs are quite surprisingly large for a small fish and usually quite a few can be seen. If you can see six to eight eggs you can count on a spawning of at least one hundred, probably considerably more. They hatch out quickly, about twenty-four hours depending on temperature, and the fry hang on for another couple of days. Once they are free-swimming they can take copious feeding. Great care must be taken however, if the usual tubed liquid food is used, as the fry seem very sensitive to pollution. Moderate aeration is quite definitely a considerable advantage in this respect. However, if possible, infusoria for first feeding, for about a week gives a better and safer start to life for the tiny fish. One week after free-swimming they should be able to handle newly hatched brine shrimp, micro-worm and dust fine dry food, and will be well on the way to adulthood.

Crossword Solution

S	W	O	R	D	S	S	H	A	R	K	S
E	T	E	E	L	Y	A					
A	N	T	A	A	W	E	L	L			
R	E	G	G	L	A	Y	E	R	M		
C	R	O	T	I	O						
H	A	S	D	E	D	U	C	T	I	O	N
I	O	D	E	V							
K	R	I	B	E	N	S	I	S	F	A	T
N	A	A	I	E							
I	T	R	O	P	I	C	A	L	M		
G	A	L	E	N	T	T	A	P			
H	I	U	E	E							
T	E	T	R	A	S	M	I	R	R	O	R

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Whiteworms

IF YOU'RE LA-DE-DAH you refer to them as oligochaetes or enchytraeids. Ordinary folk call them whiteworms. Whiteworms (there are some fourteen different species in Britain) range far and wide. They choose the undersides of refuse bins (standing on soil), well-rotted farmyard manure, decaying piles of vegetation, the crooked bottoms of aspidistra pots, and the like, to make a home.

The species most commonly bred by the aquarist, because it provides an excellent food for fish, is known to science as *Enchytraeus albidus*. It is creamy white to pale yellow, microscopically bristled, as thick through as a stout sewing thread and almost, if not quite, an inch in length.

To obtain a worthwhile supply of whiteworms it is necessary to cultivate them in a receptacle not smaller than about 15 in. by 5 in. by 12. And after the worms have been installed it is important not to feed any of them to your fish for the first couple of months. This will give them time to settle in and begin to multiply.

A plastic container makes the best worm farm. Unlike wood, it does not

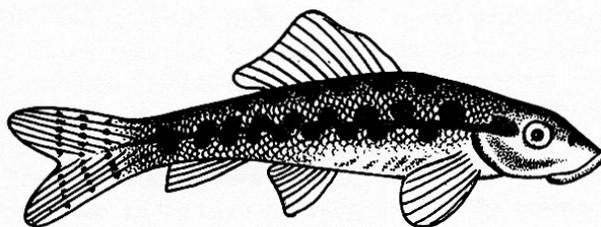
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A CURE FOR ALGAE?

PERHAPS MY TITLE is misleading, suggesting as it does that *algae* are a disease. They are no more of a disease than they are grasses but, like grasses, if they grow in places where one does not want them, they can be

inates. Specimens are said to reach about 9 in. in length but, in the confines of the aquarium, 4 in. to 5 in. seems to be nearer the usual adult length.

G. aymonieri is a light, silvery



Gyrinocheilus aymonieri

considered as a nuisance. We cannot "cure" *algae*, but we can control them. There are a variety of techniques which one can try, eg. chemical, physical and biological.

Many fish are very fond of *algae* in their diet and thus help to keep them under control in the aquarium. Probably the best *algae* eater which we can safely introduce into an aquarium—especially a community aquarium—is the *algae*-eating *Gyrinocheilus aymonieri*. This useful and attractive fish has several common names—such as the Siamese or India *algae* eater—but it is probably best known by its species name: *aymonieri*.

The fish belongs to the Family Gyrinocheilidae. The genus *Gyrinocheilus* contains several species, but only one, *G. aymonieri*, is suited to the community tank. Thailand is the country from which the fish orig-

colour on the ventral surface, with a light brown back. There are about six small bands along its dorsal surface. On each of its sides is a dark brown stripe, with about nine, vertical brown bars, arranged irregularly. The fins are almost transparent but the tail bears a series of small, dark brown dots. The upper half of the circular eye has a reddish coloration, the bottom half being silver; the eye's centre is black. The fish's mouth points downwards—rather like those of some catfish—and is modified for rasping *algae* off the solid objects in its aquatic environment, and sucking these into the mouth cavity. The "breathing" apparatus of the fish is modified to enable it to obtain oxygen while continuing to suck in its required food.

From the description and photo-

Continued, overleaf 2nd column.

WHITEWORMS *continued.*

rot away or create a mould-stained area where it is put. Furthermore, a plastic container is lighter in weight. As whiteworms do not stray away from the culture-medium they can be kept indoors. A range of temperature from about the lower fifties to the middle sixties (°F) suits them best.

The soil for whiteworms should be of a crumblike texture and kept habitually moist. Moist not *wet*. Baked soil from a well-worked garden border (after sifting it for worms, and the like) is suitable, but it is easier to buy about 14 lb. of sterilised potting soil or good yellow loam from a garden shop to fill your container.

After the soil has been introduced into the container, level it off with a piece of board and firm it down. Then procure a piece of glass narrower all round than the surface area of the soil to go on top. As the worms are light-shy cut a piece of hessian, thick card, or black plastic to cover the glass.

You can buy a portion of whiteworms at your local aquarium shop or from certain advertisers in this magazine. The worms should be distributed in shallow depressions made in the culture medium. Then fill in each depression with about a teaspoonful of stodgy milky porage, milky mashed potato, or bread (preferably brown wholemeal or black) soaked in milk. Place the glass over the lot and exclude the light. Do not disturb for a week or two, then remove the cover-

ings to see how things are going on. You should find plenty of whiteworms snaking about and most of the food eaten. If the uneaten food has turned green or developed a mould, throw it away. In any case, introduce more food into the depressions. Return the glass and light-excluding material to the receptacle. Within the space of six weeks you will find it possible to remove many hundreds of worms a week without drawing too heavily on the stock. It is advisable, though, to have two or three receptacles on the go. This will guarantee a supply of the worms for about fifty small fishes all through the year. 

ALGAE *continued.*

graph it will be seen that the fish is not the most colourful or exciting inhabitant of the aquarium, but its *algae*-eating habits make it a "must" for all my decorative aquaria. The *aymonieri* I have found to be a peaceful fish, whether large or small. It is quite shy in its habits and spends a lot of its time amongst the plants. Living, as it mostly does, on the base of the aquarium, it is well camouflaged when at rest on the gravel, but it often makes trips out into the more open areas of the tank, in search of its favourite type of *algae*. It spends most of its time hunting for these lower forms of plant life and will sometimes swim up the glass sides and front of the tank, rasping off any algal growths. Its searches often lead it on

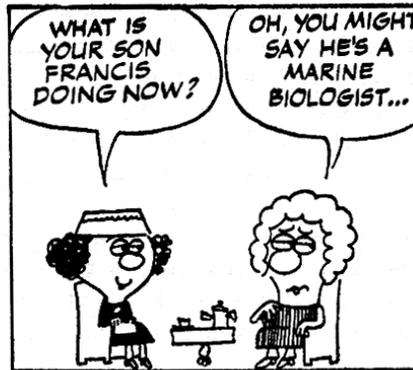
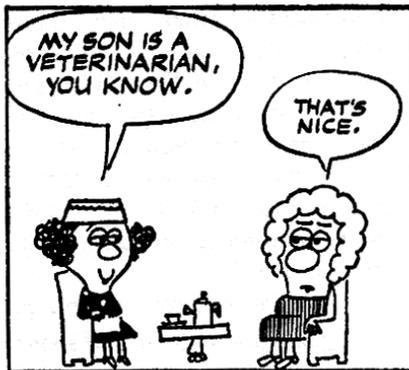
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to the leaves of the higher plants, but I have never seen it damage any of these plants. Although primarily a vegetarian, I have sometimes seen the fish nibbling at flaked food, or freeze dried foods, which have found their way down to the surface of the gravel. The fish usually makes a speedy retreat into the plants if one makes sudden movements at or around the aquarium but, as the species seems to be inquisitive, it soon returns to investigate what is happening. None of my fish has ever made any attacks on other fish species with which it shares its tank.

This interesting fish does an excellent job of keeping down algal growths in aquaria. Most of its life seems to be spent in searching for its favourite foods. Young specimens cost only a little and are a very good investment for those who do not like *algae* to get out of hand. 

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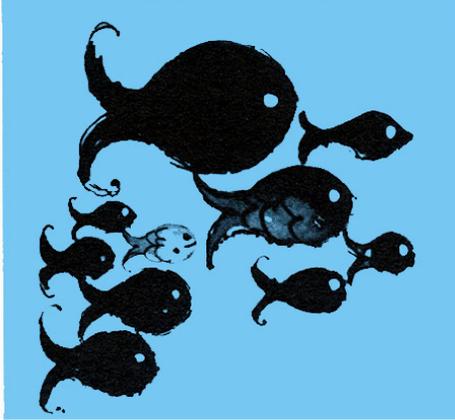


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The Aquarist's Notebook



White Clouds

ONE OF THE smallest members of the largest and most widespread of all freshwater fish families—the *Cyprinidae* (carps)—is the White Cloud Mountain minnow. This little fish is elegantly shaped, charmingly colored, active, hardy and peaceful. In addition to these desirable qualities, it has a life-expectancy of about three years and breeds freely. In fact, if a pair of White Cloud Mountain minnows are given a spacious, densely planted and snail-free aquarium to themselves, they will deposit eggs every so often at most times of the year.

The fry, that look like animated silvers of blue-green luminescent glass, dart to and fro in the middle and upper levels of the water and pick up enough infusorians (some always exist in a thickly planted aquarium) and miniscule dried food to tide them over for the first few weeks of their lives. Thenceforward most of the food introduced for their parents will prove acceptable and growth is rapid.

From this you will gather that the

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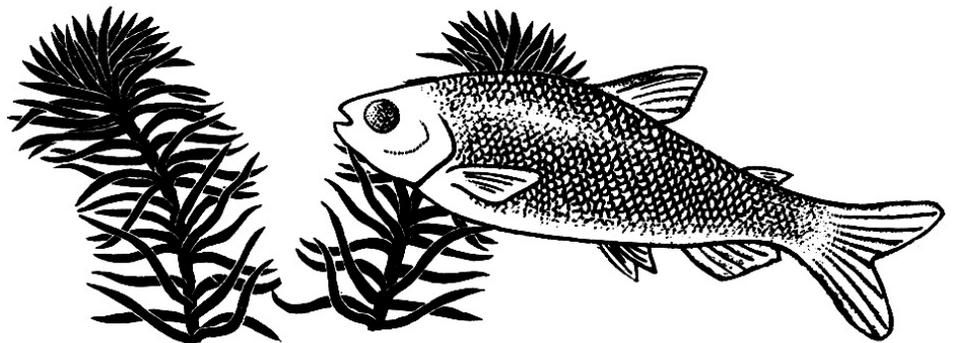
NO SEEING-EYE DOGFISH NEEDED HERE!

IN ONE SENTENCE, the blind cave fish is unusual but inexpensive, completely amiable to all but the smallest fish in a community tank and comparatively easy to breed and raise.

An attractive fish, *Anoptichthys jordani* is silvery-pink in colour and

egg. Plants are not needed. I have found that water which has an approximately neutral pH and a fairly high DH at about 75°F. to be very satisfactory.

With a maximum length of about 3½ inches, the blind cave Characins



has an adipose fin which is typical to many of the characins. *A. jordani* is thought to have evolved from *Astyanax mexicanus* when some of the latter got lost in some dark Mexican caves where the use of eyes was no longer needed. Where the eyes once were, there now remains only two empty sockets. But don't for one moment feel sorry for him. *A. jordani* has such highly developed senses of touch and smell that he rarely bumps into anything and makes an excellent scavenger by systematically scouring the bottom of the tank for food missed by the other inmates.

Spawning is a fairly simple affair. I use a 12 or 15 gallon tank with a double layer of marbles, or one of the other recognised egg-saving devices, as the breeders will eat every exposed

are easy to sex, the females being much plumper than the males. A well-conditioned pair, at least 2½ inches long, should be placed in a dark or dimly-lit aquarium. They might circle each other for some time but will eventually come together and as they rise to the surface, the female expels her eggs and the male fertilizes them.

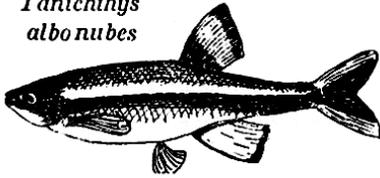
Providing the fish are removed as soon as spawning is completed, there could be as many as 800 eggs left. The same fish should be ready to breed again in a month.

Within 72 hours hatching is complete and after six days all the fry should be free-swimming. They grow fast on a first food of "liquifry" for egg layers and after three or four days on this they will readily take newly hatched brine shrimp. 

WHITE CLOUD *continued.*

parent fish are not dedicated cannibals. As a rule, they take little or no interest in their fry. But they will eat some of the eggs within easy reach. The fry themselves are more of a problem for the larger ones will worry—maybe devour—some of the smaller ones. The answer to this, of course, is to remove large fry to another tank every now and again and leave the smaller ones to grow on in peace (that is if you wish to build up a stock of White Cloud Mountain minnows). But more about the subject of breeding later.

Tanichthys albonubes



In the natural state *Tanichthys albonubes*—to give this species its scientific name—inhabits the relatively cool streams that gurgle or tumble or meander sinuously about the uplands just beyond Canton (the White Cloud Mountains, China. Be this as it may, captive specimens flourish well in any small body of still water provided it is well-aerated and kept free from swirling particles of sediment. Another thing, water that is slightly hard and alkaline suits this species better than water that is soft and acid.

Of even greater importance than the quality of the water is temperature: this should be maintained in the sixties or lower seventies (°F). For excessive heat, say, in the eighties (°F), especially if it is prolonged, leads to increasing lassitude, wasting, and premature death. Feeding is no problem at all; for almost anything alive or dried and is small enough to be swallowed is taken. Food is usually taken before it reaches the bottom; rarely from the bottom.

The general color is brown on the back shading to milk white with a faintly silverish sheen on the belly. A dark olive band above which a greenish blue to greeny gold stripe (the colour of this stripe varies according

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to the strength and direction of the light entering the aquarium) extends from the eye to the root of the tail, where it terminates in a black spot on a vivid red ground. This glowing color is also present on the base of the forked caudal fin. The lobes of this fin, and the anal and ventral fins, are a nondescript yellowish white. Sometimes, however, the anal fin has a good dash of red in it. The perky dorsal fin is red at the top and yellow at the bottom. The pectoral fins are clear.

In regard to size, the White Cloud Mountain minnow which, for the record, was first introduced to aquarium keepers in 1938, attains a length of about 1½ in. In mature specimens, the male is straighter in outline (more streamlined) than the female. Furthermore, he is slightly the brighter coloured of the two. All the same, young fish, and some adult fish not in the best of condition, are far from easy to sex (for the beginner, anyway).

But to return to breeding. That is, breeding to order. For the ordinary hobbyist, a tank measuring 18 in. by 10 in. by 10 in. is amply large enough. The water need only not reach about halfway up the sides. Plants such as Java moss (*Vesicularia dubyana*) or nitella, anchored to the bottom, are ideal for offering what protection is necessary for the eggs. Lights should be bright, preferably sunny.

Before placing the fish in the tank, separation of the sexes for about nine days to a fortnight is recommended. For separation, combined with a diet rich in live and or meat feed, invariably brings them into the pink of condition. This is indicated by the fuller and more satiny appearance of the female and the brighter colours of the

male. The temperature for conditioning and spawning this fish should average around 72°-74°F.

The actual spawning procedure is quite simple. The male drives the roe-distended female into the plants or into an algae-festooned bottom corner of the aquarium, and there, to the accompaniment of twitching fins and close pressings of bodies, some eggs are laid. The couple repeat this performance at frequent or infrequent intervals over a period of several hours, or days. While driving is taking place, a much-relished live food should be introduced into the aquarium. This helps to turn the attention of the fish away from their eggs. As soon as spawning is over, the parent fish should be removed to another tank. Make certain, however, that the fish are not subjected to any change of temperature. It seems hardly necessary to add that a spawned-out female is easily recognized by her flatter sides and underparts and diminished colours.

Incubation of the eggs takes up to three days. The newly hatched fry, so small that you have to strain your eyes to see them, cling head-up to the sides of the aquarium and the plants. But before a week is out, they become free-swimming and need plenty of food. Although the fry grow fastest on microscopical live food (*Infusoria*), flour-fine dried food may be offered as a substitute. As they grow, introduce such things as micro-worms, tiny *Daphnia*, and brine shrimps into their diet.

Under good conditions, the fry reach full size in about six to nine months. For the first few months of their lives they display colors which, for their brilliance, rival even those worn by a neon tetra. Altogether, then, *T. albonubes* is a most praiseworthy little fish.



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An Easy Killie

IF YOU'VE BEEN TEMPTED to try a "panchax," but hesitate because they're supposed to be sensitive and difficult to keep, don't believe it. Killers are like other species of fish; some are hardy, others delicate. One of the prettiest, hardest, and easiest to breed is the *Aphyosemion nigerianum*.

These fish can be kept in a community tank with no difficulty. As community members they can be a bit shy, but a floating spawning mop or two, or some surface plants will make them feel more secure, and they'll stay in better color. They breed better in the privacy of their own tank, and a permanent "Aphyo" tank will please them most. These fish are comfortable with a temperature of 68-74°F, although they can be kept in water as high as 80 for limited periods of time. Some keep them in hard, alkaline water with notable success, and has produced some beautiful hybrids in the bargain.

Feeding these killies is not difficult for they will accept paste, frozen, and live food. As with any fish, they prefer live food and thrive on it. Young-

Continued, overleaf 1st column.

LIGHTING

for aquatic plants and fish

GREEN PLANTS must have light, water and carbon-dioxide to enable them to grow; various other minerals are also essential but can generally be obtained in small quantities due to impurities in the water and if fish are present all minerals can be obtained from their waste products including carbon dioxide, so the important factor as far as aquarists are concerned is light. To understand this problem one must understand the basic facts about light. Light as we see it is approximately one octave of the electromagnetic waves which is part of a series starting with the shortest gamma, X-rays, ultra-violet, visible light, infra-red, heat radiation, ultra short radio waves increasing to the longest radio waves. The proportion we see as light has a wavelength measured in micromillimetres or Angstrom units from the shortest in the blue about 3,000 A° to the longest we can see in the red 8,000 A° for some people; others can see up to 10,000 A°.

Green plants use light as the source of energy to enable them to combine carbon dioxide, a gas, with water to form simple sugars and from these simple sugars more complex substances. The green substance in plants is known as Chlorophyll and the manufacturing process of converting carbon dioxide and water into sugars is known as photosynthesis. Chlorophyll is, in fact, a mixture of several colored chemicals which need not

concern us here, but chlorophyll is green because it reflects green light and absorbs blue and red. What we see as white light is made up of various colors (or wavelengths) and green plants only absorb some of the blue waves and a rather larger proportion of red waves, round about 6,500 to 7,000 A°.

Botanists have been arguing for some years whether blue is the most important color or red, but it seems generally accepted now that red is re-



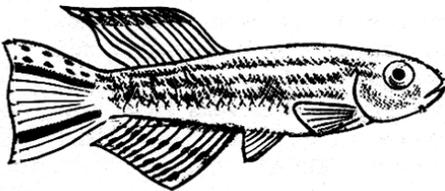
garded as the only essential color and that any blue that is absorbed is converted by the plant into red and then used. While the botanists are still arguing about the exact details of the many complicated chemical processes that take place, commercial horticultural growers have been putting recent advances in the development of more powerful light source to practical use by growing plants with supplementary lighting or growth rooms during the winter months when our daylight is so extremely poor. I have

Continued, overleaf 2nd column.

APHYOSEMION *continued.*

sters will readily eat dry food, but as they mature they will eat it only if very very hungry.

Convincing these fish to spawn is a fairly simple matter. If you have healthy, well fed, mature specimens they will spawn without any more encouragement than the presence of a spawning mop or two. The males are occasionally rough, so two females are recommended. Some male killies who have full colour and even spawn, are infertile because their gonads haven't fully developed yet. If your fish spawn but produce clear eggs that fungus shortly, this may indicate that you have young males.



Eggs should be harvested before the end of an eight-day period. They are reasonably hard-shelled and can be gently picked off the mop with a pair of tweezers. The average egg yield is about 25-30 eggs per day. They can be stored in flat "refrigerator" dishes with some acriflavine or other fungicide added to the water. Incubation takes about 14 days and the fry are large enough at birth to eat newly-hatched brine shrimp or microworms.

After three days the fry should be transferred to a larger container (with the aid of a soup spoon) and then to a rearing tank by the end of the week. From this point on, all you have to do is provide plenty of good food, clean water, and room to grow. Partial changes of water (25 per cent per week) and cooler temperatures (68-72°F) seem to encourage more rapid growth and healthier fish with this species.

They usually "sex out" in from 7-10 weeks. Many males gain size before they color out, but it has been my observation that they are usually quite beautiful.

Try a killie. Get yourself *Aphyosemion nigerianum* the guppy of the killie world. 

LIGHTING *continued.*

grown tomatoes successfully on a commercial scale throughout the winter and found it to be a paying proposition, but there are more profitable crops than tomatoes that can be grown in the winter months. A small glasshouse nursery I know spends over \$2,800 a year on electricity and increases the amount used annually by adding more lights. The electric

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lamps we use in our homes are known as tungsten lamps because the light is produced by a white hot, very fine tungsten wire. This type of light gives a small proportion of blue, more in the yellow, still more in the red and most of the energy is radiated in the infra-red and heat bands. A hundred watt tungsten bulb uses one unit of electricity every ten hours which costs about 6¢ (this varies with different rates) but the amount of electricity actually converted into light is less than one per cent and the amount of this that is usable by plants is probably less than 10 per cent (of 1 per cent), so one is paying very dearly to grow plants under tungsten lamps. Another important point is that infra-red and heat waves depress the action of any usable light but with aquatic plants the water filters out the heat waves and renders the tungsten lamp more efficient, but the infra-red light still helps to "draw" or "elongate" the plants.

The modern fluorescent lamp gives more visible light and very little infra-red and heat radiation, but some of the electric energy is lost in the control gear which is essential for these tubes which have no electrical resistance like the fine tungsten wire. In more recent years manufacturers have developed fluorescent tubes with spe-

cial red and blue phosphors to radiate colours that are absorbed by plants; these pink or red fluorescent tubes are ideal for the aquarist and providing they are used correctly will grow and flower any aquatic plant, including tropical plants not previously flowered in this country. Most sub-aquatic plants need 10 watts of this type of pink or red light per square foot and this should be as near the surface of



the water as safety permits. So a 48 in. x 12 in. x 12 in. or 15 in. deep tank needs a 40 watt tube, but 80 watt will give even better results. There is a danger of turning the water green with free-swimming algae if too great an intensity is used. The daylength (or number of hours every 24) that the plants are illuminated is very important; all plants require 12 hours light a day to be healthy and most tropical plants need 13 or 14 hours if they are to flower, although they respond best to an 18 hour day. On the other hand plants must have a period of darkness to grow successfully and most plants require 6 hours continuous darkness every 24 hours (or day) to grow really successfully. Most tropical fish, particularly Cichlids and Angels, require good light and a daylength over 12 hours to induce spawning. Goldfish respond to increased intensity and duration although some fancy goldfish will spawn under almost any conditions as far as light is concerned. I have successfully spawned Angels and other tropical fish under both types of pink and red fluorescent lamps at the intensity of 10 watts to the square foot and the tube within 3 inches of the surface of the water and a duration of 14 to 18 hours every day. 

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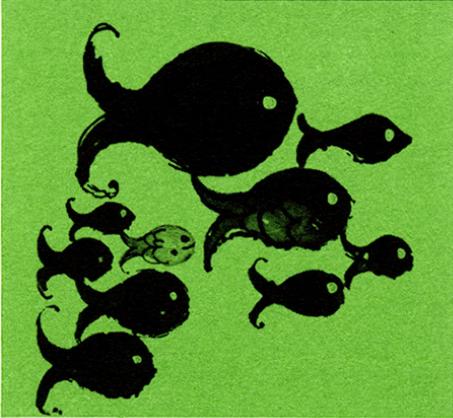
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The Aquarist's Notebook



Zebra Danios

THE ZEBRA FISH (*Brachydanio rerio*) has always been a popular fish, especially with newcomers to the hobby and aquarists who keep community tanks. I have been a keen aquarist for several years and have always kept a few zebras.

It is slightly more than 3 years since I first decided to breed zebras,



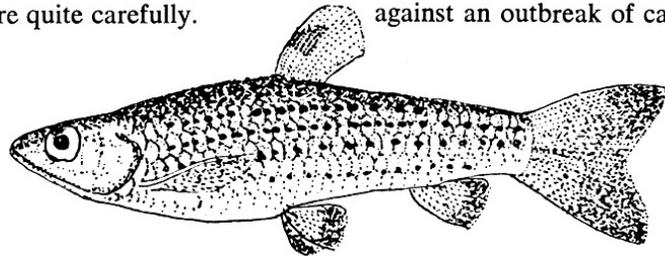
and I tried the classical method which is recommended in most books; namely the bare tank and marble method. The chosen pair were separated for a few days whilst I set up my tank, sterilising it and carefully arranging two layers of glass marbles, with a water level 3 in. above the marbles and a temperature of 78-80°F (25-26°C). The water was, of course, fresh and everything had been done according to the book! I then

Continued, overleaf 2nd column.

THE RED-SPOTTED CHARACIN

WHAT AN EXTRAORDINARY fish this South American characin is. To take at random three characteristics which set it apart from the rest of its tribe: first, its unusual breeding habits; second, its wide temperature tolerance; and, third, its general appearance. I will describe its breeding procedure quite carefully.

like fry break free. This they do in about fifty hours at a temperature of 78°F (26°C). A few days later you will see them swimming around and looking for food (micro-organisms) at all levels of the water. At this stage of their development, it is as well to remove the male also as a precaution against an outbreak of cannibalism.



To begin with, there is much spreading of fins (on the part of the male), intensification of colors, and chasing in and out of the plants. Next, the male (sometimes helped by the female) fans a saucer-shaped depression in the sand. When the spawning site is ready or to the couple's liking, the female lays some eggs in the depression. This performance is repeated several times over until the female is spawned out. A spawning may consist of anything from a few score to several hundred eggs, all fertilized by the attentive male.

As soon as egg-laying is over, the male turns spiteful and drives the female away. (The aquarist who really cares about his fish is advised to separate the sexes without delay before damage is done.) Now the male fans the eggs until the dark, almost guppy-

As regard temperature tolerance, this extends over a range of some thirty degrees (°F), which is rather surprising when one takes into account the geographical distribution of the fish: northern (equatorial) Brazil. Ordinarily a temperature of 75°F (24°C) suits this fish well, but experience has shown that it can stand a very gradual drop to the sixties with no ill effect.

Like its congeners, the outline of *Copeina guttata*—to give the species its formal name—is long-backed and rather slender. The top of the head is flattened (depressed) and the mouth is directed upwards. The basic color is sky-blue to blue-grey shading down to white on the underparts. The scales are large, not a few of them marked with an orange to red spot. The fins

Continued, overleaf 1st column.

RED SPOTTED *continued.*

are yellow in the base and orange to red around the margins. A black marking is present in the dorsal fin (in both sexes). The colors are stronger in the male than they are in the female. Most unusually, the upper lobe of the forked caudal fin (particularly in the male) is noticeably enlarged. Remarkably, too, the fish grows larger (up to 6 in.) in the aquarium than it does in the natural state (4 in. or thereabouts). Altogether, then, it looks more like an elongated killfish than a typical tetra.

As the red-spotted copeina is neither bad tempered nor a destroyer of plants, it may be placed in a community aquarium without fear of its doing any harm. But as it is a retiring species, that likes to spend a lot of its time day-dreaming at or near the surface, it is happiest, I think, when it is given a tank to itself.

The regular 18 in. x 10 in. x 10 in. aquarium tank affords ample living space. *C. guttata* is not faddy about the quality of the water it is placed in providing it is neither markedly hard and alkaline nor excessively soft and acid. In a word, any matured tap water will do. But thick planting along the back and ends is called for to provide the sort of environment it flourishes in best. A close-fitting glass cover is essential; for though the fish (as has been mentioned above) is not always on the go, and sometimes remains quiescent for quite long periods at a stretch, it can, and does, jump without warning or provocation.

Feeding is no problem at all; for it will eat anything swallowable alive or dried. Normally, the red-spotted copeina will live for upwards of three or four years. It would seem, then, that this species is altogether a most desirable fish for the keen beginner to keep and breed.

The red-spotted copeina is no comparative newcomer to the aquarium scene. It turned up in Germany in 1912, and by the middle of the 1930s it was well-established in this country. But the outbreak of the Second World War stopped breeding, and, quite naturally, a decline in its availability (and popularity) set in. 

Zebra *Danio continued*

placed the pair in the breeding tank and eagerly awaited the results, which I understood to be guaranteed with this method. But, believe it or not—nothing happened! For 3 days nothing happened!

I decided to take the zebras out and try again later, but as I netted the female I noticed the huge bulges of egg roe, and remembered that somewhere I had read about hand-spawning fish. So there and then, whilst the zebra

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was still in the net, I took a jar lid, which by chance was nearby, and quickly dipped it into the breeding tank water so as to get just enough water in the lid to cover the zebra but not enough to allow her to swim in. I then laid the female zebra on her side in the lid and gently pressed the egg roe bulges, moving slowly in a direction from head to tail; then, after turning her over, I repeated the operation. There appeared to be hundreds of eggs in the lid, rolling about all over.

I then did the same with the male, in the same water and whilst the eggs were still there. Some of the eggs were, of course, destroyed through putting the male in the same water, but I hoped that the many remaining eggs would be fertilised. I then almost nonchalantly swished the lid and its contents around in the breeding tank, scattering the eggs all over, and replaced the top glass. 'Nothing ventured, nothing gained' was the sentiment.

A few days later fry began to appear, stuck to the tank sides, and within a week the breeding tank seemed to be full of fry. I fed the fry on lettuce infusoria, followed by brine shrimp, crushed tubifex, crushed white worm and small powdered foods. The

young zebras were reared in a 15 in. square by 12 in. deep tank and would eat anything I cared to put in—even duckweed, but they always seemed to prefer dry food.

I kept seven of the youngsters and grew them on, their lives being spent first of all in another 15 in. square tank, then in a 24 in. by 12 in. by 12 in. tank and finally in a 36 in. by 12 in. tank. When they were adult, I took them to many fish shows, where they won awards in the danio/rasboras, pairs and breeders classes, although they always seemed to be overshadowed by their larger cousins and other bigger fishes—a common handicap that most small fishes have to face at shows.



I have only two of these zebras left, and they are past the breeding and showing stages and are a little bent with age. They are now 3 years old, but I haven't the heart to kill them off, and I intend to let them live out their lives in peace, to see how long they live. As regards size, I measured one female that died a couple of months ago, and it measured 1 7/8 in. from the nose to the base of the tail.

I have, of course, bred these zebras and their offspring several times, all ironically enough by the classical marble method. I could never successfully hand-spawn them again, and I have never had zebras of the same quality as those first hand-spawned ones. The subsequent broods of young zebras began to get deformities; broken stripes seemed to increase on more and more fish, and it became increasingly difficult to get a good size on any of them—all faults, I suspect, that were caused by too much inbreeding.

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A CATFISH FROM THE CONGO

"Rule Busters"

LET US CONSIDER the "rule buster," the unorthodox, the person who dares defy established beliefs—and who seems to get by without damage. This subject could be enlarged to cover many fields, even life in general, but here we keep within our special province of aquarium problems.

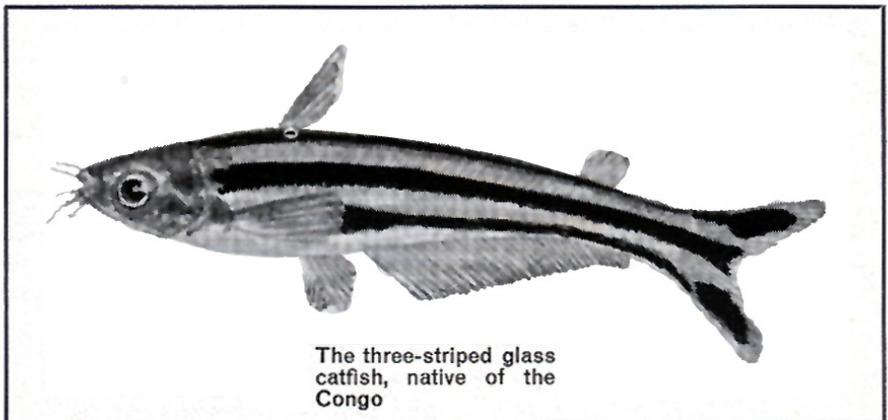
To put the point plainly, without too many introductory flourishes, it is a known fact that a few successful aquarists seem at times to defy the accepted rules of management. Their fishes appear to be immune to disease and death. Other persons, much more particular, experience losses for which they are unable to account.

For instance, let us take the matter of adding fresh water in winter. It is generally recognized that raw water at this season must not only be brought to the temperature of the aquarium, but it should also be allowed to stand and ripen. It is general practice, based on the results of experience. Some "rule busters" ignore this practice and "get away with it." They merely mix hot and cold water to about the right temperature and change anywhere up

Continued, overleaf

Etropiella debauwi, commonly called the three-striped glass catfish, is a member of the family *Schilbeidae*. Members of this family, that range in length from a few inches to a foot or more, are widespread over tropical Africa, and parts of

African fishes, in 1901. But it was not until some fifty-three years later that the species began to turn up in the tanks of dealers in Europe and America. Like so many interesting and choice fishes from the troubled Congo, *E. debauwi* does not come



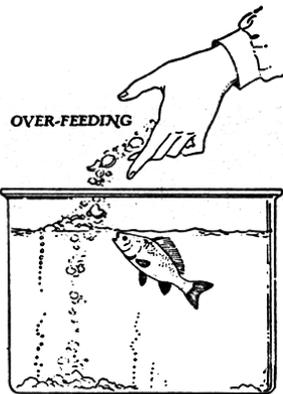
Africa beyond the tropics, and south-east Asia. They are characterised by an elongated body flattened on the sides, spinous (anteriorly) dorsal and pectoral fins, a long-based anal fin, and teeth in the jaws and palatine bones. In most species of the numerous genera an adipose fin, of sorts, is present, and, with a few exceptions, the caudal fin is forked to a greater or lesser degree. The barbels, four to eight in number, may be either short or long.

E. debauwi is native to the Stanley Pool region of the Congo. It was first described for science by G. A. Boulenger, the zoologist and authority on

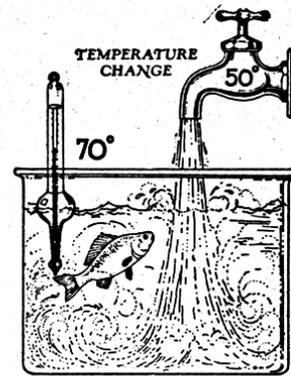
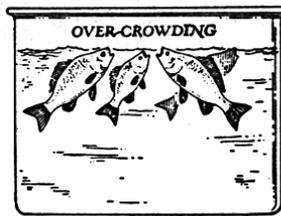
onto the market as often as one would wish. Also, there appears to be no record of its having bred in captivity.

The body is silvery, almost glass-clear in parts, shading to pearly white on the throat and belly. There are three dark grey to blackish stripes on the sides, the middle one extending onto the fork of the caudal fin. The dorsal fin is short and is situated close to the head. Three pairs of barbels, silver like the body, and so fine as almost to escape notice, are carried in a forward position. The sexes are not easily told apart, but in well-grown specimens the male (according

Continued, overleaf



THREE SURE WAYS TO KILL YOUR FISHES



Rule Buster continued.

to a quarter the volume of the aquarium. Their fishes enjoy and suffer no ill effects.

The conservative aquarist, seeing the law thus flouted, says "Why don't his fishes get the Ich? Mine certainly would."

There is an unseen factor in back of such cases. It is *condition*. The fellow who seems to "get away with murder" isn't quite as crazy as he seems. In other ways he has been keeping his fishes in fine condition.

Frequent small feedings of desirable foods given in rotation, plenty of room per fish, healthy growing plants, a good average temperature (not too fixed) are some of the conditions which keep a fish fit for unusual happenings. Condition even tells in such accidents when a fish jumps out of a net to the floor. A weakly fish will probably die from it, while a strong one will be all right or will soon recover.

As to when fishes are in fine condition, anyone with eyes can tell. They

should be plump, active and clear-finned.

In general, it doesn't pay to defy the rules. Leave that to the geniuses. One of the oldest of amateur experiments is trying to acclimate exotic fishes to cold water. A worthy but impractical idea. It always fails to change the nature of the fish, although it sometimes proves that its temperature range is greater than had been supposed.

Anyhow, don't believe all you hear — and only half of what you see! ●

Glass Catfish continued.

to authoritative writers) is slimmer and darker striped than the female. A length of 3 in. may be attained.

Unlike most catfishes known to the tropical aquarist, the three-striped glass catfish finds its pleasure and its food in the middle and upper levels of the water. In short, it is neither a floor-shuffler nor a seeker-out of other fishes' left-overs. It swims in short, sudden darts or rapid dashes (when frightened) from one end of the aquarium to the other. It takes its rest in a slightly head-upwards position, its tail shaking perpetually.

With regard to food, *E. debauwi* is essentially carnivorous, and it is reasonable to assume that insects, aquatic and otherwise, make up the bulk of its diet in the wild. But be this as it may, in captivity it can be fed on a wide variety of food, dried food included.

At this point, however, it is necessary to mention that not all specimens will accept everything, and some new-

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ly-purchased specimens may refuse to take any food at all. But unless there is something very exceptional about the fish or the aquarium into which they have been introduced, interest in food will be resumed within the space of a few days, provided the fish are left in peace and quiet to get over the abrupt change of environment.

In the matter of environment, *E. debauwi* settles down fastest in a long aquarium (24 in. at least) filled with clear, well-aerated, soft neutral to slightly acid water maintained at a

temperature of from 75°F. (24°C.) to 78°F. (26°C.). It should be furnished from the middle back with dense thickets of tall-growing vegetation.

Last but not least, *E. debauwi* is a shoaling fish and usually becomes increasingly inactive and mopy if it is separated from the company of its own kind. Obviously, then, if the fish is to flourish, it should be kept in a group of three or more. Equally important is the fact that it should never be placed with any fishes (it will not harm other fishes) that will become so interested in its fascinating quiverings that they will take bites at it or worry it to an early death by too much jostling or boisterous activity. ●

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The Aquarist's Notebook



Fish Food Values

THE Bureau of Fisheries of the U. S. Department of Commerce publishes, from time to time, reports of feeding experiments on game fishes which are of great interest to the aquarist. For what's food for the trout is food for the Guppy. These reports, unfortunately, are missed by the majority of those of us who like to raise our tropical fish fry to as large a size and as fine a coloration as possible. For this reason we believe it profitable to include abstracts of such reports as they appear.

In the experiments of the Bureau of Fisheries, a wide variety of fresh meat and fish products, dried animal products and cereals were used with varying success on various species of trout. These results may be summarized as follows:

Beef liver. Raw beef liver is a food of proven success greater than that of any other meat. *It is especially valuable as a growth producer.* Because of the ease with which it gives up its components to the water it may be fed less wastefully by mixing the ground liver with some flour

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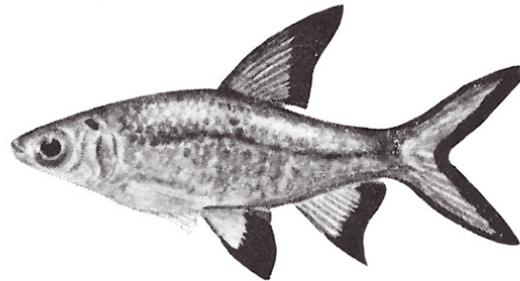
THE SILVER OR

"BALA" SHARK

THE SILVER or bala shark is extensively found in the rivers and lakes of Thailand and Indonesia. It is a cyprinid or carp and attains perhaps 12-14 in. in the natural state, but less than half that in captivity. It is a species that frequents all levels of the water, is non-aggressive, and has a fairly wide range of temperature, that is to say from the low seventies to the upper eighties (°F.). A great point in its favour—as a fish for the decorative aquarium—is that it does not uproot the plants or chew

posterior markings. The mouth is flexible and protractile and bears no barbels at the corners. As in other cyprinids, the teeth are in the throat and grind the food against a bony plate on the base of the skull.

Perhaps not unnaturally for a fish that exceeds middle finger length and is active into the bargain, the silver shark grows best and lives longest in a spacious aquarium. A tank of about 36 in. by 15 in. by 12 in. will do, but a 48 in. by 15 in. by 12 in. will suit it better. It should be furnished with



them to shreds. It will, however, browse on soft *algae*, and is a lively and graceful swimmer. In addition to these admirable qualities it is most handsomely coloured. Indeed, a well-grown specimen in good condition is a joy to behold.

In outline the fish is elongated spindle-shaped. In colour it is silver, dark above and light, almost whittish, below. The scales are quite large and reflect the light like a shattered looking-glass: a looking-glass reflecting the golden tints of the sun. The pectoral fins are clear, the other fins are yellow inclining to orange, with black

clean sand and plenty of plants. Its companions (if it is housed with other fish not of its own kind) should be of about its own size. Fishes such as the great scissortail (*Rasbora caudimaculata*) and the giant danio (*Danio malabaricus*) are among the most suitable.

Sometimes the silver shark will jump without the least provocation. The aquarist, therefore, must ever be on guard against the fish leaping to its own destruction. In short, the tank should not be left uncovered.

All aquarists of any experience and *Continued overleaf 3rd column.*

Fish Foods continued.

to absorb the meat juices and to act as a binder.

Beef heart. Also of great value, but objectionable because of the waste and labor of removing the fatty and connective tissues. However, it tends to reduce mortality of the young fry. Combination of beef liver for rapid growth and beef heart to reduce mortality proved excellent, resulting in nearly the same rate of growth as on liver alone and an even lower mortality than those on beef heart only. Especially fine results were obtained by feeding beef heart exclusively for the first three or four weeks and, thereafter, adding fifty percent of beef liver to the ration.

Beef melts or spleen produce very poor growth.

Pig liver is inferior to beef liver.

Sheep liver ration gave a high mortality and unsatisfactory growth.

Fresh fish. The results in general were greatly inferior to those obtained from standard meats. Also unsatisfactory because they are greasy and spoil easily.

Cooked meats. Mortality was four times greater than on raw liver.

The dried animal products were first mixed with warm water to form a thick mush. The results follow:

Clam heads consist of the dried ground siphons, gills and mantle of the clams. It gave the best results of any dry product. It should always be fed with fresh meat. Such a mixture produced better growth than any straight meat diet. In fact, the authors consider it the best trout ration thus far developed. Produces fine coloration. About fifty per cent of water is added to make the mush.

Fresh-water mussel meal was less successful.

Fish meals. Menhaden, pilchard, haddock, cod-liver, and shrimp meals in combination with fresh meats were tried with fair success. The growth rate for a fifty-fifty ration of beef liver with various meals was best with clam meal followed by pilchard meal, haddock meal and, last, shrimp meal.

Dry milk products. Both dry skim

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milk and buttermilk are inferior to clam meal.

Wheat middlings were found to possess little nutritive value.

Soy-bean meal tends to retard growth rate.

Cod-liver oil and yeast. These constituents are, of course, rich in vitamins. Trout on beef or sheep liver showed no vitamin deficiency. On the other hand, rainbow trout fingerlings on a ration of beef heart grew more rapidly with less mortality when small amounts of codliver oil and dry yeast were added to the meat.

Conclusions

From the point of view of the aquarist several important suggestions come from this report. A food of half beef liver and half beef heart, ground to the proper consistency in a meat chopper, appears to be ideal for growing fish. With this can be incorporated dry shrimp or, if obtainable, the especially valuable clam meal. Care must be taken, however, to avoid pollution of the aquarium water by feeding more than the fish will consume at a feeding. Liver is an especially bad offender in this respect. For this reason the writer recommends the use of rearing tanks with no sand and, therefore, no plants, but with aeration. Unconsumed food can be readily siphoned off from the slate bottom. Since most of the live bearers are vegetarians primarily, it would seem advisable to incorporate ground dried lettuce and spinach leaves with the meat ration. Incidentally, some one ought to try ground raw carrots as a supplementary food, since these are especially rich in the growth stimulating and anti-infective vitamin. ●

Bala Shark continued.

wide reading known that the quality of water is of great importance to fishes and probably every species has its own likes and dislikes in the matter of hardness and acidity. But the silver shark, like most cyprinds, is an adaptable species that thrives in any clean and well-aerated water maintained in the middle to upper seventies (°F).

A difficulty is, however, that some specimens can be finical or indifferent feeders. This is a failing of some other home aquarium sharks (about as unlike the sharks of popular conception as fleas are to ferrets). Therefore it is essential, when buying a silver shark, to choose a fish that is well-fleshed on the sides, has well-shaped fins, and appears to have plenty of energy. Small specimens that show lean sides, a slightly arching ventral surface, and sluggish movements should be left alone: at best they'll turn out to be poor or indifferent feeders, at worst diseased.

Ordinarily the silver shark will snap at any food (alive or dried) moving in the water. It will also search for, and take, food moving or still from the bottom. It flourishes well on a mixed diet of various worms, tiny fragments of red meat, and flake food or wheat germ direct from the packet. In an algae-free tank greenstuff such as cooked spinach or finely chopped brussels sprouts should be offered every so often.

The external sex distinctions of *B. melanopterus* are not known to the writer, and there appears to be no mention in the literature of the hobby of the fish having bred in captivity. Yet I suppose this will be accomplished before long, with large fish in a massive tank equipped with all the clever apparatus that makes modern fishkeepers and breeding so much easier than it was a decade or so ago. ●

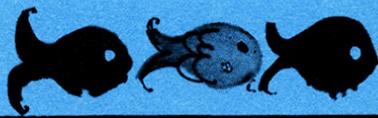
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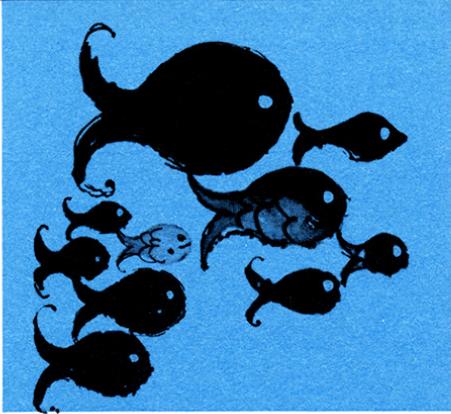
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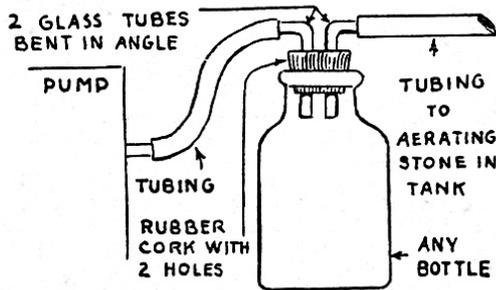
THE ATTRACTION OF "CATS"

THE QUEER SHAPES and movements of the various tropical cat-fishes are most attractive, and the demand for at least one peaceful "cat" in an aquarium is understandable. Some of the kinds that mix peacefully with other inmates are usually available and their quaint charm has persuaded

American alternative (possibly because the black and white animal called a skunk is so well known over there). The habits and shape are similar to those of the common bronze cat-fish, but the colouring is pearly-white marked with a distinct black line. It is a typical *corydoras*, mixing freely with others of its kind and never giving any trouble in a community tank.

Pump Backup

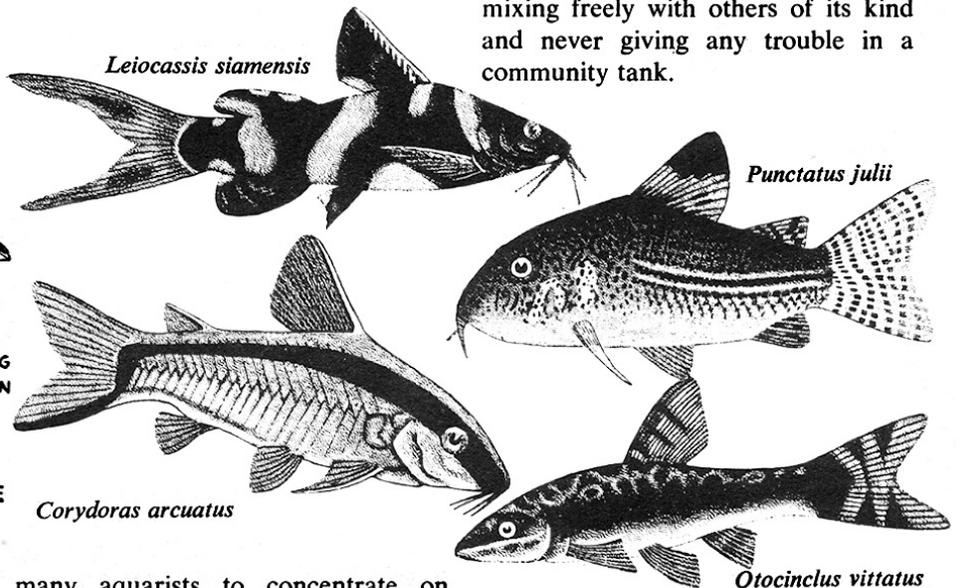
I FIND THAT when I shut off my pump, there seems to be a tendency for water to either be sucked back or siphoned back through the rubber tubing to the pump. To overcome this condition, I have an ar-



range-ment which I can best describe with the accompanying diagram. This arrangement also has a further asset in that a small back pressure is built up in the bottle, thus making a steady and even flow of air through the stone, instead of a pulsating stream of bubbles.

Perhaps the principal annoyance in connection with aeration is that the control needle valve gradually becomes choked with small particles from the air or from the tube itself.

Continued overleaf 1st column.



many aquarists to concentrate on seeking other kinds.

There are many species now available though a few come to use in small numbers only. Some of these cat-fishes do look somewhat similar but among them are sufficient differences for a choice to be made. I have picked out six to show some of these differences of form and marking.

Corydoras arcuatus has a number of common names. Streamlined Cat-fish is one, and Skunk Cat-fish is an

Many aquarists think that the most attractive of the *corydoras* group is *C. punctatus julii*, the Leopard Cat-fish. It is certainly a prettily marked fish and one that is usually agreeable in its temperament, but in my view the appearance of the previous fish—the Skunk Cat-fish—is more distinctive in any aquarium.

A rather larger cat-fish, which grows to about 6 inches and therefore *Continued overleaf, 1st column.*

Pump continued.

This gradually cuts down the flow. Most of these particles can be removed by continuing either one of the tubes down to the bottom of the bottle and tightly packing the entire bottle with absorbent cotton. The air must then pass through the cotton. If leaden air pipes are used, this advice is especially valuable, as a fine white powder is constantly formed in the pipe.

Some aquarists clean compressed air by having the bottle partly filled with water. The air enters by a tube extending to the bottom, leaving by a short one at the top. I think the moisture would clog the valves. ●

Catfish continued.

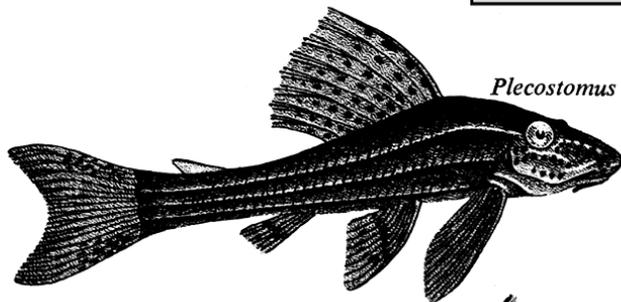
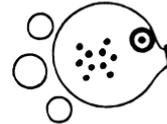
can be kept in larger aquariums with big fish, is *Leiocassis siamensis*. This is one of the species that is hard to obtain at times; this is a pity because its colouring is both pretty and striking. The light parts are a faintly pink-

The Whip-tail Cat-fish, *Loricaria parva*, is fully armoured with bony plates and it has a big head that contrasts strongly with its slender shape extending into the whiptail. The colour is yellowish-brown marked with darker blotches and bands and is very variable. During much of the day *L. parva* is to be seen stuck fast to a stone or to the glass of the aquarium; but in the evening it becomes much more active. Algae and the soft part of plants form the bulk of its food, but it also roots about on the bottom, consuming edible parts of the detritus there.

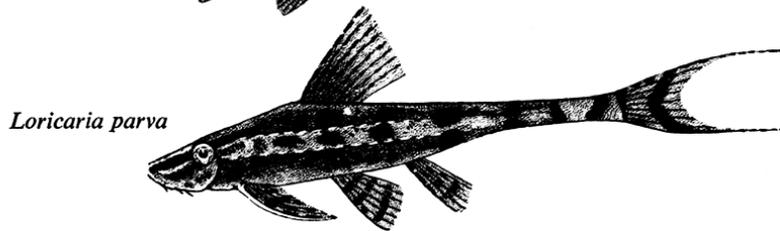
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For the "cat-lover" who fancies trying a really big fish, there is *Plecostomus commersoni* which grows to about 15 inches. It is rather ordinary in colour, being grey-brown, mottled and barred with darker marks, but its charm lies in its ability to suck on to anything so strongly that it is hard to separate from that object.

A larger tank, with no plants, and plenty of large stones, is recommended for all the big cat-fishes but most of them require large quantities of vegetable food although they are omnivorous and take live food as well. But whether you have a pair of big ones on their own, or include some of the smaller kinds in a community tank, you can find plenty of variety among the many kinds of cat-fishes.



Plecostomus commersoni



Loricaria parva

cream colour and against this background the very dark grey bands show up clearly. It is said that the female has a reddish tail though I have never seen this.

L. siamensis does not have the armoured scales we see so clearly on the *corydoras* species, and both barbels are much longer. The more slender shape of this fish gives it a more streamlined appearance.

Another sucker cat-fish is *Otocinclus vittatus*, which has a variable type of mottled colouring with a denser stripe along its middle. This fish is fairly small and has become quite popular in aquariums because of its peaceful habits. Because the mouth is below the head there is little evidence of "cat" tentacles in this fish.



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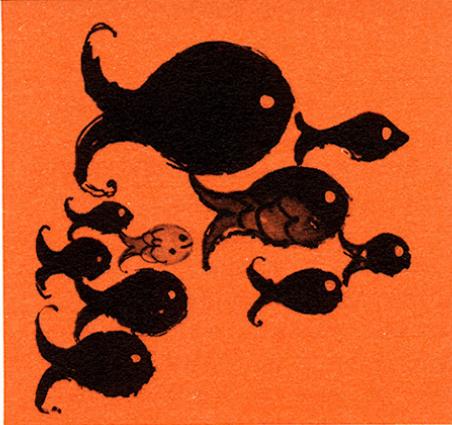
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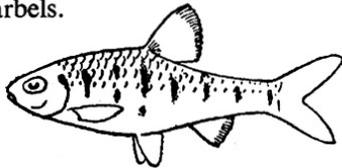
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THE STRANGE HISTORY OF "BABINGTON'S CURSE"

The Golden Barb

THE NAME OF golden barb is very appropriate: a rich golden yellow is the basic color of the entire body, slightly darker on the back and lightening towards silver in the belly area. A number of dark-green indistinct markings appear on and just below the lateral line and these are much more pronounced in the male; there is also another more distinct dark area at the root of the caudal fin. Fins are of a deep-red shade and when the fish is in congenial surroundings a red flush is to be seen in the area of the snout. There are no barbels.



This is an excellent community fish, being colorful, lively and peaceful. All foods are readily taken from all levels and rooting about the tank bottom after feeding is indulged in, which is the usual barb practice.

For those who are interested in the breeding and rearing of tropicals, the

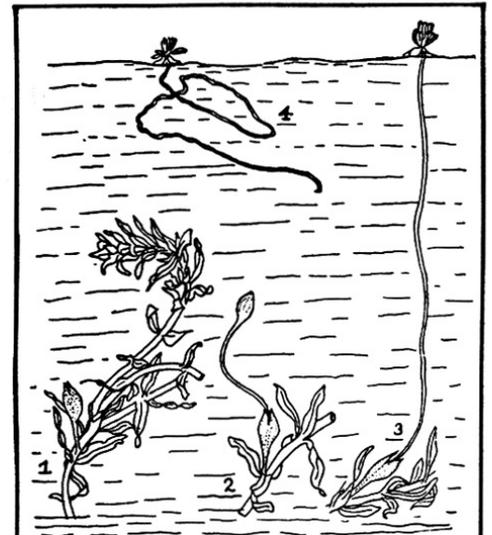
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BABINGTON, it turns out, was an innocent man. The curse that bears his name was given in the confusion of the time and in the desire to attach blame to someone, even though that person was only remotely connected with the unhappy idea of introducing the American aquatic weed, Anacharis, to the unsuspecting sweet waters of the British Isles. America's harmless aquatic plant citizen, the homely pond-weed, *Elodea canadensis*, is well-behaved in its own country. It is collected eagerly and cultivated in fresh-water ponds and aquaria. Yet it occupies a black page in England's history. And Babington's name will always be connected with the unusual story of a plant's running amuck in a strange country.

Babington, an English professor of botany, was studying the mysteries of reproduction in Anacharis, a weed originally native to dry land, which had deserted terra firma for the fertile and more abundant water supply of pond ooze. The significance of this change in mode of life fascinated Babington. He watched and studied his plants carefully; he kept his waterweeds safely indoors in his greenhouse.

On one unhappy day in 1847, however, his friend, the curator of the Cambridge Botanic Gardens, asked for and received some of these American water plants from Professor Babington. These he innocently introduced into the waters of the River

Cam. In a few years, by 1852, this once-rare waterweed multiplied and spread throughout the course of the river. Though it faced competition from the native British fresh-water



THE FLOWERING OF THE MALE PLANT

1. The first picture (in the lower left hand corner) shows a male plant still enclosed in its spathe or leafy compartment.
2. The second picture shows the male plant arising by a slender stalk from its leafy compartment.
3. The male flower has now reached the surface of the water.
4. The pollen granules are scattered far and wide as the male flower bursts completely open. The pollen reaches the female flower arising from other stalks

plants, the American invader ran wild. Nothing could stop it. It became a botanic cancer in the life of the river

Continued overleaf 1st column.

Babington continued.

population. It usurped all the nourishment in the stream. It choked the native water plants out of existence. It did more than that: it completely filled the stream. It stopped fishing, swimming, and rowing. It clogged the flow, raised the water level, and prevented the towing of barges. An emergency was declared by the government, but no successful plan of coping with the green menace was discovered.

There was another outcropping of this pestiferous weed in Berwickshire. Its growth, by 1854, became so luxuriant in the River Trent that it

GOLDEN BARB *continued.*

schuberti barb has another point in its favour, for it is reasonably easy to induce to spawn. pH and water hardness are not important, but, as always, best results are obtained with chlorine-free water. Matured tank water or carefully filtered rain water may be used: fine-leaf plants such as *Myriophyllum* or hornwort serve as suitable spawning media, or alternatively coconut fibre or willow root can be used with equal success, but these must be boiled before use.

A plump one-year-old female should be used with a brightly coloured male of the same age. Spawning usually occurs within 2 to 3 days of placing them in the breeding tank; parents should be removed as soon after spawning as possible. The young hatch in 24 to 36 hours at a temperature of 76°F (25°C) and are easily raised in the usual manner, i.e. Infusoria for the first 3 days, then, graduating to brine shrimp, followed by micro-worm and finely sifted dry foods, weaning later to sifted daphnia, if available, or finely chopped worms. This is an excellent subject with which success may be expected, but not too easy to make the attempt uninteresting.

To sum up, the golden barb is a perfect little fish, having no vices, being exceptionally hardy if given the correct treatment, of good colour and interest.

threatened to block that stream at Burton. Still the governmental experts could do nothing. They had to let nature take its unnatural course. It was "Babington's Curse."

In America, the perfect Anacharis family, father, mother, and offspring, live kindly; they keep well within their destined boundaries. They are the best of neighbors. When the plant is ready for biparental reproduction, a female flower bud, borne on a long filament, is sent upwards from its main stem. In this manner Anacharis shows its terrestrial ancestry at the time of pollination for, although the plants are entirely aquatic during most of their life-time, *they are conceived above the waterline.* The female flower opens at the surface of the water and exposes its ovules to the

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air. At about the same time another filament which bears the male flower bud is formed at another portion of the stem. The male flower bud breaks away from the stem and floats to the surface, where it breaks open explosively and scatters thousands of pollen grains that float until they reach the female flower. Here they fertilize the ovules to form seeds. One species of Anacharis, *Elodea densa* has white flowers containing nectar, which attracts pollen-carrying insects to the ovules. Thus these aquatic plants have retained an ancestral trick of their terrestrial relatives for the purpose of propagating aquatic descendants.

But in England, Anacharis never reproduces itself in the sexual manner just described. Agnes Arbor, the British botanist, suggests that the whole Elodean population of England may be regarded as a single individual, mechanically subdivided into vast numbers of apparently distinct plants.

It seems that Professor Babington gave the curator of the Botanic Gardens a monstrous female. Indoors this plant amazon displayed no inkling of its vast vegetative reproductive powers, but, once taken into the English river courses, the waterweed subdivided itself into hundreds of new plants. These hundreds subdivided themselves and produced thousands more. Single strands of the virile fresh-water weed grew twenty to thirty feet long. The aquatic botanical monster multiplied, invaded, and filled the rivers of England.

Fortunately for England, soon after Anacharis had reached the peak of its remarkable growth, a period of disintegration set in — for no apparent reason. It grew, it flourished, and then regressed miserably to a period of stagnation, almost to a point of extinction.



The history of the early South American potato in Ireland up to 1847 is another curious record of the grand success of a newly introduced vegetable in suitable territory. Potatoes flourished wonderfully well in Ireland. They became the basic food of the peasantry. But, like the Elodean waterweeds, they were propagated vegetatively. And so when disaster in the form of an infectious disease hit one potato, all were affected. The potato famine of Ireland in 1846 was a national calamity. The Anacharis famine of England after 1883 was a national blessing.

The weakness of any organism propagated, not by two parents, but by vegetative reproduction lies in the sameness of the offspring. England's Anacharis plants were identical to the highest degree. They could not survive changing conditions. But the name, Babington's Curse, has lasted till this day.

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How and Where to Look for Mosquito Larvae

WRITERS ON aquarium topics make frequent references to mosquito larvae as fishfood, but the fact remains that many persons, even aquarists, do not know what the things look like, a great disadvantage in setting out to collect them. Some people (not as many as in former years) are familiar with rain-barrel-wrigglers, but do not know that they are potential mosquitoes. The object of this little article is to enlighten that small proportion of aquarists who would like to collect some of this fine fish food, but do not know where to look, nor what to look for.

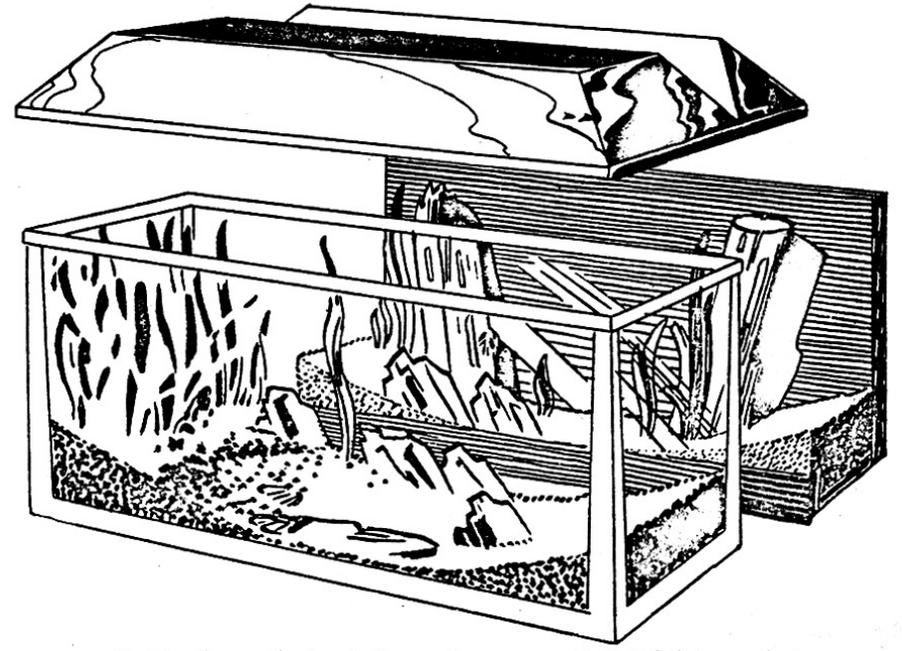
Mosquitoes always deposit their eggs on still water. Contrary to some erroneous belief, they never breed in grass, shrubby or vines, although adult mosquitoes often hide there. Biting is done only by the female. When well fed she fills with eggs, which are cleverly deposited in the form of a slightly upcurved floating raft. It looks dark, like a large flake of soot. These rafts themselves are very good to collect if one has young fishes that would be interested in eat-

Continued overleaf 3rd column.

REALISTIC AQUARIUMS

FOR years I have entertained myself and my friends with a hobby closely related to fish culture but seldom thought of or mentioned by fanciers. From the time I bought my first small tank and a handful of guppies, I have always been concerned with the problem of how to

and the existing ornaments are in very bad taste, most of the decorations I have used were either collected or made by myself. The problems arising from this necessity have proven so difficult to surmount in many cases, that I feel justified in passing on some of my ideas with the



Sketch of an effective background arrangement. Petrified logs, plants cut out of tin and painted, and a cloth screen are used to create a perfect illusion of mysterious depths.

make a few gallons of water really look like the bottom of the sea. This has proved so interesting that the business of raising fish has been almost eclipsed by the fascination of designing backgrounds for my tanks. Since there is an astonishing scarcity of ready made material for the tank,

hope that interested aquarists may be able to use them as short-cuts to the achievement of truly natural surroundings for their fish.

I have always felt that the worst feature of the usual aquarium is the fact that it permits one to look

Continued overleaf, 1st column.

Realistic Aquariums continued.

through it, and forces the fish to swim against a background of wall-paper, bookcases, or the house across the way. This can not bring out the natural beauty of the fish or create an illusion of natural under-water life. Accordingly, my first efforts were directed toward rendering the back glass panel attractively opaque. This may be done simply, by painting the glass green on the outside, or very decoratively by pasting a painted paper panel on the glass. This may be plain or it may have carefully painted imitations of *Sagittaria*, *Cabomba*, or other water plants repeating the real plants inside. A mirror instead of the rear glass also does the trick nicely, but the quicksilver is ruined by water and must be carefully painted with water-proof varnish before insertion.

The painted background may take a variety of forms, from a simple imitation of the vegetation in the tank to an under-sea growth with coral and undersea monsters. There is, however, always one drawback to this type of background. The sand stops abruptly and leaves a telltale line where nature ends and the picture begins. I have gone to great lengths in many cases to overcome this. A very satisfactory arrangement is to make the back panel itself from a flat slab of natural rock. Limestone with an irregular face may be squared up and beveled on the edges, to fit the tank and form a charming background. Small plants may be set upon the miniature ledges and moss grown on those which are out of water. Lacking the facilities to do this, a very thin piece of stone may be placed within the tank at the back and the pictorial panel pasted on the outside, as before, to appear as vegetation growing behind the stone.

None of these devices really give a depth of perspective, however, and the under-water scenic designer who wants a complete illusion can find employment for many a long winter evening by constructing a complicated background which starts at the line of sand in the back and seems to go

back twenty feet through a beautiful undersea jungle. Start by disguising the line of sand against the glass. This can be done on the outside very nicely by selecting an old weatherbeaten stick, the length of the tank, and placing it next to the glass. If the stick is well chosen it will look like a sunken log. To this may be attached imitation *Vallisneria* and *Sagittaria* which appear to be growing behind the log. Behind the plants, place a

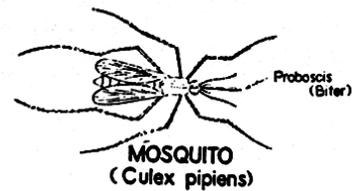
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frame with green voile stretched tightly over the front and a cut-out screen of water plants on the back. Dimly made out through the real plants, the imitations, the voile and the screen, may be seen a final green panel with suggestions of rocks and green water. When nicely assembled and lit, this background is completely baffling to the spectator, who thinks the tank must be built into the wall.

Very satisfactory *Sagittaria* may be made from green or painted paper, but the most permanent plants are made from tin or thin sheet brass cut out with a scissors and decorated with oil paint. If you have a talent for painting you can even imitate rotted places on the leaves.

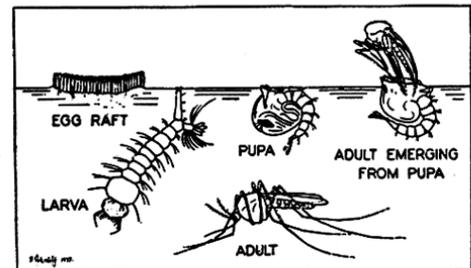
Decorations for the inside of the tank should harmonize, if possible, with those in the back. These are not easy to find, because wood, following a prevailing custom, always either floats or rots, and water-proof varnish does not remain so forever. This seems to preclude the use of wooden imitations of sunken logs or ships' hulls, except for temporary installations.

Mosquito Larvae continued.



ing newly-hatched larvae about 1/6" long. These rafts may be placed in the tank with the fishes. Every egg hatches.

The accompanying enlarged illustration gives an idea of the shape of the larvae. They average about 1/4" long, and are mostly dark gray or brown. A few are bright green. Breathing through a tube at the surface of the water, they congregate in masses, ready to wriggle to the bottom when alarmed. For this reason they must be approached slowly. A quick sweep with a long-handled net gets most of them.



STAGES IN THE DEVELOPMENT OF A MOSQUITO (enlarged about 4 diameters)

It is said that if the mosquito becomes wet in leaving its case, it cannot leave the water, and drowns. A film of oil on the water chokes the breathing tube of the larvae. This method, together with mosquito-eating fishes (and larvae-catching aquarists) constitute the principal methods of mosquito control.

Shortly before hatching, the larvae turn into the more ball-like pupae, in which forms they are unable to leave the surface except for a few seconds. They are equally as good fish food, but too dangerously near splitting at the back and becoming pesky mosquitoes. This is an astonishing process. In warm weather the cycle from egg to mosquito takes from 7 to 10 days.

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The Aquarist's Notebook



"Aquary"

MR. W. H. COTTON, a leading English writer on the aquarium and allied subjects, has made what seems to us a very good suggestion as to what we might call our aquarium rooms or houses. "Aquary" is his solution of what this writer has always found to be an awkward difficulty.

"Greenhouse" for several reasons is unsatisfactory. It is in popular and long established use to convey an entirely different idea. Furthermore, the best houses for fish culture are not built like greenhouses. They have solid side walls and receive nearly all their light from openings in the roof.

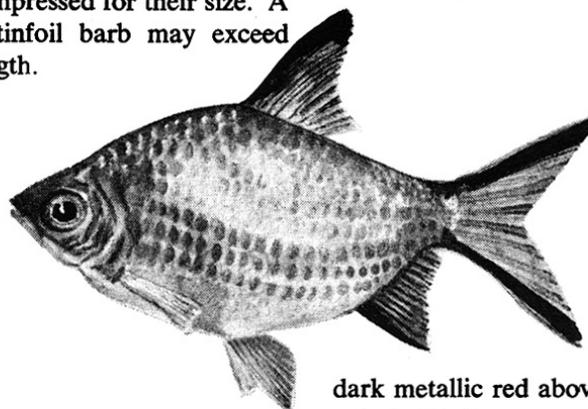
"Fish house" is just too awful. It suggests fishmongers and smelly places in the public market. "Fish room" in a home is nearly as bad.

The background of Mr. Cotton's idea is not far to seek. In many parts of Europe, and especially in England, the hobby of keeping fancy cage birds is a tremendous affair. The rooms and houses in which they are kept are commonly called aviaries, the same as a bee establishment is called an

Continued overleaf 3rd column.

THE TINFOIL BARB

THIS handsomely proportioned and attractively coloured barb is native to the freshwater of Thailand and Indonesia. Immature (small) fish are typically aquarium-barb-like in outline, but mature fish are almost, if not quite, tall diamond shaped and considerably compressed for their size. A well-grown tinfoil barb may exceed a foot in length.



are yellowish to red. The top portion and anterior rays of the dorsal fin are marked with black as, also, are the upper and lower margins of the well-spaced caudal lobes. There are small barbels on the mouth. The iris of the large eye is silver to gold below and

dark metallic red above. The pupil is velvety black.

The species is an active one and swims at all levels in the water. It is a good jumper. It may be placed with other fishes in a community tank but may chevy them around too much

Continued overleaf 1st column.

In coloration, *B. schwanenfeldi* is leaden green on the back shading down to silver overcast with yellow on the sides. The underparts are pearly white. Viewed before a strong light, the scales sparkle, tinsel-like. The fins

My first is in FISH but not in NET;
My third is in LITTLE but not in LARGE;
My fourth is in STEAMER and also in BARGE;
My fifth is in BREEDING but not in TRAP;
My sixth is in TREE but not in SAP;

FIND THE PLANT

My seventh is in AIR but not in PUMP;
My eighth is in SOAR but not in JUMP;
My ninth is in BISCUIT but not in TIN;
My whole isn't big, but it's definitely "in"!



ANSWER: SSSVGRIVH

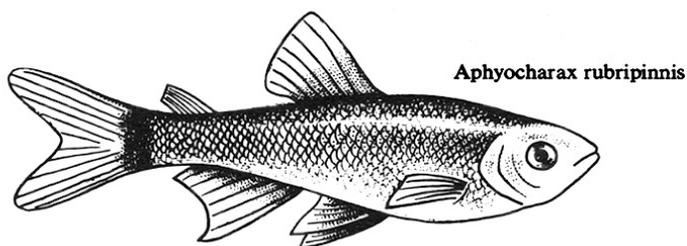
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A BEGINNER'S FISH-

THE BLOODFIN

THE bloodfin (*Aphyocharax rubripinnis*) was first made known to tropical aquarists under the false scientific name of *Tetragonopterus rubropictus* or *rubripinnis* in 1906. It is one of the smaller members of the family *Characidae* and hails from the northern half of Argentina. From all points of view it is a most desirable

the upper lobe of the forked caudal, are red. In mature specimens the fins of the female are not so well-coloured as those of the male. Also, she is the larger of the two. The male, when in breeding condition, intensifies his colours to such an extent that his sex should be easily recognisable; a roe-laden female clearly shows an extra



aquarium fish; for among other things it is peaceful, pleasingly coloured, a frequenter of the middle and upper levels of the water, active, hardy enough to stand a gradual fall in the temperature to about 65°F (18°C), and always ready to accept any small live or dried food. Furthermore, it is one of the characins that is not especially difficult to breed.

Ordinarily it grows to a length of about 1¾ in., but exceptionally it will attain 2 in.

The slender body is greenish grey on the back shading down to a bluish band (not very apparent unless the fish is viewed before a strong light), that divides the leaden grey lower sides from the silvery underparts. The fins, with the exception of the pectorals, the tiny adipose, and

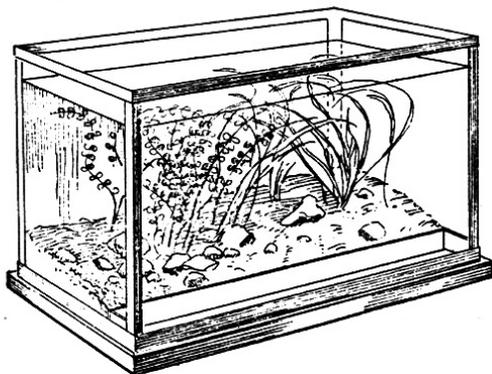
fullness in the sides.

A tank measuring 24 in. by 12 in. by 12 in. is recommended for spawning, but one measuring only about 18 in. by 12 in. by 12 in. will suffice. As bloodfins are particularly keen on eating their own non-adhesive eggs some method of saving them must be adopted. A satisfactory way is to cover the floor of the tank with a layer of well-washed pea-sized gravel over-strewn with weighted-down needle- or finely dissected-leaved plants. As will be realised, the plants get in the way of the fish as they swing about after the eggs, and it follows that the eggs that escape being eaten come to rest among the pebbles. It follows, too, that the eggs will reach safety all the sooner if the water is no

Continued overleaf 2nd column.

Dirt Trapping

IN THE USUAL swishing about of the water by aquarium fishes, the natural dirt settlings or humus collects in certain places. They are usually the low spots and the corners. Artificial depressions are sometimes introduced so that this dirt will concentrate at points where it may easily be siphoned off or lifted by the use of a diptube.



AQUARIUM WITH DIRT TRENCH

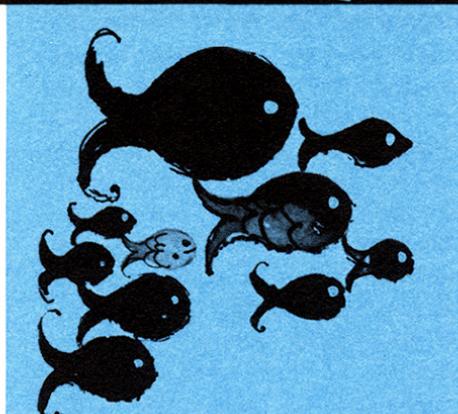
This is not a part of the aquarium proper, but is set up by the aquarist. The idea is capable of a number of variations.

The most used form of dirt pit consists of a small trench along the sand adjoining the front glass of the aqua-

Continued overleaf 1st column.



The Aquarist's Notebook



A Primer On Hardness

HARDNESS is a term that indicates the amount of calcium and/or magnesium present in water and is not connected with any pH values. That is, a hard water may be acid or alkaline. Also there is no neutral point as we have in pH, but rather a continuous scale running from zero to values well above several hundred. In this country we calculate hardness as the number of grains of CaCO_3 per gallon, or as the number of parts of CaCO_3 per million of water. Other countries use different standards and hence we cannot usually compare the numerical values directly. The German scale of degrees hardness ($^{\circ}\text{D.H.}$) may be taken as almost equal to our scale in grains per gallon. The actual ratio is $1^{\circ}\text{D.H.} = 1.044$ grains per gallon.

There are kits available to measure hardness and are not much more complicated to use than those to measure pH, although somewhat more expensive. Basically the determination is made by counting the number of drops of the reagent needed to cause the indicator used

Continued overleaf 2nd column.

THE PENCILFISH

ORDER: Ostariophysii, from Greek *ostarion* — little bone, and *physa* — a bladder.

FAMILY: Characidae, from Greek *charax* — a sea fish.

SPECIES: *Poecilibrycon*, from Greek *poikilias* — a kind of spotted fish, and Latin *auratus* — ornamented with gold.

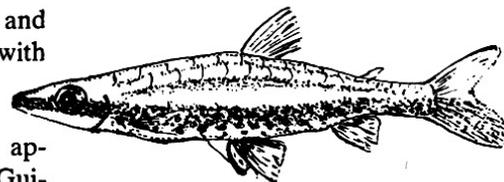
IN GENERAL body outline and appearance, this little gem from Guiana and the Amazon might well be mistaken for a *Nannostomus*. The presence of a small adipose fin, however, serves to identify it as a different species. None of the *Nannostomus* group carries this distinctive feature.

Nor can it be confused with *Poecilibrycon eques*, although it has been sold as such, for it swims in the characteristic "pencil-fish position" — at an angle of up to 45 degrees from the horizontal, whereas *P. eques* maintains the more usual horizontal position, swimming only at an angle when feeding at the surface, or changing its swimming level.

It would be interesting to know what causes the pencils to swim at the angle they do. Without knowing definitely, I would hazard a guess that the swim bladder is in a different position from the normal, so that the body weight is distributed unevenly front and rear of the bladder. It would be interesting to know whether or not this is so, or if there is some other explanation. Perhaps someone who

reads this will know the answer and write in about it.

From conjecture let us return to fact! Of a maximum length of almost 2 inches, *P. auratus* is beautifully



streamlined, its shape being emphasized by its longitudinal division into several narrow, colored bands of golden brown, pure brown and black, with a row of black dots. The fins are as follows: the lower half of the caudal is black, the anal brown with a red spot close to the body, others very transparent and almost colorless.

Aquarium specimens are not prolific. Normally happy in from 70° to 72° F., they need higher temperatures (from 80° to 84° F.) to stimulate spawning. Sexes are identical except when the female fills with roe, at which time she is noticeably plumper than her mate. Live food — little and often (and small) — will further bring them into condition.

They scatter eggs singly. Scatter is perhaps not the right word; the eggs are found on the underside of broad-leaved *Cryptocoryne* or *Sagittaria*, which argues some gymnastic ability on the part of the breeders to defy the force of gravity.

Continued overleaf 1st column.

PENCILFISH *continued.*

In from 2 to 3 days the fry hatch. The parents are supposed not to eat the eggs and to do a certain amount of guard duty until the fry emerge. For safety, remove parents after hatching is finished. It is by no means certain that the fry will be eaten if left with their parents, but with a species of fish which is not prolific, it is wisest to ensure the survival of as many fry as possible. Otherwise how can other aquarists share your pleasure in studying these fish?

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Thriving Infusoria cultures of the smaller kinds are a must if it is hoped to raise many fry. The mouths of the parents are small enough, but the mouths of the youngsters are just minute.

The best way to get small Infusoria is to use fairly fresh cultures, I mean young cultures. It seems that when microscopic creatures first make their appearance in water, it is the smaller species which are apparent. Gradually, as the culture "ripens," larger species crowd the others out — a sort of survival of the fittest. The larger species can only be nibbled at by the fry instead of being swallowed, and, I imagine, could possibly choke them if wedged in their gullets.

The older cultures, containing paramecia and the like, can safely be used on larger fry of different species.

If dried food is used at all it must be ground to the finest powder. The decay of a certain amount of uneaten food might well start off cultures of Infusoria, but harmful bacteria and their by-products of poisonous gases may also be produced, with disastrous results.



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HARDNESS *continued.*

to change from red to blue. This number gives the hardness in grains per gallon. The color change is sharp. The values are easily reproduced and accurate to 1-grain per gallon.

The average hobbyist need not be concerned with hardness as much as the enterprising and would-be breeders of the so-called "problem fish." Here hardness can well stand between the thin line of success and failure. By "problem fish" reference is made to Neons, Rasboras, Aphyosemions, Glowlights and Pencil Fish, etc. Certain plants such as *Ambulia*, *Cabomba*, *Myriophyllum*, *Ludwigia* and probably the *Cryptocorynes* too, seem to do best in soft water. This, as well as light requirements, may well explain why many hobbyists fail to successfully propagate them. Strong light and a soft water seems to be the answer for all of these except the *Cryptocorynes* which prefer a darker location. *Anacharis* seems to be able to remove the water's hardness over a period of time. Whether this is directly used by the plant in its growth or merely removed to make a more favorable environment, cannot be said. Not all plants are like these; *Swordplants*, *Sagittaria* and *Vallisneria* do better in the harder waters (values above 15-grains per gallon). The king of aquarium plants, the *Madagascar Lace-Leaf Plant*, requires a very soft water if any hope is to be held for its survival. The German hobbyists seem to make a big "to-do" about duplicating nature in the aquarium; and while some do not agree fully with the necessity of all their ideas, no one can gainsay their success in breeding the problem fishes and propagating many of the aquatic plants we have trouble with. The answer seems to be a soft water. The actual value is a bit hard to pin down, but it seems to be around 4° D.H. for the fish, and about 10° D.H. for the *Aponogeton fenestralis* (other factors such as pH, the temperatures, light, etc., are also involved, but are not within the scope of these notes).

By now the question arises of where this hardness comes from. Part of the answer is that it is there from the start because of the minerals

leached out of the soil as the water flows over or through it. The hobbyist uses this water in his tanks, some of it evaporates and is replaced. But the minerals causing hardness do not evaporate, and the result is that they concentrate. The rest of the hardness is introduced by the hobbyist himself, knowingly or not. Snails die in the tank and not all are removed. Neutralizer blocks are used to keep the water on the alkaline pH side (in the old days hobbyists used molded blocks of plaster - of - Paris). The snail's shells are a good source of Calcium and as they dissolve, just the same as the neutralizers do, the hardness of the water increases; sometimes to the point where we find a crusty white film forming on exposed parts of the heaters or even the sides of the tanks in the corners above the water-line. This deposit is not always due to hardness, it may be other minerals present.

Hardness cannot be removed by a charcoal filter. Commercial water softening material can be used (not the detergent type though, but rather a natural or a synthetic type known as "Zeolite"), but are not particularly practical. They are a bit expensive and have a limited capacity although they can be regenerated. The most practical way, when hardness is to be controlled, is to use distilled water. Rain water may be used, although collecting sufficient quantities may pose a problem.

The hardness values of spring water and tap water will vary from season to season. It has been observed that values in some areas range from 10 to 80 grains per gallon over a period of three months.

From the foregoing it can be readily seen that water-hardness is not the whole story or a magic key to success to many of our present "hard to propagate" fishes and plant problems, but it is an important part, and a direct step toward that success. A general summary of this article is that these observations are factual, but, there is still much to learn and the pathway is broad, clearly marked and wide open for the serious hobbyist to explore.





The Aquarist's Notebook



HOW TO SEX ANGELFISH!

THE FISH must be in good condition, and to be certain about them I prefer them to be about 1½ in. in diameter. A reasonably well-grown fish should attain this size at about 7-8 months of age.

The important sexing point is the region of the body directly behind the junction of the pectoral fins with the angel's body. If the fish is viewed

head-on the body of a male in good condition is concave, that of a female is convex. In the diagrams the differences are exaggerated.

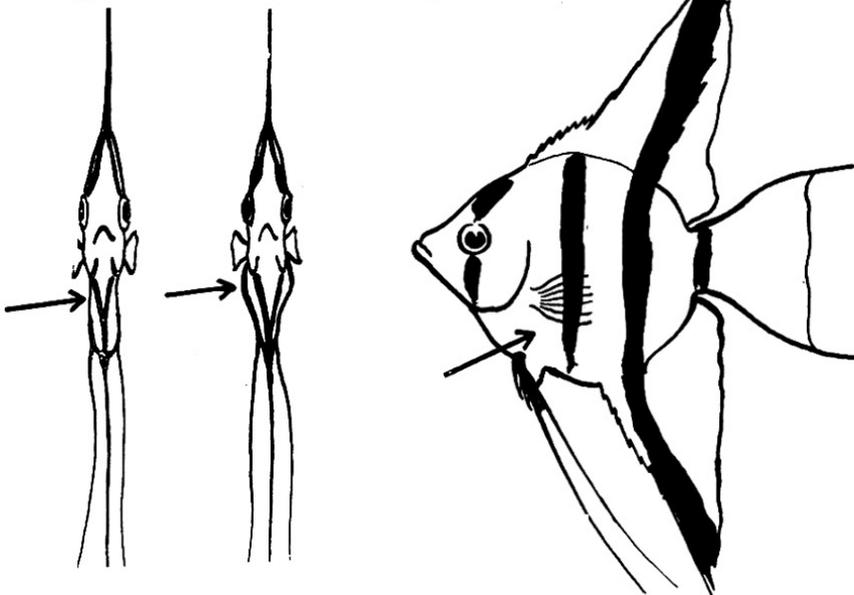
Practice in this area makes perfect, as with many others. If readers take every opportunity of sexing angel fish and are keen observers they should in time make few mistakes.

Primer On pH

ALTHOUGH the term pH is used freely throughout aquarium literature, it remains no easy task to explain it to the satisfaction of all aquarists. Fortunately for us, the importance of pH lies not in its definition but in its application to the tropical fish hobby. Therefore, the following brief explanation is presented by way of introduction.

Acids and bases form two important classes of chemical compounds. An example of an acid would be the liquid in an automobile battery; that of a base would be common household lye. When mixed together, they are said to neutralize each other. Since there are strong and weak acids as well as strong and weak bases, sometimes only a partial neutralization occurs. It remains for some system of measurement to describe the condition of a solution containing either acids or bases, or, a mixture of both. This measure is called, pH. The neutral point is given a value of 7. Any value below this denotes an acid condition; any value above denotes a basic or, a more frequently

Continued overleaf.



The first is in **ARRIVES** but not in **DEPARTS**
The second is in **BILLIARDS** and also in **DARTS**
The third is in **ANKLE** but not in **KNEE**
The fourth is in **SLEIGH** but not in **SKI**
The fifth is in **STRAIGHT** but not in **NARROW**

Arrows indicate the body region of the angel fish that indicates sex differences. In the head-on views of male (left) and female (right) the differences of outline are exaggerated

FIND THE PLANT

Answer on next page.

The sixth is in **THRUSH** and also in **SPARROW**
The seventh is in **TEN** and also in **NINE**
The eighth is in **BEER** and also in **WINE**
The ninth is in **THIRD** and also in **THREE**
The tenth is in **TWIG** but not in **TREE**
The last is found in **ABUNDANCE**.

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used term, an alkaline condition. Therefore, pure water has a pH of 7. However, due to chemicals contained in natural waters, waters used for aquarium purposes can vary over a wide range of pH. In nature, this range is approximately from 5.0 to 8.5. However, the range of pH most common in aquaria is nowhere near as great, i.e. it may be 6.5 to 7.5.

The scale used as a measure of pH is an unusual one. For instance, a pH of 6 is 10 times as acid as a pH of 7, a pH of 5 is 10 times as acid as a pH of 6 and, of course, a pH of 5 is 100 times as acid as a pH of 7! It works the same way on the other side of the scale for alkalinity. It can be seen, therefore, that a small change in pH may result in quite a big change in acidity or alkalinity.

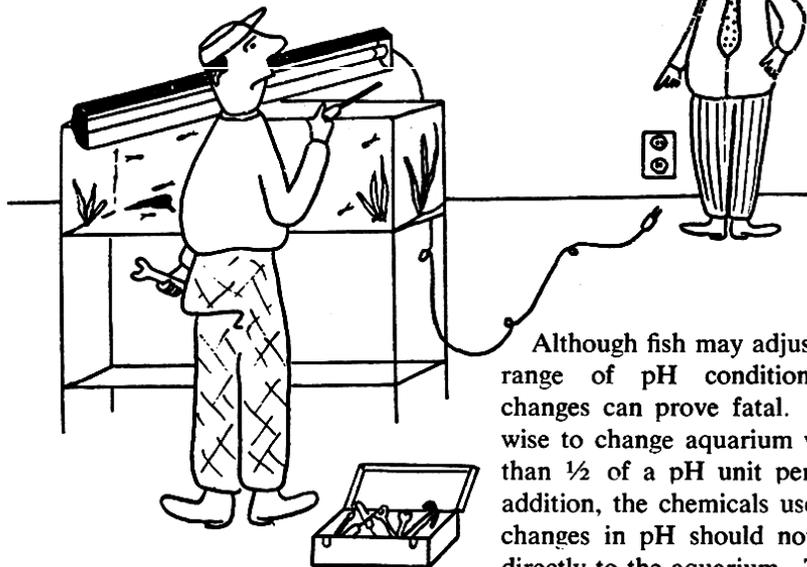
There are two popular methods used by aquarists for testing for pH. The oldest method uses an indicator solution which changes color when added to waters of varying pH values. The color of the indicator can then be compared with a color chart and the pH values can be determined. A newer system utilizes chemically treated strips of paper in place of the indicator solution. There are several advantages and disadvantages to both methods. The paper indicator is more convenient but does not show up pH differences as accurately as the liquid. What is not stressed very often, however, is that both the chemicals in the liquid indicator and in the paper, deteriorate with time. In this respect,

the paper will outlast the liquid. If the liquid indicator kit is stored in a cool, dark place it may be used for 6 months, after which it should be discarded. If the paper indicator is stored away from moisture and light, it should last for a year. The color standards provided with both types quickly fade when exposed to moisture and light. At least two manufacturers of aquarium test kits partially solve this problem by using, as color comparators, vials filled with colored solutions. They are sealed from the destructive action of air and will last many years if not continuously exposed to strong light.

For many years, aquarists wishing to effect changes in pH in aquaria have utilized two chemicals. For decreasing acidity and increasing alkalinity, ordinary baking soda has been used. Chemically, baking soda is sodium bicarbonate, a relatively mild agent for this purpose. For traveling in the other direction, increasing acid-

There are other suitable chemicals for changing the pH of aquaria. Sodium acid tartrate is one the author uses frequently. This chemical will increase the acidity of aquarium water but will not increase its mineral content as much as with the addition of sodium acid phosphate. More important, however, are the sundry organic materials such as tannic acid, oak leaves and peat extracts used to breed some of the so-called problem fishes. Since the acidity of natural waters is hardly caused by the presence of sodium acid phosphate, many aquarists feel that the acidification of aquarium water should be done with these more or less "natural acids." We shall investigate this idea further, but in the meantime, simply add that these natural materials impart some color (usually brown) to the aquarium water and are a bit tricky to handle.

"I think I've found your 'short-circuit,' Simson!"



Although fish may adjust to a wide range of pH conditions, sudden changes can prove fatal. It is never wise to change aquarium water more than 1/2 of a pH unit per week. In addition, the chemicals used to effect changes in pH should not be added directly to the aquarium. The chemical can be added to a cup of aquarium water, completely dissolved and then added to the tank. Simple precautions such as these prevent shocks to the delicate balance that a fish maintains with its watery environment.



Solution to **FIND THE PLANT**

Vallisneria

ity, sodium acid phosphate (sometimes called sodium biphosphate) is very often used. Strong acids such as hydrochloric and sulfuric could be used to effect changes in pH but due to the inherently corrosive nature of these materials and their powerful action, they are not suited to aquarium purposes. This holds true for powerful bases such as lye, also. In the aquarium, less drastic agents are to be preferred.

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Aquarist's Notebook - Volume VII





The Aquarist's Notebook



TRY YOUR HAND

WITH MOUTHBREEDERS!

TROPICAL QUERIES

Is it true that duckweed is the smallest known flowering plant?

It is true that a duckweed and not just duckweed, a term that embraces a large number of miniscule floating plants, is the smallest known flowering plant. The duckweed in question is *Wolffia arrhiza*, which is rootless and grows no larger than an ordinary pin-head.

Is there anything I can do to stop a large male swordtail attacking its companions in a community tank? I was under the impression that the swordtail was a good mixer.

Occasionally a male swordtail will develop into a persistent bully. You cannot change the nature of a bullying fish but you can see that its rushes are impeded by thick planting. Also, you can see that its companions are not the kind likely to be worried by its behaviour. As a last resort, you can always remove the fish from the tank.

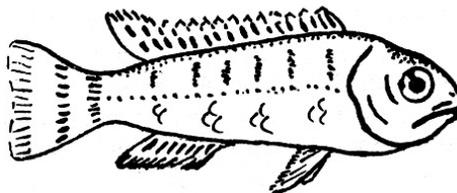
I should be interested to know something about the care of the arowana in the tropical aquarium.

First and foremost, the arowana will attain about 18 in. in length and therefore demands a large aquarium kept well-aerated. Young (small) specimens will feed on water fleas, gnat larvae, tubifex, and the like, but well-grown fish should have livebearer fry, earthworms, and strips of raw meat or uncooked white fish. A temperature in the neighbourhood of 75°F (24°C) is about right. Perhaps it should not be necessary to mention that the arowana is not a fish for the community tank.

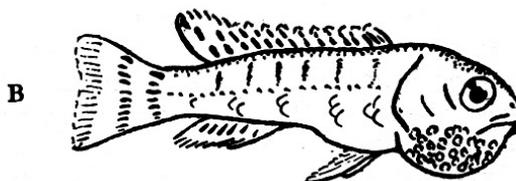
AT FIRST acquaintance these fish appear drab and uninteresting compared with recent imports of more colorful tropicals, but kept in a medium-sized, well-planted tank, they really look very attractive as adults. The general overall color is silvery olive with numerous bright-green spangles on the anal, caudal and dorsal fins; these fins are tipped with orange. Four or five vertical dark

an upturned rounded end, instead of the extended dorsal fin which is so common in other cichlids. His colors are more intense, his fins generally larger than those of the female and, when he is in breeding condition, the tip of his anal fin seems to be almost red rather than orange.

The female is slimmer than the male, her mouth is much wider than his and the head appears more square



A



B

Drawings of the author's female mouthbreeder made before spawning (A) and 8 days after spawning (B)

bars are sometimes present on the upper half of the body, their intensity varying with conditions. As the scientific name of the fish, *Haplochromis multicolor*, indicates, it really possesses more colors than we give it credit for, but these are only in evidence if the fish is well kept in suitable planted surroundings.

Difference in the sexes is very obvious after the first are about 1 inch long. The male is of conventional shape with a long dorsal fin having

when viewed from the front. When first purchased, it is often found that the female will not eat and that she has a mouthful of eggs, as these fish will often breed in a community tank.

Of the four fish that I had, three were males and one was a female. It was soon very clear that one male was mildly aggressive towards the other two, especially at feeding times, when he monopolized the feeding area until he could eat no more, after-

Continued overleaf 1st column.

MOUTHBREEDER *continued.*

wards allowing the others to eat. He did not disturb the female, who was very shy and found plenty to eat at the "off-peak" periods. This male was left in the tank with the female, the two others being removed.

Feeding was on the whole carried out with live foods, *Tubifex*, white worms and *Daphnia* mainly. It is my experience that these fish, as with cichlids generally, are not partial to dried food.

The breeding tank was 18 in. by 10 in. by 10 in., though only 8 inches water depth was used. Fine gravel covered the bottom of the tank, which was planted fairly liberally with *Cambomba*, *Myriophyllum* and *Hygrophila*.

Water, as siphoned from the community tank, showed a pH of 7.2 and the temperature was maintained around 76° F. This is only mentioned as a matter of interest as the fish will accept a fairly wide range of water conditions as long as the water is clear and supports normal plant life.

Feeding continued for 2 more days and, in the absence of other males, this male paid more attention to the female, spreading his fins, showing his full colors and looking more like what we usually associate with cichlid behavior. At the end of the second day, both fish were found to be circling around a shallow depression in the gravel and were close to the bottom of the tank, the female going down into this depression from time to time. I did not see any eggs but assumed that I was watching the spawning action of these fish. There they remained that night and a small light was left on at one end of the tank.

Next morning, when food was offered the female refused to eat and her mouth was closed tight, her lower jaws bulging; it was assumed that her mouth was full of eggs. The male was then removed from the tank. Although *Daphnia* and *Tubifex* were still present in the tank, the female could not be tempted to eat and, at the end of the same day, she had

adopted a chewing action of her jaws, which resembled that of an animal chewing the cud. This was to keep the eggs clean and free from fungus and dirt and this action continued throughout the long incubation period of the eggs.

The eggs continued to develop and the mass could be clearly seen through the distended sides of her lower jaw after a few days. At about the eighth day, the eggs had so developed that she had difficulty in fully closing her

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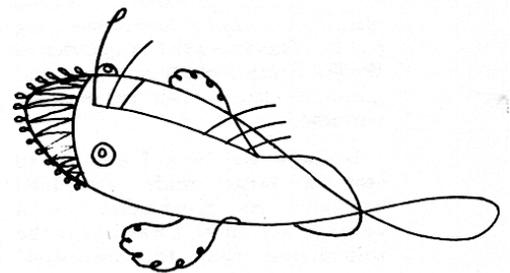
mouth, and the young embryos could be seen quite clearly inside her mouth as she often approached the front of the tank in her curious, almost defensive, concern to know who was looking at her through a lens. The chewing action was continuing throughout this time and the eggs were rolling about in the manner of clothes in an automatic washing machine, though more slowly. By this time, the embryonic eyes could be seen with good top lighting quite clearly through the sides of her lower jaw.

Lack of food had reduced the body of the female until it was quite hollow in the middle and, by contrast, her head seemed extra large and almost square in side elevation, until at the twelfth day or so, she was seen to be eating *Daphnia* and I feared for the worst. Switching on the light, I saw the female dash deep into the plant masses with her mouth once again closed tightly. At that time I did not see any young fry, but later when it was semi-dark in the tank, I saw a shoal of about 40 fry close to their mother, and when I approached closer to see them they dashed into her capacious mouth so quickly that

some of the late arrivals left their tails protruding, but these were soon tucked in.

The whole action resembled a crowd of people entering an Underground train in the rush hour! It was most amusing to watch and this has no doubt endeared this fish to many who would not normally give it a second glance, or so it was in my family. The fry were of a dull drab color, about 1/4 inch long but with fairly large eyes. If too frequently disturbed the female will sometimes eat the youngsters, as I had found out before with an earlier attempt, so the female was removed.

As they were too large for Infusoria, feeding of the fry commenced with micro worms, progressing on to *Daphnia*, *Tubifex* and white worms: they did not seem to appreciate dried food very much. 



FIND THE DISEASE

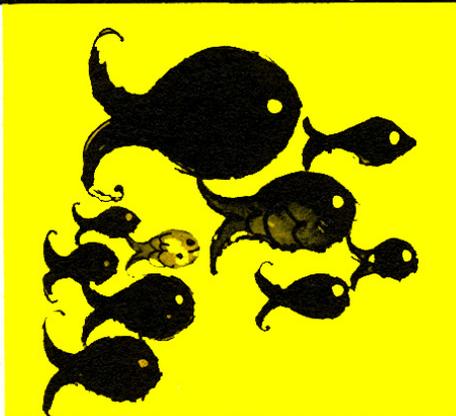
My first is in **WINTER** but not in **SPRING**,
My second is in **FETCH** but not in **BRING**.
My third is in **FILTER** and also in **FISH**,
My fourth is in **PLATE** but not in **DISH**.
My fifth is in **WATER** but not in **MILK**,
My sixth is in **SATIN** and also in **SILK**.
My seventh is in **HAPPY** but not in **SAD**,
My eighth is in **GOOD** but not in **BAD**.
My ninth is in **DAYTIME** and also in
NIGHT, My whole isn't nice, but it can
be put right!

Answer: **LOLS ELIHW**

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Facts About Lighting

A RECENT evaluation of five separate formulas conceived by as many authorities for the amount of artificial illumination required by an aquarium produced some interesting results. Applying these formulas to a standard 15 gallon tank and assuming incandescent bulbs to be used 8 hours a day, the wattages suggested were 50, 60, 75, 80 and 100. These differences of opinion are not singled out for the purpose of criticizing their sources, but rather to emphasize the uncertainties entertained in an analysis of artificial light and the aquarium. They indicate that the beginner must rely to a certain extent upon his or her own experimentation, tank by tank, until the desired results are obtained. In general, these results are of two kinds: (1) illumination which displays tropical fishes at their best and (2), lighting which produces optimum plant growth.

There are two major types of artificial lighting in use today, incandescent and fluorescent. Unfortunately, neither of them are ideal for aquaria. A quick summary of their respective

Continued overleaf 2nd column.

THIS AQUARIST

GOES "BANANAS"!

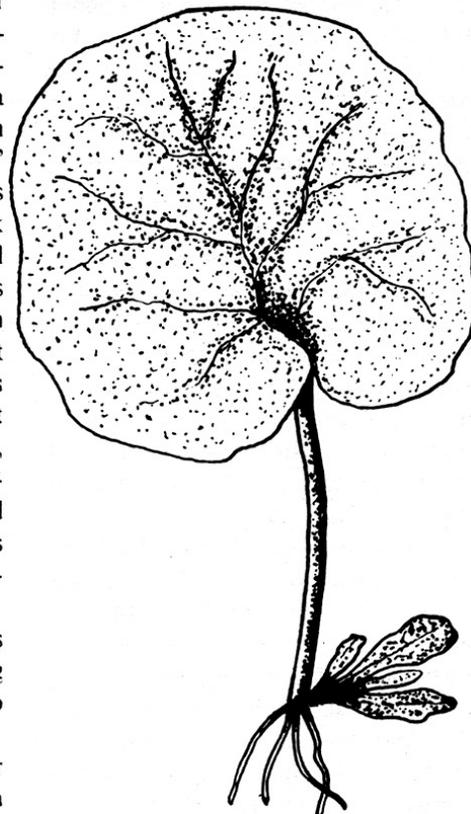
FOR MANY years now the "under-water Banana Plant" has been a popular waterplant although it is not an ideal aquarium plant. What makes this plant attractive to the aquarist is the curious tubers on the base of many long petioled, heart shaped-rounded, light green or slightly purple leaves. These tubers are like a bunch of bananas and for this reason the plant is called the "banana plant."

Unfortunately, the banana-plant is not completely suited to indoor-tank conditions and will not grow as well as many other aquarium-plants. Its cultivation is not always easy. Often it dies away after a relatively short time of cultivation. As a rule this failure to thrive is due to insufficient light conditions. On the other hand, if we have bright daylight, the banana-plant will grow very strong and after a time it will form numerous floating leaves which shade other submerged plants.

First of all, the banana-plant needs plenty of light — especially, strong top light. Best is daylight but also artificial illumination with fluorescent-lamps (warm white de luxe type or Gro-Lux) will do. Water depth should be about 8 to 12 inches, and the temperature range should be from 60 to 70 degrees F. The plant will grow better in slightly acid water (pH 6.5).

It does not matter if we insert the banana-plant so that the tubers are covered by the gravel. But as we usu-

ally want to see the "bananas", it is preferable to plant in such a manner that only the tips of the long roots are inserted into the gravel, while the "bananas", or tubers, are a little



above the aquarium floor and resting on the aquarium gravel. After a time, the plant will grow and form new leaves and long roots. Young banana-plants can be kept floating free on the water-surface, so they will remain rather small for a long period. An

Continued overleaf 1st column.

BANANA PLANT *continued.*

aquarium-plant fertilizer should be used regularly in this case. Normally the banana-plant will form a new plant if it flowers. After the flower clusters have been developed on the petioles near the base of the floating leaf, we can observe small leaves and roots and sometime later, the tubers will be formed. Then the parent leaf disintegrates and the new plant floats free. In autumn it sinks to the ground and after a rest-period, it will develop new shoots in the spring. Under indoor-tank conditions, it is very difficult to get flowers to appear on the banana-plant. Propagation of this aquatic is easier accomplished in a pool which gets plenty of sunlight, or a well-lighted aquarium.

If we keep strong plants in shallow water and very good light, the banana-plant often forms lateral shoots but unfortunately, they are seldom useful for reproduction. It is little known that the banana-plant can be propagated by leaf-cuttings of floating leaves. It seems that submerged, leaves are not suited to this sort of reproduction. A very important factor for rooting leaf-cuttings is intensive illumination and a temperature not below 70 degrees F. The cut leaves should be kept floating on the water-surface. After about two weeks, roots will form on the cutting-point and after a short time we can also see tender shoots. Now it is time to separate the young plant from the leaf-stalk and place it into the gravel in shallow water in a well-lighted environment. Often the leaf-cutting will develop another rooted shoot. Unfortunately the development of bananas on shoot-plants is uncertain. In some cases it is successful if the young plants after some months are allowed to float free on the water-surface.

Actually, one should suppose that the bananas can be used for propagation but I have never seen shoots on the tubers; on the contrary, the bananas will root after a time if we remove them from the plant and place them into the gravel. 

LIGHTING *continued.*

advantages would appear as follows:

Incandescent

1. Low initial costs, high operating costs.
2. Displays most fishes best.
3. Promotes good plant growth.

Fluorescent

1. Low operating costs, high initial cost.
2. Provides light with a minimum of heat.
3. Provides an even and distributed source of illumination.

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In spite of the apparent advantages of incandescent lighting in providing the desired results mentioned previously, fluorescent is usually recommended for the beginning aquarist. It has been felt that the heat and algae problems so often accompanying the use of incandescent lamps would be that much more of a burden to the beginner. If the aquarium is located so as to avoid hot weather problems (in the basement, for example) or if, during the summer months, the incandescent lamps can be replaced with the fluorescent type, then incandescent lamps would be the better choice. Actually, a combination of the two light types, barring expense considerations, is probably the closest thing to ideal aquarium lighting.

It is difficult to talk of incandescent light in relation to natural daylight since the latter is a variable quantity. In general, it can be said that incandescent contains a greater proportion of yellow rays and fewer blue rays than daylight. In comparison with fluorescent. However, incandescent is very strong in pink and red rays. It is these pinks and reds which bring

out the subtle colors of many fishes and promote a lusty plant growth. Unlike fluorescent lamps which usually are no hotter than 100°-120° F., incandescent lamps become too hot to handle. In addition, their spherical shape tends to concentrate this heat in small areas and as a result are capable of heating aquarium water to dangerous levels in hot weather. With fluorescent lamps, however, the tubular form distributes not only the heat but the light itself. This prevents the casting of shadows and reduces complications in maintaining the correct water temperature. Such a distribution also reduces areas of rigorous algae growth along with the problems that such growth bring.

The aquarist who invests in fluorescent lighting will find it relatively expensive compared with incandescent lighting. There is extra equipment in the form of starters and ballasts, and in addition, lamps and sockets are more expensive. For the same amount of light delivered, however, operating costs for fluorescents are only about 1/3 as much as for incandescents. The lamp life of a fluorescent tube is many times that of its incandescent cousin.

A method used to improve the use of incandescent lamps for aquarium use has been the placing of a strip of heat reflecting glass between the reflector and the aquarium. A large part of the heat produced by these lamps is via radiation and is effectively stopped by the glass. The heat reflecting glass is not too expensive (about as much as lucite or plexiglas) but is only obtainable from glass specialists or upon special order.

On the other side of the ledger, the use of "warm-white," "warm-tint" or warm white deluxe fluorescent lamps has helped somewhat in providing a fluorescent lamp emitting more of the red end of the spectrum. 

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ALL ABOUT FILTERS

FILTERS, in the main are mechanical devices (except for the biological under-gravel type) and can be either air- or power-operated; they will clear the water, removing suspended particles from it and also remove some dissolved minerals and gases by means of a charcoal bed. Filters will continue to function with little or no regular maintenance, de-

clogged, in which case the water can only rise in the filter box to the level of the water in the tank, when the siphon action will stop. The pumping action is usually an airlift, although more sophisticated filters use motor-driven impellers. These types of filters include inside corner filters on the surface of the water, inside box filters on the gravel, outside air-operated filters, outside power-operated filters and closed-circuit outside power filters.

TROPICAL QUERIES

I used ordinary window putty to fix the glass sides into my aquarium frame, but after filling the tank an oily scum has appeared on the water. Is there any preparation on the market I could use to paint over the cement to prevent the oil working out?

If you draw sheets of newspaper across the surface of the water over the next few days you will rid your aquarium of this nuisance.

We have a well set-up tank with filter and aerator but there is a lot of black substance on and near the base of the tank. What is the cause please?

This black mould is usually caused by overfeeding with dried foods. By this I do not mean that the fishes have eaten too much but that food has been left uneaten and this has turned foul and caused the mould. Even with a filter and an aerator the foulness can occur. Try and siphon off as much of the black matter as possible and remove any sand or gravel from the base which is also discoloured. Replace with some clean gravel and then stop all dried-food feeding for a fortnight. The fish will be all the better for the rest from this and the tank should soon get quite clear. A little live food can be given. If too much food is not given the fish will work over the base of the tank and pick up any food they can find before it turns sour.

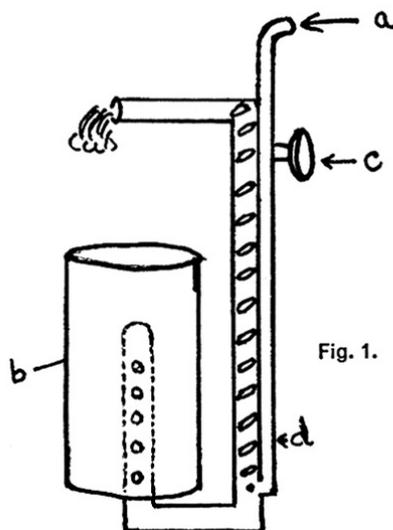


Fig. 1.

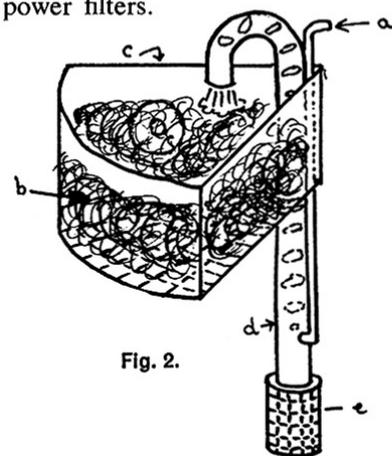


Fig. 2.

pending upon the type of filter used.

Taking the "mechanical" types of filter first, we see that these achieve their objective by passing water from the tank through a chamber containing filtering medium of some description, and then returning the clean water back to the tank. Usually, water is *siphoned* into the filter box and the cleaned water *pumped* out; this system avoids the filter overflowing should the filter medium become

The simplest filter is the sponge type (Fig. 1), where water is drawn through a sponge and released at the top of the tank. My only criticism of this type is that the clean water should be released further away from the sponge; a length of plastic hose will help achieve this.

The inside corner filter suffers from the drawback in that water is pumped *into* it, so that if the filter becomes

Continued overleaf.

clogged, dirty water overflows into the tank (Fig. 2).

Inside bottom filters are very efficient and convenient (Fig. 3), but *only* if they are easily accessible for *regular* cleaning; certainly not for use in tanks in out-of-the-way situations!

Outside filters are very popular, but usually one needs to cut the tank hood to accommodate them neatly; also some of the faster water turnover types have long, ungainly pipes which may be a problem to hide. Another factor, all air-operated filters are noisy to some degree, depending on the speed at which they are run and this can have an effect on one's comfort far removed from the usually quoted tranquilizing one that aquaria are renowned for! (Fig. 4).

Power-operated filters are usually quieter, have a fast water turnover rate (which may or may not be a good thing), but sometimes are a bit unaesthetic.

A recent development has been the introduction of motor attachments to "powerize" the more normal air-operated outside filter. Such a fitment increases the water turnover rate, but this can also be achieved by fitting different airlift systems (Fig. 5).

Sub-gravel filters are usually classed as being "biological" in operation; water is drawn through the gravel, a bacterial colony is set up which breaks down the debris pulled into the gravel, and clean water is released at the surface, or just below it.

This type of filter needs the minimum of attention; the only thing I have needed to do is unblock the airline tube to the filter. It needs a good depth of gravel above it, and I believe the secret of its success (as a *biological* filter) is to run it *slow* enough or

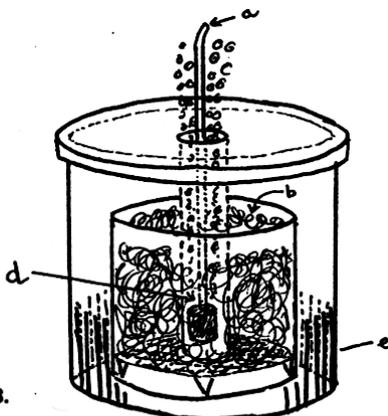
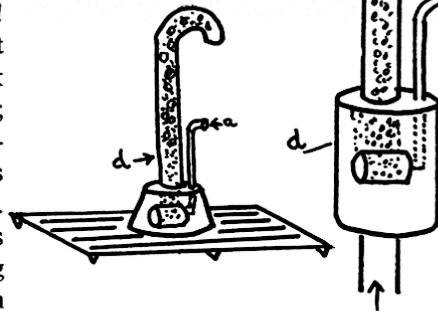


Fig. 3.

Key to diagrams

- a—air supply to airlift
- b—filter medium
- c—sucker attachment
- d—airlift
- e—intake guard



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pulling water through a filter medium, at the same time drawing nourishment past the roots of the plants too quickly for them to benefit from this type of filtration. This system of filtration certainly keeps the water clear providing of course, that suitable fish are chosen, but I have had no experience of improved plant-growth despite experimenting with various depths of gravel and rates of water flow through the filter.

Sub-gravel filters are often used, coupled up to an outside power filter, in marine aquaria and "jumbo" versions are regularly advocated with this use in mind; whether or not they function "biologically" or "mechanically" in this mode is debatable, bearing in mind the much faster water turnover rate.

As I have said, most filters are required to be quiet in operation and unobtrusive—this leads to that old adage, "Out of sight, out of mind"; how many of us fit the filter at the back of the tank and promptly forget it? This may well account for reports of finding fry in the filter box, where eggs from spontaneous spawnings have been siphoned, hatched and flourished. Ironic isn't it? We go to

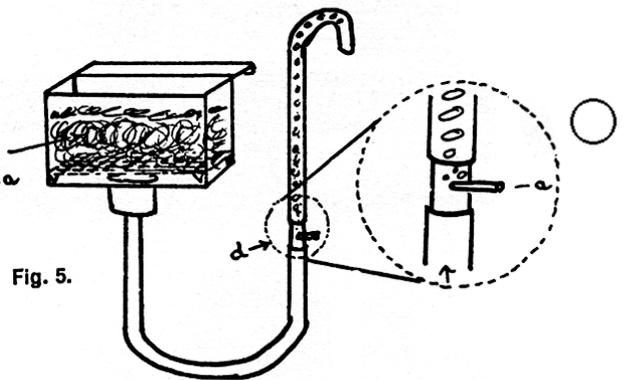


Fig. 5.

great lengths to spawn some fish, often to no avail when all we need is a filter box left unattended for a while!

From this it follows that not all filters get the regular attention they should and the tank-water is circulated over and over again through a box full of concentrated dirt. One author makes the point that "the filter not only removes mulm from the tank but ensures that this matter is very efficiently bathed in a constant flow of water which will dissolve out anything that can be dissolved. Waste material which would otherwise collect in a still corner of the tank is constantly extracted and presumably yields more of itself up to the tank water than would be the case in an unfiltered tank." Food for thought indeed. Another point to look out for—when removing water from the tank either prior to topping-up or for use at Shows, should the tank water level fall below the level of water in the filter then the filter box contents *will empty back* into the tank.

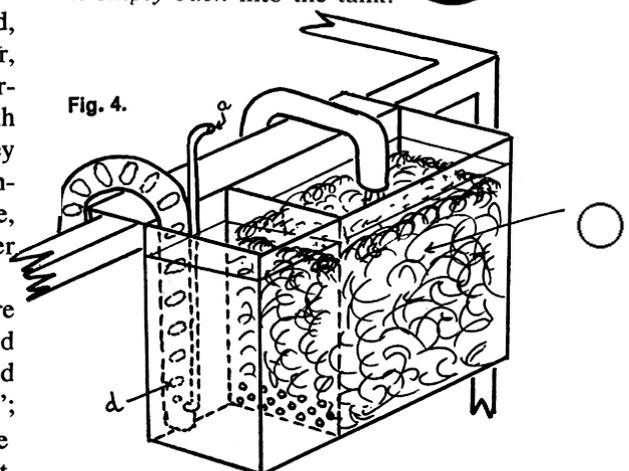


Fig. 4.

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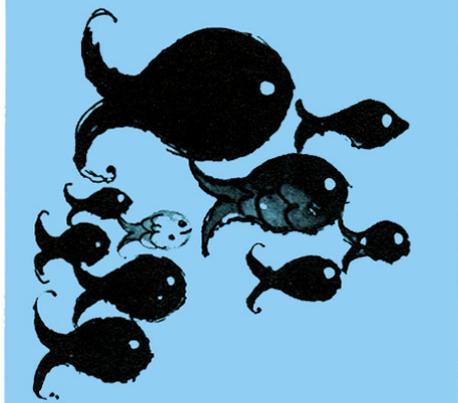
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Experts- Have a Heart!

EVERY pet shop worth its salt displays a wealth of text-books designed to help aquarists, old and new, to solve their problems, and for the most part they fulfill their purpose admirably. There are times, however, when they are completely useless, particularly if the reader is a person relatively new to the hobby. Certainly, there is a valid reason for this; these books are written by experienced aquarists who have, presumably, kept fish for many years. It is quite natural that these people will have forgotten many of the difficulties they had to face when they set up their first aquarium. I, myself, have only been keeping fish for two years, if that, but even after such a short time I real realise that I now do, automatically, many things to which I had to give considerable thought a few months ago.

Let us go right back to the beginning. Young, never-seen-a-fish-in-his-life-before Mr. Algy Green goes into his friendly neighbourhood pet shop. He buys his tank, heater, thermostat, etc., and also pays some extortionate

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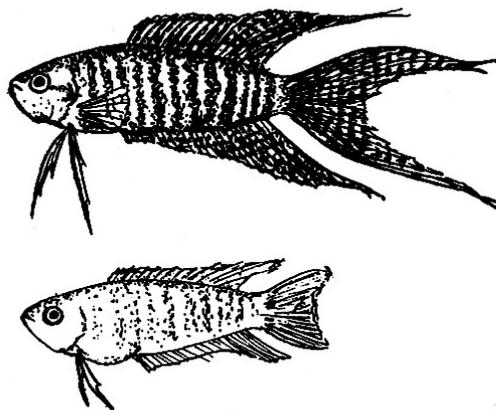
THE PARADISE FISH

THE PARADISE FISH was the first bubble-nest builder to be introduced to aquarists, well over half a century ago, when tropical fishkeeping, as we now know it, was unheard of. How, then, did the fish manage to live?

They are not hot-water fishes — they can stand 80° F. and over for

visible to devote a small aquarium to the exclusive use of a single male, with a second one given over to a female or two.

It is difficult to give an adequate word picture of the astonishing beauty of an adult male paradise fish, particularly during his courtship of the female, or while he is building a



Male (top) and female paradise fish

considerable periods, but it shortens their lives materially. At the other end of the scale, they can withstand temperatures near freezing, and this is why they lived before heating water was indulged in. They are happiest in from 65° to 70° F.

Originally hailing from the rice fields of China, the paradise fish has been very extensively bred both in America, and on the continent. Unfortunately, the males are singularly aggressive, and although occasionally they live in harmony with other species in community tanks, it is ad-

bubble nest for the reception of her eggs. Red, and peacock blue, orange and emerald green, in stripes and dots, splashes and spangles, and covering not only the complete body, but extending to the outermost extremities of all the long, flowing fins, burnished overall with a metallic lustre; and glowing with constantly varying intensity — this is but a poor description, but will have to do.

By comparison, the female of the species is a drab, uninteresting creature — anaemic, short finned, and

Continued overleaf 2nd column.

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price for a gaudy, glossy and highly technical encyclopaedia. It seems to me that such books are far too vague to be of any use to the totally inexperienced aquarist. "When setting up the tank" the book might say blithely, "put in enough gravel or sand"—but how much is enough? "Do not include too many plants in the tank"—how many plants are too many? I was faced with this problem myself, and found that there was such a profuse growth of vegetation that it was almost necessary to supply each fish with a machete and let them do a "Stanley-and-Livingston" act. This problem dealt with, and my fish visible again, yet another difficulty cropped up. Have you ever noticed how every drum of fish-food you buy gives such obscure directions about the quantities to be used that they might almost have been written by a politician? "Use just enough that the fish can clear the food from the water in ten minutes." The poor ignorant aquarist stoops over his tank, peering through the water, his watch in his hand, searching for minute crumbs of soggy food.

Professional authorities, and their so-called good advice, can cause domestic strife, and are probably responsible for the high divorce rate. One expert actually advocated the keeping of tubifex and other live foods in the family refrigerator. When I tried that the consequence was that I almost had to leave home!

Please, all you experts, please spare a thought for we novices! 

timid, filling up with eggs every two or three days so that she more often than not looks as though she has swallowed a marble, and ready to flee at the slightest sign of the approach of her bellicose husband. He has a fascination for her, however, so that she succumbs to his advances and allows him to enfold her in a close embrace beneath the bubble nest. After each embrace, while the two bodies lie motionless for a second or two, a group of whitish eggs the size of a pinhead, fall slowly downward through the water.

Suddenly the male, and then the female, stir themselves, come out of their trance-like state, and swim around gathering the eggs in their mouths, taking them to the surface and spitting them into the heart of the bubbles.

Periodic embracing goes on until the female is spent. Now the mood of the male changes, and he rushes at her with fins outspread and mouth agape, tearing her fins, and drawing blood from her body if she is not lively enough to dodge his attacks. She has served his purpose, he wants her out of the way, and the quicker the better.

All wise aquarists remove the female immediately spawning is over. Apart from the question of the danger to her life, the agitation of the water during the wife-beating can frequently cause the breaking up of the nest and the loss of much of its contents.

Once the female is gone, the male will normally settle down to conduct a ceaseless vigil over the nest and eggs. He will replace broken bubbles or add to them. He will shift eggs from one position to a more favorable one, and occasionally may even construct a completely fresh nest and transfer all the eggs to it.

All the time he will retain his brilliant hue. Hatching normally starts within 48 hours of the eggs being placed in the nest. With the move-

ment of the young in the nest, father's vigilance is redoubled. If any of his youngsters fall out of bed, he is there to catch them before they land on the tank bottom, and to replace them.

Sometimes, especially if he has not been well fed before spawning, his hunger will overcome his paternal scruples, and the babies form his breakfast. Yet I have known a male paradise ignore *Daphnia* until the babies were free-swimming, presumably because he might eat them by mistake if he made a wild grab for food.

The fry are very small — only the tiniest of live animal and vegetable foods will be taken. Paramecia, for instance, are far too large for them to tackle. In the absence of suitable live food, powdered egg can be substituted. The right quantity is difficult to estimate, however, and any uneaten will, unless removed quickly, begin to decompose and pollute the water.

It is useless to say that this does not matter because paradise fishes can supplement their air supply at the water surface. The adults can, but the fry cannot until their labyrinth organs are formed, and these do not begin to develop until they are two to three weeks old.

At this time they are particularly susceptible to chill, and the aquarium should be kept closely covered to prevent draughts upon the surface of the water. Many a good, healthy spawning has been lost through neglect of this precaution. Overcrowding will stunt growth, and as the fry get older, more and more tanks must be pressed into service if the aim is to raise large numbers.

Perhaps it is more humane to cull the fry constantly, leaving only the best and most vigorous to grow on, and to serve the others to large cichlids — Dempseys, angels, acaras, and the like.

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Saving The Bubble-nesters

IT IS A LITTLE unusual, but not really rare, for a pair of bubble-nest-builders (Bettas, Paradise, Gouramies, etc.) to spawn in a community tank. After all, why not? Eggs develop and something must be done about it. A timid couple may find a corner among aquarium grasses and floating plants in which to build a love nest.

Even though they succeed in hatching the eggs and guarding the young for a week or two, they cannot possibly prevent the babies from wandering far enough away to be eaten by "friendly enemies." Therefore some plan must quickly be put into effect if the nest and its precious contents are to be preserved. Obviously, the corner of the aquarium containing the father and his family can be partitioned off. This is apt to be both difficult and inconvenient. The stratagem I have found to be effective is to dip out the nest in a saucepan and deposit it in another aquarium containing the same kind of water.

I do not remove the nest until the eggs are hatched and the young about

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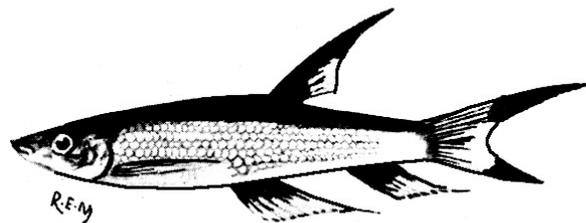
COPEINA ARNOLDI-

THE SPRAYING CHARACIN

I ALWAYS FEEL that breeding is the most absorbing aspect of tropical fishkeeping. Without a doubt, maintaining an aquarium is interesting enough, but the eccentric manner in which some species reproduce invariably encourages the ordinary aquarist to further his hobby by setting up a breeding tank. Once an aquarist's interest begins to develop along these lines, his desire for the unusual will increase proportionately.

was maintained, by frequent testing with a pH test set.

Knowing what to expect we had placed in the tank a piece of slate that had one end embedded in the sand and was supported below the surface of the water by a rock that held the slate, half out of the water, at an angle of 30-45 degrees, as shown in the diagram. Also in the tank we placed a few floating plants, namely *Riccia* and floating fern, and



Spraying characin (Copeina arnoldi)

One such unusual breeding habit that I happened to witness took place in a friend's breeding tank that contained a pair of spraying characins (*Copeina arnoldi*), of the family Characidae.

We had decided previously that we would make an attempt at breeding this particular characin and had set the stage by half-filling a 24 in. by 12 in. by 12 in. breeding tank with seasoned water. The water in the tank was kept at a steady 75° F. throughout the entire breeding period an a pH value of 6.8, slightly acid.

planted bunches of *Fontinalis* in the sand.

After the tank had been allowed to stand for a further week, we selected the healthiest-looking pair of fish and introduced them to the tank. It is no trouble to separate the two sexes of *Copeina arnoldi* as they differ from each other in many ways. The male is very much larger than the female and has a more pointed dorsal fin. The female carries a red spot on her dorsal fin and is always recognizable by the characteristic fullness when

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SPRAYING CHARACIN *continued.*
ripe that indicates the female sex. In addition, if the female is observed with a strong light behind her, the dark yellow eggs in the ovary can be seen through the abdominal wall.

The pair of spraying characins were then well conditioned on a diet of Daphnia, white worms, chopped earthworm, raw beef and fish and before long the female began to bulge with spawn. It soon became apparent that the larger the female became with eggs, the more attention the male paid to her, and it was not long before the male was darting through the water in search of a suitable spot on which the pair could spawn.

Inevitably, the male fish soon began to examine the slate and, after a most thorough inspection, he drove the female to within an inch or so of it. Then quite suddenly they leapt from the water, locked their fins and appeared to cling together on the slate. At first we wondered how they managed to keep attached to the slate

BUBBLENESTERS *continued.*

a day or two old, for the parent is able to guard them for a time. Neither parent is removed with the nest. Young have been successfully reared without the care of the parents, especially with those species that have eggs which are lighter than water, such as Giant Gouramies. With such species the eggs may be removed before hatching.

The experiment is always worth trying, for, under the conditions mentioned, the young would be lost any-how. On a number of occasions I have rescued and reared a fair proportion of the young of Three-Spot Gouramies, Paradise Fish and *Trichogaster leeri*.

but after much observation it became apparent that by pressing their tins to the surface of the slate they were able to produce a form of suction, rather like that when rubber suckers are attached to glass or tiles.

While they were clinging in this manner 10 eggs were deposited by the female and fertilized by the male. The eggs appeared to adhere effectively and could not be easily dislodged from the slate. Whether the eggs were forced from the female by the sudden jar as she leapt on the slate, or whether they were forced from her by pressure on her body from the male, it is hard to say. It was obvious, however, that the fin-locking procedure of the spawning fish facilitated a complete fertilization of the extruded ova. This was proved from the resultant number of fry.

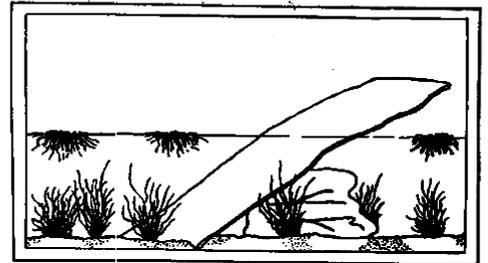
In all, it took 52 minutes for the fish to produce somewhere in the region of 90 eggs by this method of spawning.

The male and the female worked on incessantly, never stopping for a moment, until the final eggs were laid. Then, completely exhausted, the pair wriggled from the slate for the last time and sank to the bottom of the tank, where they rested from their labors. The rest was not complete for the male, because every 15 minutes or so afterwards, he made a fast dash for the spawning site and by vigorously thrashing his tail fin about, succeeded in splashing water over the neat circle of eggs on the slate. In this manner he continuously kept the eggs moist for the next 3 days.

At the end of this period I received a phone call to say that the eggs were hatching, and on arrival I saw that this was indeed the case. As they hatched out, the fry were wriggling into the water from the slate and were making their way to the bottom of the tank, where they were hiding in the vegetation.

When the last egg had hatched and the male no longer occupied himself by splashing water over the spawning site, the parents began to show their hereditary cannibalistic tendencies by hunting out and devouring the young

fry for which they had previously worked so hard to produce. It is still a mystery why fishes should react in such a way — building and then destroying. Perhaps this action is entirely because fishes lack a power of reason. Without a reasoning power the desire and need for live food, particularly after the energy used when producing young, obviously becomes stronger than the maternal instinct and mental will-power that fishes are capable of exerting. In some cases they can be distracted from their efforts by constant feeding with live foods, particularly after the



Floating plants and a piece of slate inclined above the water surface were special features of the breeding aquarium used.

eggs have hatched, but their desire to consume their own offspring is obviously great. Needless to say that once this pair of spraying characins were seen to display these tendencies they were removed from the tank without delay.

Little was seen of the fry for the next 7 days, during which time they were fed with plenty of Infusoria, but on the seventh morning we were greeted with the sight of about 60 fry swimming in a school, obviously looking for food. The fry were then fed on sifted live Daphnia, freshly hatched brine shrimp and dried foods and lived without mishap to be distributed amongst our closest friends.

The spraying characin is a peaceful species, growing eventually to about 3 inches, and is therefore most desirable as an addition to the community tank.

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Something About Scales

THE SCALES of a fish are the present-day remnants of the heavy, enamelled 'armour-plate' which the earliest-known fossil fishes wore. As in the course of their evolution fishes became more active and speedier, this continuous mail-like covering had to become more flexible. This was accomplished by breaking it up into small sections. In time, fishes also developed more powerful teeth and jaws, so that the need for thick external protection grew less. Even so, a few species with these heavy scales still exist, like the sturgeon and the alligator garfish, whose scales are horny enough to blunt an axe.

Nevertheless, the chief function of fish scales is still protection, which is noticeably evident in those fishes like the porcupine fish and the trunk fish which have stiff or spiny points to their scales. And at least one fish, the surgeon fish, actually has defensive scales modified into the deadly offensive weapons of its two tail scales extended like sharp knives sheathed in skin but ready to flick into action when necessary. All fishes have a

Continued overleaf 2nd column.

CATFISHES

FOR THE BEGINNER

BECAUSE tropical catfishes are so markedly different in form from our well known native species, they usually command the attention of those viewing them for the first time. The most commonly found catfishes in the aquarium represent but two types, the armored catfishes of the genus *Corydoras*, and the sucker-mouthed catfishes exemplified by the bizarre *Plecostomus*. The former type is by far the most useful and have much to recommend them to the be-

ginner. They are droll little creatures and are interesting fishes in their own right. What other fish will "wink" at its owner! When added to this the fact that they are valuable scavengers and, at the same time, harmless to other fishes, popularity of *Corydoras* is indeed justified. Perhaps a good rule of thumb to inject here is, for scavenging purposes use one *Corydoras* per 5 gallons of water.



The smaller sucker-mouthed catfishes such as *Loricaria* and *Otocinclus* are also desirable aquarium occupants. These fish are excellent scavengers and, in addition, remove unwanted green algae from plants,

rockwork and even the sides of the aquarium. While most sucker-mouthed catfishes are small and innocuous, the large sucker-mouthed catfish known as *Plecostomus* can be criticized on this score. Growing to over a foot in length in their natural habitat, they are much too large for the average aquarium. Even if pur-

chased in a very tiny size, their rate of growth is such that it is only a matter of time before larger quarters must be found for them. Experience has shown that they are prone to dig into the gravel and uproot plants when they get large. Worst of all, certain cantankerous individuals may actually attack other fishes. The beginner is certainly encouraged to avoid this "gentleman" and substitute the more cooperative *Loricaria* and *Otocinclus*.

Occasionally, a few miscellaneous species of catfishes are found in the aquarium. Bubble-nest building catfishes of the genera *Hoplosternum* and *Callichthys* are unusual in ap-

Continued overleaf 1st column.

CATFISHES *continued.*

pearance, active in aquaria and are good scavengers. However, they do grow to about 6 inches and will outgrow the smaller sizes of aquaria. Glass catfishes are sometimes to be had and, to some, are the strangest catfishes of all. If the aquarist has a spare evening, he might try counting the vertebrae on this fish!

There are a number of catfishes that are definitely not beginner's fishes. Foremost among these are the expensive African catfishes such as *Clarias*, *Synodontis*, *Heteronuestes*, etc. and the infrequently seen South American catfishes of the genera *Pimelodella* and *Pimelodus*. These catfishes are decided predators and will easily swallow fishes a third of their own size. Of course, as curiosities and with fishes their own size, they may be successfully maintained but as such, cannot be classified as beginner's fishes.

None of the catfishes can be said to be easily bred. A great many spawnings do occur with no assist from the aquarist and therefore fall into the "accidental" category. Of those that are bred with the least difficulty, it appears that the time required to condition the breeders is very long. It is a rare occurrence if more than two spawnings are obtained from one pair during any one year. However, *Corydoras aeneus* can be spawned regularly and many times a year.



As a summary it can be said that *Corydoras* and, to a lesser extent, *Otocinclus*, and *Loricaria* should form the bulwark of the beginner's catfish force. For that "something different touch" might be added an occasional glass catfish or, if a 20 gallon or larger tank can be supplied, a bubble-nest building catfish. As far as those unusual and expensive catfishes equipped with suspiciously large mouths are concerned, the beginner should think twice before admitting them to a community aquarium. In this case, the "community" might shortly consist of only catfishes! ●



SCALES *continued.*

layer of skin over the scales, usually thin and transparent so as to be almost invisible, though occasionally,

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as with brook trout, it is fairly heavy and makes the scales hard to see. In the eels the skin is so dense that the scales are entirely hidden. Only rarely is a fish's skin unprotected by scales, and then it is usually ossified, as in the sea horse.

All fish scales are actually dead material, being the chemical products of the skin's activity. They may be formed in either of two ways. In the sharks and rays the skin is blown out into minute papillae, the outer layer becoming enamel-hard by the deposition of chalk, rather like the formation of teeth in animals and human beings. In most other fishes the scales are formed as simple plates in the inner layer of the skin or dermis. They do not protrude and are mostly circular or ovoid in shape. These may be further classified into two distinct forms: the ctenoid, or wavy-edged spiny scales, on such fishes as perch and bass, making their bodies rough to the touch, and the more usual evenly curved cycloid or smooth scales, found in soft-rayed fishes like the salmon, carp, trout and herring. But there is no fundamental difference between ctenoid and cycloid scales, for they sometimes both occur on the same fish. For example, the dab has prickly ctenoid scales on its dark upper surface and smooth cycloid scales on the underside.

When a fish hatches from the egg it is quite scaleless or naked. One or two species, such as the catfish, remain that way throughout their life,

but the majority develop their scales before they are much older; minute plates appear in the skin and soon form a complete covering. Coarse fishes have their scale covering when they are between ½ in. and 1 in. long, whereas salmon and trout then are usually about 2 in. long. A fish's total number of scales is determined early in its life, no new ones appearing later except to replace any lost accidentally.

The forward end of each scale lies embedded in the dermis, or inner layer of skin, and the free after-end so develops that it covers the front end of the scale behind it, rather like tiles on a roof. This means that the free end of the scale is the only visible portion, though it is very much smaller than the complete scale.

As a fish grows, it must continue to be covered in this overlapping fashion. This is not done by increasing the number of scales but by each individual scale growing to keep up with that small portion of the creature's body which it covered originally. Such growth is achieved by adding new rings of dentine around the edge, in a somewhat similar fashion to the way a tree grows. ●



"I'll see your *Discus* and raise you 12 *Angelfish*!"

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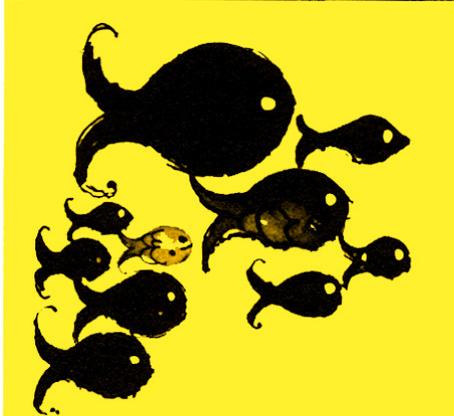
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Basic Needs

WITH the many "gadgets" available to the average beginner in the way of well designed aquariums, thermometers, heaters, thermostats, aerators and filters, there is little left for him to do but satisfy the three main needs of his fishes to keep them in perfect condition. Those three main needs are vitally important, and no matter how well set-up a tank may be, unless those needs are correctly met, disaster is a foregone conclusion.

First comes the matter of feeding. It has been stated many times that fishes (or any other animal for that matter, including humans) can be quickly killed by the mistaken kindness of over-feeding.

Fishes in nature sometimes go a long time between meals. It may be a matter of hours, days, yes, in some cases even weeks. They are *used* to being hungry by nature, and anything that we may do to upset this routine will surely cause trouble. Therefore, it is the *kindest* thing you can do when you keep them hungry. This does not mean practical starvation by any means. Just hungry to the point

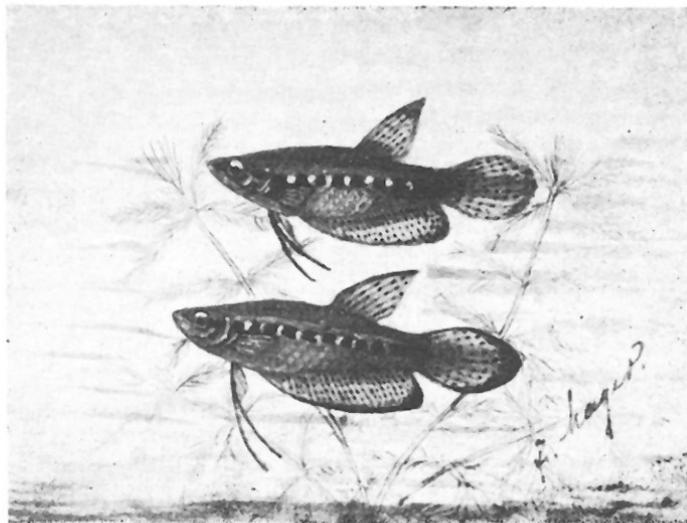
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A PETITE BUT

PRETTY GOURAMI

THIS pretty little fish, formerly known as *Ctenops pumilus* was first introduced in Germany in 1913 and is said to occur in Siam, Cambodia and throughout the Malay Peninsula in swamps, rice fields, ditches and the low lands of the mouths of rivers. It attains a length of 1¾" and is an excellent aquarium fish.

and colorless. The ventrals are yellowish. Dorsal is greenish with rows of dark reddish-brown points, and the anal fin has the same color and markings. The center of the caudal fin is a yellowish green with rows of red-brown points and a red-brown extreme border. When a strong light falls on the fish it shows an iridescence that is striking in its beauty.



The body is elongated, compressed and shaped as shown in the illustration. The male coloration is an olive-green on the back; sides are light olive-green with belly and tail a greenish white. From the top of the snout runs a band of dark-blue-black spots on down to the root of the tail. The tail is bordered by bright green spots and lines. Light spots are also between the black blotches of the lateral band. The pectorals are transparent

The female coloration is subdued.

Trichopsis pumilus is quite peaceful and can be kept in a community tank with other small fishes. For breeding, a four gallon aquarium is sufficient. It should be thickly planted with Cabomba, Myriophyllum and Nitella with Pistia or Water-fern on the surface. The water height should not exceed 6 inches. Temperature, 70 to 80 degrees Fahrenheit. No aera-

Continued overleaf 1st column.

tion is necessary. *T. pumilus* likes all kinds of small living food. At first they are somewhat shy but soon become quite tame. The croaking sounds which are produced by the related *Trichopsis vittatus* are never heard from the dwarf *Trichopsis*, either when fighting or during breeding.

When the female becomes ripe with spawn, the male builds a bubble-nest under a floating plant, then after a short love-game they spawn as a rule during the early morning hours. The young ones hatch after 24 to 36 hours and hang under the bubble-nest like tiny black "commas," solicitously guarded by the male parent.

The fry must be fed with the finest of living food. The parents can be left in the aquarium as they do not molest the young ones if fed sufficiently with mosquito larve or similar live food. A principal condition for success in breeding *T. pumilus* is to keep a uniform temperature of about 80 degrees and a cover on while the fry are young. The cover should not be lifted if the temperatures between the room and the aquarium varies even a few degrees. 

Beginner's Rules continued.

where they are always eager for a meal.

Hungry fishes are usually healthy fishes, and the best way to keep them that way is to feed sparingly. As a guiding rule, feed about as much as they can easily clean up, and we mean really clean up, in five minutes.

But for all around good health and general routine feeding, be guided by the five-minute rule.

As to what to feed, that again is another story, but here the Beginner should try to plan a balanced diet of both living and prepared foods. Almost any of the well known brands of prepared foods sold by leading dealers

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are good wholesome foods. Most dealers too carry live foods in season such as White Worms cultures, Tubifex Worms and Daphnia. For those fishes large enough to eat them, nothing is better than an occasional meal of finely chopped earthworms that may be had for the digging. These can be found in the winter time under sheltered spots where the earth is a bit moist and protected from freezing by old logs or fairly deep layers of rotting leaves.

Next in importance to good feeding is the need for plenty of air-surface space per fish. There is hardly an aquarist today, who at one time or another has not been guilty of over-

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crowding. When fishes gather at the top of their tank "bubbling" for air, they are in reality on the verge of suffocating. That is if they do it constantly whether anyone is near their tank or not. Sometimes fishes that are reasonably hungry will come to the top looking for food when someone comes near their tank. This is different from the frantic gulping that they do when they need air due to overcrowding, foul water, or any other situation which might cause them distress through lack of oxygen. Such a condition needs immediate attention and relief. There are three ways to handle it. First, reduce the number of fishes in the tank. Second, increase the air-surface of their water by giving them a larger tank. Third, apply mechanical aeration. Rather too few fishes for a tank than even one too many is a safe rule to guide the Beginner. One way to estimate the required surface space for Goldfish is to have just one inch of fish, not count-

ing the tail, to every 25 square inches of water-surface.

As for the Exotics — small fishes, Guppies for example should have at least 3 square inches of surface per fish. Larger Exotics such as Swords, Platies, etc., need about 6 to 8 square inches. Medium sized Barbs and similar sized fishes need about 20 square inches, and the large fishes such as the big Barbs and Cichlids of 5-inches or more require not less than 54 square inches of water surface to get along happily. These figures are the *least* per fish that can be used to keep the fishes alive. For good healthy, growth and breeding these figures should be doubled and tripled if possible.

The last of the three most important needs of your fishes is to keep them in even temperatures. To submit them to sudden temperature changes simply means to invite disease, the most common being "shimmies" — "ichthy" and "fungus," either singly or altogether.

Most temperature changes are inadvertently made by guessing at the temperature of the water that is being used to completely change or partially change the water in a tank. It is best to be sure. Use a good thermometer and not just guess with a "finger dip." A 2-degree difference is all that can normally be considered as safe.

Water changing should be handled with a good bit of care and discretion. Do as little of it as possible. Avoid situations which might make water changes necessary such as the direct action or reaction of over-feeding or over-crowding. Then again, either too much or too little light might make it necessary for a full or partial change of water. Watch the danger signs carefully and if the water has to be changed, make sure it is the same temperature as the water to which the fishes were accustomed.

It is by taking care of these three basic needs of your fishes, namely, proper feeding, plenty of air-surface space and suitable even temperatures that you will be assured of a fair measure of success. 



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Cutting Jars- A Hint

THERE IS NOTHING difficult about cutting down a glass preserve jar to make an excellent, non-toxic container for an aquarium plant needing a compost richer than plain, washed gravel, or in cutting down a large pickle jar to make a convenient aquarium to serve as a breeding tank for small fishes or a quarantine tank.

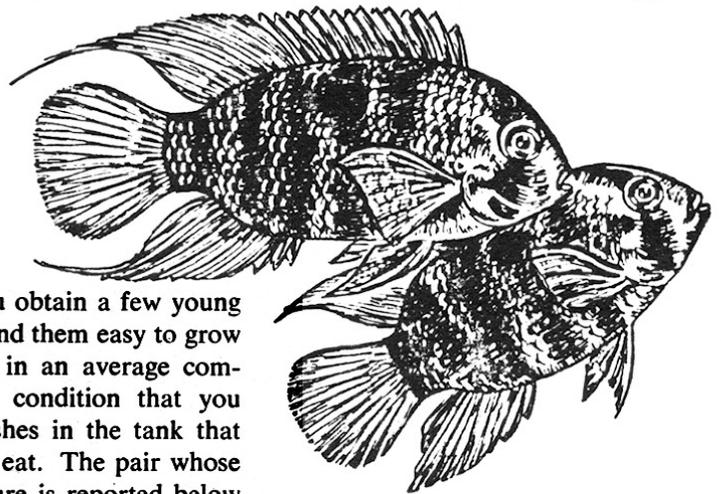
To make such a container, all you have to do is to wind three or four turns of darning or knitting wool around the jar at the desired height, moisten the wool well with alcohol (wood alcohol is best), and set it alight. The instant the flames have died down, hold the jar under a dripping coldwater tap. The glass will then break right round where the wool was with a sudden crack. To make the cut-down jar safe to handle, blunt the razor-sharp edges with a few rubs of a carborundum stone. If the jar is to be used as a tank, the edges may also be bound with vinyl electrician's tape.

A BEGINNER'S CICHLID-

THE BLUE ACARA

THIS FISH is one of those that you rarely see in the average dealer's tanks, at least in the adult state. Like myself you have no doubt admired it in a friend's tank or in a public aquarium and, because of its average adult size (about 5½ in.), you have thought that it is not for you; and the smaller acaras offered for sale do not have the full spangled color of the

plates make them most attractive, especially with front lighting. Both sexes look alike until 2½ to 3 in. long, and even at sexual maturity fullness of the female seems to be the only true indication of sex. After this size, sexual by-play in the tank will usually tell you which are the males and females, but as the fish progress to their mature state, it is apparent



adult. But if you obtain a few young acaras you will find them easy to grow on to adult size in an average community tank on condition that you have no baby fishes in the tank that the acaras could eat. The pair whose breeding procedure is reported below were comparatively well behaved in a 3 ft. community tank and though they did eat one or two baby guppies they did not attack the adults nor even a neon tetra until they reached 2½ in. in length, when they were removed to another tank.

The name blue acara seems a little misleading as, in common with other cichlids, they have a number of color phases and appear different in various lights. In the adults, the bright-green spangles around the mouth and gill

that the fins of the males are a little longer than the females and the crests of the dorsal and anal fins drawn out into a thin filament which reaches as far as, and sometimes beyond, the end of the tail. The body of the male is also more laterally compressed than that of his partner, and he is generally more aggressive. Color is no indication of sex, as the female, if ready to spawn, will often maintain a more constant color than the male. The

Continued overleaf.

ten or so vertical dark bars on both fish are of very variable intensity, according to the moods. *Aequidens latifrons* is the name by which this fish has been generally known and this makes reference to its flattened forehead. In keeping with the general appeal of the adult fish, it is often known in other countries as *A. pulcher* (which means pretty).

Feeding these fish presented no problem as they had the same food as the other fishes, mainly white worm, *Daphnia*, *Tubifex* and occasionally some of the cat's tinned food. They will occasionally eat dried food, too, especially if it is of animal origin.

As the broods of the cichlids are usually large, the tank which was set up was 27 in. by 12 in. by 12 in., although only 8 in. of matured water was added. By matured water nothing special is indicated, just water from an established aquarium, in this case from the community tank. From the garden, some flattened sandstone and Portland stones were used to make a cave (about 6 in. cube) at one end of the tank, and three flat rocks were pressed into the gravel over the remainder of the tank.

Temperature of the water averaged 80° F. on introduction of the breeding pair, who immediately took it in turns to chase one another around the tank. Next day it appeared that the female, although her fins were a little torn, could still put up quite a fight, and knew at which strategic time to dash into the cave into a little recess which seemed to be made for her alone — as indeed it was. The male in the meantime had started to polish the flattened stone with his mouth and the female helped from time to time.

As the female spent quite a lot of time in the cave and chased the male away, I placed a sheet of glass in front of the cave and separated the pair. Almost immediately each fish swam up and down its side of the glass, "kissing" one another through it. Separately fed on live food, there they were left for 2 days, during which time they never left the glass face for more

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than a few seconds. When the glass screen was removed, both fishes had settled their differences and were the best of friends, kissing and nudging one another. That same evening, they had locked their jaws together and were pulling and twisting each other, as in a tug-o'-war.

Next day the female had retired to the cave and would not let the male come near, so he continued to wander around the tank occasionally polishing a piece of rock from time to time. In the evening both fish were in the cave as it became dark. On the following day he was once again outside, with a difference. With a long-focus magnifying lens and a strong light I could just make out rows of eggs, rather large ones, each about 1 millimeter in diameter and of hyaline appearance, on the vertical face of the inner wall of the cave. The female was fanning the eggs with her pectoral fins in a regular manner, going up and down the rows; at the same time she kept a watchful eye on the male to prevent his entry.

Incubation of the eggs could be seen only with difficulty, as it took place 8 in. from the front face of the tank. Three days later the female had placed them in a pit in front of the tank, where she mounted guard over a circular mass of wriggling little golden bodies, which, because of a heavy yolk sac, were standing on their heads. These young fry were around 3/16 in. long and were kept in neat order by their mother, who continued to fan them with her fins. She may have taken exception to the writer, who peered at them through a short-focus lens, for she continued to move them to little pits in various parts of the tank until 4 days later they fol-

lowed her about in a most attractive little school near the bottom of the tank at all times. A scraper used to clean the front glass was vigorously attacked by both parents and the male even bit my finger.

The fry were fed on brine shrimp, micro worms, tinned fish and *Tubifex* and grew rapidly until at the tenth day they were 5/16 in. long and the parents were removed. From then on the young fry exercised their individuality and swam in all areas of the tank, eating until their little tummies were bulging. By this time they appeared to be more of an attractive golden color, on their under surfaces at least, and the first green spangles showed on the gill plates 14 days after hatching.

Raising the fry was no problem and they were consistent in growth, there being no great variation between the largest and the smallest members of the family. Growth is fairly rapid and pleasurable to watch. There were 187 fry in this batch.

Tropical queries

How can I prevent tubifex worms establishing themselves in the sand on the bottom of my aquarium?

A couple of hard-working compost-sifters such as *Corydoras aeneus* will soon clear tubifex out of the sand, but prevention is better than cure; so make certain that the fishes are not given too many of the worms at a time, and delay the worms entry into the water by covering the bottom of the perforated feeder with a good thickness of nylon wool.

Can algae kill fish?

Thick growths of thread algae can trap and smother small or delicate fishes. Also, as free-swimming algae dies down it sometimes results in a build-up of poisonous gases and this, in a balanced aquarium not freshened up by the addition of clean water, may lead to the rapid extinction of all higher forms of animal life.

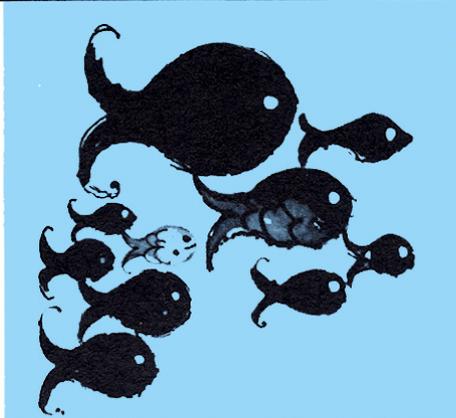
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The Aquarist's Notebook



DON'T PASS UP

THE DWARF GOURAMI!

THIS BEAUTIFUL little fish is not seen as often as it deserves, but in my opinion it is most attractive. Dealers, when they do stock it, have such small specimens that their customers usually buy something more colorful, especially if they are stocking a community tank. If they had seen the fully developed fish in a dealer's tank they would waste no time in adding it to their collection.

and *Daphnia*. Temperature of the water was 80° F. and a few plants were thrown loosely into the water to make the fish more at home; the tank was intended to be a temporary home until they could put on a bit more weight. Three weeks later, when the six fish had shown themselves to be two males and four females, it was decided to separate the sexes. It was then that I first saw a

TROPICAL QUERIES

Would you recommend *Aploncheilus lineatus* for a community tank?

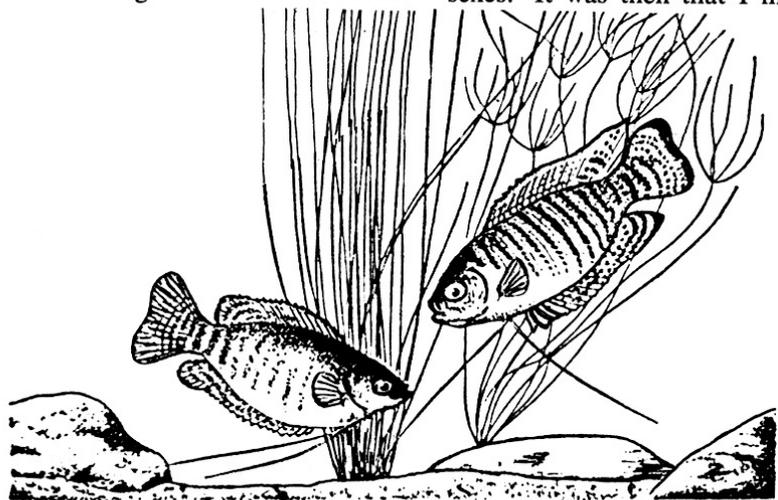
A lineatus is not to be trusted with much smaller fishes. But young (small) specimens are no danger at all and even larger ones are seldom any trouble if their companions are too large to be swallowed and keep to the lower levels of the water.

What is an anchor worm?

The anchor worm is a parasitic crustacean with a worm-like shape. The female of the species clamps herself to a fish, upon which the parasite feeds, by means of hooked appendages. The wounds made by these hooked appendages almost always lead to the development of bacterial and fungal complaints. It follows, therefore, that even if the fish is not killed by the parasite itself, death will result sooner or later from these secondary infections.

I am planning to make a garden pond and would prefer to use concrete. Would you please tell me the advantages or otherwise of plastics versus concrete?

A concrete pond is harder to make than one made with Butyl sheeting. The price might be more for the latter, but the pond could be made and stocked much more quickly than if concrete was used.



For this reason, I have never been able to purchase adult fish, as they are not often available. So, as the best text-books advise, I bought half-a-dozen healthy-looking youngsters and I didn't see much in the jar, as they were only half an inch long and, of course, unsexable.

Left in a tank of their own, 12 in. by 8 in. by 8 in. in size, with water from the community tank, they were fed on white worms, fine dried food

neat little bubble nest with *Riccia* and strands of bladderwort woven into it. This nest was about half an inch high and contained a few eggs, which I removed and brought up in a shallow pie dish floating in the larger tank. The males at this time were approximately 1½ in. long and in wonderful color, with their sloping bars and green-spangled areas on the gill plates, fins similarly barred and

Continued overleaf

with a definite prolongation of the trailing edge of the dorsal fin. Females were a silvery mauve color, and faint bars could be detected in certain lights, but all the females were distended with spawn.

As you see, the size of the tank did not deter these little fish from breeding, but it was not ideal and a likely looking pair was taken out one week later and introduced into a 24 in. by 12 in. tank with a water depth of 6 in. Matured water was used as before and average temperature was 82° F.; pH was noted as 6.8. Plants were arranged at each end (*Cabomba* mainly), with a half-inch layer of bladderwort and *Riccia* at the surface. This larger tank is almost a necessity, as will be explained.

Almost immediately, the pair of fish took stock of their surroundings and courtship started, with spreading of fins of both sexes and their finest display of colors. The male, who never seems to lose much of his pattern at any time, was really beautiful and even the female seemed to shine brighter. Before long, both of them were blowing bubbles in a disorganized fashion at the surface, fine bubbles such as often occur just above the heater. This was in the late evening.

Next morning, at about 7 o'clock, the pair were finishing a well-constructed nest of fine bubbles, bladderwort and *Riccia*. After an hour they started spawning, as the female approached the male, swimming by his side until he swam a little higher. Then he arched his body across the back of the female and it seemed that his head was actually touching his tail, as he squeezed steadily on the bulging sides of the female. Together the pair rolled over an inch or so below the nest in their embrace, and though it was not apparent to me at first, about 10 to 20 very minute eggs left the female.

At this point the pair separated and the female appeared lifeless and lost height in the water, but she recovered before touching the bottom of the tank and swam upwards, blowing a few fine bubbles at the same time.

The eggs almost immediately floated up to the nest. This procedure was repeated over a period of 2 hours and at this time the nest was compact and most of the eggs were on its under surface. Afterwards both parent fish were removed.

The eggs were quite different from what was expected from my experience of other bubble-nest builders. These were pelagic, that is to say floating, unlike those of the fighting fish (*Betta*), which have an immediate tendency to sink. Most surpris-

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ing, however, was their small size, about ½ mm. diameter, very clear and faintly amber. At first they were difficult to see with top light, but with a side light, they could be seen to be faint golden spheres of the same size as the bubbles, though not depending on them for support.

Removal of the parents is optional, as though some aquarists say that the male is liable to bully the female after spawning, I have never found it to be so; as the eggs float quite well, his presence does not seem so necessary as it is with the fighting fish.

Development of the eggs proceeds quite rapidly and in 12 hours some opacity is apparent. At 24 hours minute black specks can be seen and, after a further 24 hours, some of the fry can be seen upside down just below the surface; and soon they are making little circular tours in a manner reminiscent of tadpoles, though returning to the surface each time. On the third day they are only about 2½ mm. long, on an even keel and taking Infusoria. On the fourth day they swim at various levels with complete confidence, and as they are now scattered all over the tank the aquarist is liable to think his batch is lost. A

good magnifying glass and a strong light will show that this is not so.

Feeding continues with Infusoria (or, as I prefer, a professionally made substitute), until the end of the week, and then they are graduated on to micro worms, brine shrimps, small *Daphnia*, shredded earthworm and dust-fine dried foods. Growth seems to me to very slow at first, but it is here that the necessity for a fairly large tank becomes clear.

As most of the feeding is carried out at or near the surface, this area needs to be as large as practicable. Light aeration helps in bringing up the batch, which may be of as many as 120 fry, though at the end of the first week they seem to be reduced in numbers and this could be due to several factors. Infusorial feeding and fine dried foods in a small tank tend to produce contamination, both mechanical and also bacteriological.

Over a number of spawnings of average size, I have only ever averaged 45 to 50 fish brought to maturity. Full maturity for the dwarf gourami means about 2 in. long for either sex. Seen with a front light when adult, the males are most attractively colored and, as stated before, this may be the reason they are not often to be purchased in their adult condition. Another reason is their shyness in a community tank, in which they often find themselves. Most dealers have a few in a new consignment, and I would advise you to sort out these from their more colorful companions while they are young. Breeding them is a very pleasantly rewarding occupation and those in my tanks have always caught the eye of people who have never actually seen these fish in full color, and are therefore not sure if this is the dwarf gourami or not.

In a large collection it seems to hold its own without being quarrelsome, and the males do not fight or become unduly aggressive to females.

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STRANGE REPRODUCTION

SPAWNING the swordtail characin (*Corynopoma riisei*) is an easy and most interesting process. Members of this particular species of the family Characinidae are cheap and readily obtained from dealers, and as so few difficulties are presented when breeding, it is a wonderful fish for arousing interest and confidence in the novice.

The swordtail characin grows to about 3 inches and breeds at 2 inches, by which time the male fish can be identified by the club-like extension to his operculum (gill cover). When I was a novice (with a somewhat de-praved mind), I thought that this appendage was used solely for battering females into submission or for use when assaulting other fishes! This is not true, for in fact I found that the swordtail characin is a most peaceful species and makes a delightful addition to the community tank.

Breeding should be allowed to take place in quite a large tank, one of at least 15 gallons capacity (24 in. by 12 in. by 12 in.), as these fish are extremely prolific in their spawnings. They produce around 300 to 400 fry

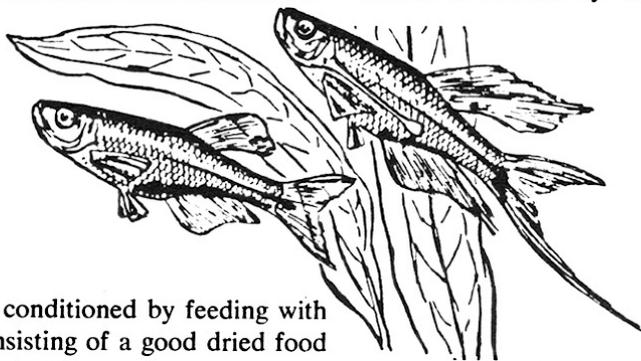
at each spawning when fully grown.

The breeding tank should contain soft water with a pH 6.8, i.e. slightly acid. The temperature of the water, normally most suitable at 75° F., can be increased to 82° F. as a breeding optimum. The tank should contain plenty of dense vegetation in which the female can lay her eggs and which will also provide seclusion for the fry when newly hatched.

A suitably matured pair of swordtail characins can be introduced to the

The eggs of the female are discharged from the ovaries at spawning time but remain in the oviduct until they are fertilized by the male spermatozoa, after which they are expelled from the body of the female and deposited by her on the vegetation, etc., where they remain until they hatch.

Eggs of the female swordtail characin are dermersal eggs, i.e. (i) they are adhesive and possess sticky membranes or threads by which they are



tank and conditioned by feeding with a diet consisting of a good dried food well varied with plenty of live foods.

Before long, the fish will become extremely active with the male fairly prancing around the female and showing off in general. As the male's agitation increases, the club-like extension (known as the "corynopoma") on the operculum will become enlarged and stand out at right angles, in contrast to its normal position at the side of the body. The male will then effect copulation with the female by curving his body and directing sperm at the ventral opening of the female.

attached to various surfaces in the breeding tank (this sticky secretion is apparently not soluble in the water); (ii) the eggs are found to possess a specific gravity a little greater than that of water, which means that if any of the eggs become detached from their surroundings they will immediately sink to the bottom of the tank.

The spermatozoa produced by the testes of the male swordtail characin are formed into compact balls in the sperm vesicles and are then known as spermatophores. In these sperma-

Continued overleaf

tophores the tightly packed spermatozoa are held together by some form of gelatine or matrix which is unaffected by contact with water, but which dissolves after entry into the ovary-uterus of the female, and releases the spermatozoa. These spermatohores can be examined microscopically if taken with a pipette immediately after copulation from the ventral opening of the female.

Although the male fish makes many "attacks" on the female by curving his body and firing spermatohores "cannon-fashion" at her ventral opening as he passes, very few direct hits are necessary as each spermatohore is found to consist of many thousand of spermatozoa.

In some circles it is thought that the corynypoma assists the aim of the male when firing spermatohores. From experiment I have found that the corynypoma is sensitive to touch, which could possibly indicate that it helps the male with his aim if it is used as a "feeler." There is also the possibility that nerve fibres in these structures could be instrumental in triggering-off the release of the spermatohores.

When the male swordtail characin has temporarily expended himself, the female will retire alone to the vegetation, where she will deposit the eggs thath have by this time, been fertilized.

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The action of the female in entering the vegetation and depositing her eggs unaccompanied by the male has led some aquarists to believe that the male spermatozoa are released into the surrounding water, where they are gathered in the mouth of the female. The female is then thought to fertilize the eggs herself with the captured sperm. The internal fertilization process of the female swordtail characin can be ascertained by a biological examination.

The fry appear to be quite hardy and can be fed immediately on Infusoria. It should be remembered, when the young are hatched, and possibly before this stage, that the parents will require to be kept from committing infanticide.

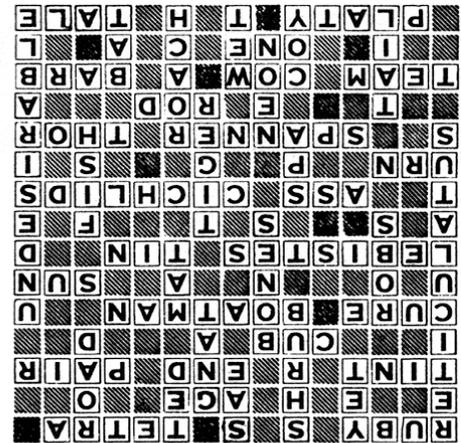


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Crossword Solution



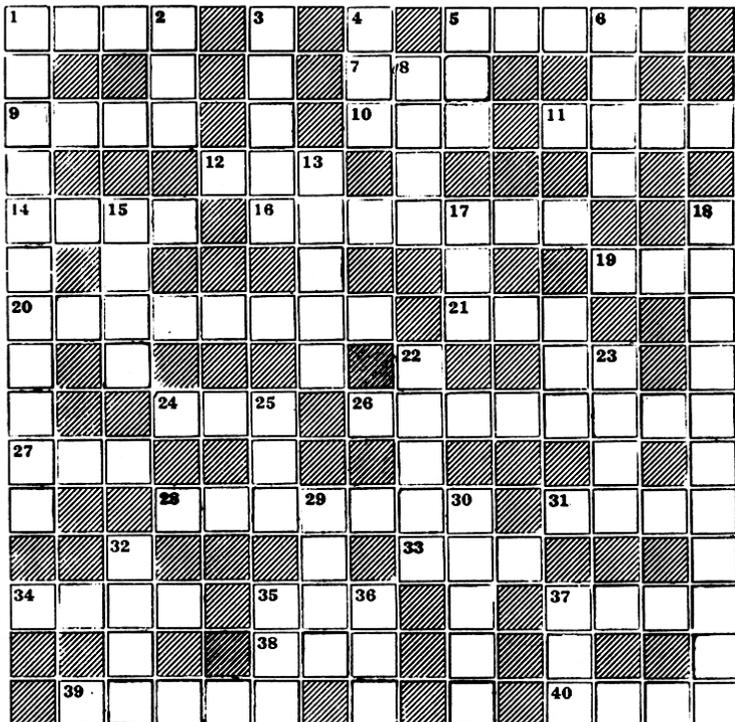
Crossword

CLUES ACROSS

- 1. Precious stone
- 5. See 29 down.
- 7. Long time
- 9. Color lightly
- 10. Ned terminates
- 11. True ones required for breeding
- 12. Young lion
- 14. Needed for *Ichthyophonus*
- 16. Type of beetle
- 19. Heavenly body
- 20 & 1 down. Millions fish
- 21. Metal obtained from *Barbus schwanenfeldi*
- 24. Long-eared quadruped
- 26. Usually a pugnacious family
- 27. Water container
- 31. Scandinavian god
- 33. Used for catching fish
- 34. A good one will win the breeders' class

CLUES DOWN

- 18. What white spot in the tank s.
- 22. This cat is also a barb
- 23. See 35 across.
- 25. Health resort
- 29 & 5 across. *Hyphessobrycon innesi*
- 30. *Rutilus rutilus*
- 32. Caudal fin
- 35. Shy
- 36. What all fish must be
- 37. Club got from *Platax orbicularis*



Tropical queries

I have two half-grown discus living in a thickly planted 36 in. by 15 in. by 12 in. tank. What other fishes could I keep with them?

Small fishes such as neon tetras, guppies (the fry of which will provide a useful food for the discus) and harlequins can be placed with discus. But do keep careful watch that any fishes introduced into the discus tank do not rob the cichlids of their food.

I have a grey-coloured catfish, with a body outline not unlike that of a rather plump botia, and a forked caudal fin adorned with horizontal bands of black and white. The barbels on the mouth are long and whip-like. Could you possibly identify this catfish for me?

I would say that your catfish is *Dianema urostriata* from Brazil.

Is it true that salt will kill catfish?

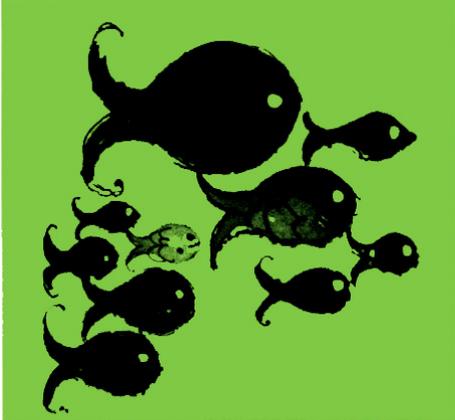
Some catfish are sensitive to salt in the water, but the general run of species can stand slightly saline conditions. Do not overlook the fact that some species of catfish are found in the natural state in brackish water.

What is the life-span of a well-fed platy kept in a spacious aquarium filled with clean, well-aerated water?

Roughly the same as that of a properly cared for guppy, which is eighteen months to about two years.



The Aquarist's Notebook



Beginner's Mistakes

ONE SATURDAY I was (as usual) in one of the local aquarium stores and listened to the customer before me buying fish: "I'll have two of those—do they fight?"

This reminded me of the mistakes newcomers always make when first beginning. In this case furnishing a community tank with incompatible species. (I've lost \$8-worth of fish this week!) Well, of course, we all do it—like the guy who made an all-wood tank, except for the window, to a friend's specification and set it up in the spare bedroom for breeding Platys. His wife rather objected when she was almost swept out of the front door, when ascending the stairs, by approximately forty gallons of water descending rapidly. The watermark on the stair carpet is quite pretty, though.

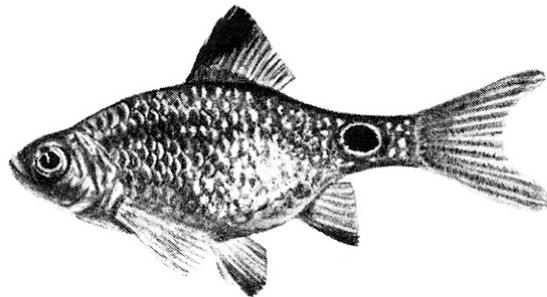
And then, of course, there are the mistakes which aren't really mistakes, as well. You could call them environmental effects. Like the controversy which used to exist regarding changing aquarium water. Some people have aquaria for years and only top them up—others change a percentage each

Continued overleaf 2nd column.

FUN WITH THE ROSY BARB

THE ROSY BARB — scientific name *Barbus conchoni*—is deservedly popular because it is colourful, peaceful, frequents all levels of the water, and has a life-expectancy of some four or five years. Furthermore, it has the qualities that count for much with aquarists—hardiness (it has a temperature tolerance of from about 65°F to 85°F), and a readiness to breed.

of silver, gold and coppery red. There is a greenish gold iridescence on the gill-covers. A black blotch or spot with a gold margin is present near the tail. The fins are yellow to orange red, except the pectorals which are clear. The dorsal, anal and ventral fins have black tips. The female is a more sombre-hued fish altogether: in general her sides are plain olive to olive green



Ordinarily it attains a length of about 3 in. (6 in. in the rivers and streams of its native India) and is therefore more suited to a 24 in. by 12 in. by 12 in. or larger tank than one of smaller proportions. For breeding, however, an 18 in. by 12 in. by 12 in. tank is acceptable (to the fish) if not ideal. But more about breeding later.

For the benefit of the beginner, a few words about the physical appearance of the fish will not be out of place. In body shape it is typically carp-like. That is to say in outline rather like a compressed spindle. The male is greenish brown on the back, light olive on the sides and white tinged with pink, or red, on the belly. The scales have dark edges and reflect metallic gleams

with a silvery sheen but, in common with the male, she does sport a dark spot on the posterior part of her body. Her fins are at best a translucent greenish yellow; they have little or no dark colour along the margins or tips. The species lacks barbels.

There is no mistaking a pair of *B. conchoni* in breeding condition; for, apart from the remarkable improvement in the coloration of the male (a fiery red through which the scales sparkle like diamond chippings) the female shows markedly distended sides. There is also increased activity on the part of both sexes.

As has been mentioned above, a tank no larger than 18 in. long may be
Continued overleaf 1st column.

ROSY BARB *continued.*

used for breeding, but as the male is a vigorous driver a larger tank allows for more freedom of movement and more space for the fry to develop properly after breaking free from the eggs. This they will do in about forty-eight hours.

Spawning usually takes place under the influence of a strong natural or artificial light. There are some preliminary chasings and body-pressings in the plants and then, if everything turns out all right, egg-scattering takes place.

The tank set aside for breeding should contain clear, matured water (ordinary tapwater drawn two or three days previously is quite suitable) and some bunched sprays of *myriophyllum*, hornwort, *fontinalis*, or *elodea* (to name some of the most readily available spawning plants) weighted to a floor-covering of scrupulously clean sharp sand. The fish should not be subjected to any change of temperature when they are introduced into the breeding tank (last thing at night is advised), but after the transfer has been carried out the thermostat should be reset to give a temperature a little above normal.

Spawning in and near the plants may go on for an hour or more but immediately it is over the parent fish must be separated from the eggs with all possible speed. If you fail to do this all the eggs will be sought out and eaten in in next to no time.

As soon as the fry have absorbed their yolk-sacs, they leave the plants or the sides of the aquarium (where they have been clinging tail-down) and

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swim about in search of microscopic food. For about nine days then, such things as infusoria, flour-fine dried food and cupfuls of floating algae (green water) should be given several times a day. If dried food is given only the minutest sprinkling should be flicked onto the surface of the water. After nine days, the fry should be large enough to take micro worms, tiny *Daphnia*, brine shrimps, and pulverized flake food. 

MISTAKES *continued.*

week. Of course, both are right, but if you do either in the wrong area it is curtains for the fish. The reason? Well—if you live in an area where the water is hard and alkaline, you will be well advised to top up only, as the urine from the stock merely helps to reduce the pH which is all to the fishes' benefit, but in an area of soft and acid water the pH would reduce to too low a level for health, so water changing is ideal in these conditions.

Another mistake is to be dogmatic about undergravel filters. I personally used to have the firm conviction that one couldn't grow plants properly using them—until I visited a friend whose tanks all contained these filters and which were all chock full of plants.

The answer to this was again simple—my tanks had one inch of gravel at the front and three inches at the back, whilst his tanks had three inches at the front and five or six inches at the back. The depth of gravel was the deciding factor and the reason I used the shallower depth was that my tanks were shallower than his—being only twelve inches deep.

Another deep-rooted fallacy which we all follow at first is the balanced aquarium theory that you must have a tank containing gravel, plants and fish in the correct proportions to be successful, particularly if you want them to breed. These are, of course, attractive and practicable also if you only have two or three, but as soon as you set up a fish house you have to think again unless you want to live in it. Practically all commercial breeders, and a large proportion of advanced amateurs, use bare tanks and spawning mops (or peat for the killies) and maintain them for years perfectly successfully with a minimum of labor, no gravel and never a plant in sight. Growing plants is a separate branch of the hobby.

Over a period of more than ten years, containing disappointments and periods of elation, but always a quiet satisfaction with the hobby, I have found that one cannot generalize, or even accept information at its face value, but rather must analyze it, and compare the conditions with one's own before taking any action. Indeed, in some cases, action could be disastrous.

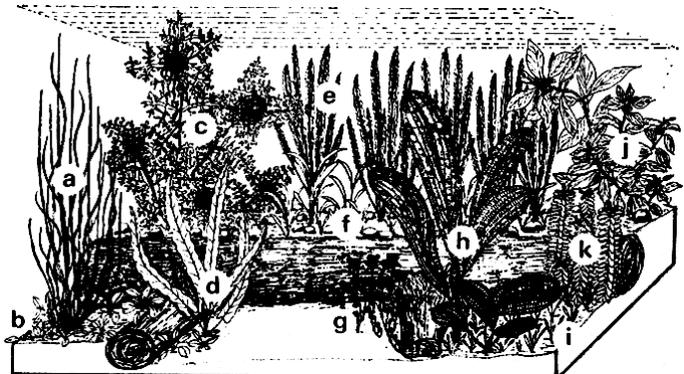
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The Aquascape Corner

In response to many enquiries from hobbyists requesting ideas and layouts on aquascaping aquaria, we have decided during the next few months to illustrate each month an aquascape which our customers may wish to use. Below are the plants used in the above.

Aquascape No. 1 (suitable for a 36 in. aquarium):

- (a) 5 *Vallisneria torta*; (b) 4 *Cryptocoryne lingua*; (c) 5 *Syn-nema triflorum*; (d) 1 *Barclaya longifolia*; (e) 4 *Cryptocoryne balansae*; (f) 5 *Cryptocoryne lucens*; (g) 2 *Marsilea quadrifolia*; (h) 1 *Aponogeton fenestralis*; (i) 4 *Echinodorus tennelus*; (j) 3 *Nomophilla stricta*; (k) 5 *Rotala rotundifolia*.





The Aquarist's Notebook



The Algae Problem

A READER recently asked how he could deal with an excessive growth of *algae* in his aquarium, a problem with which most aquarists have to contend at some time. It would be virtually impossible to find a decorative aquarium which did not contain a number of genera and species of *algae*—and in fact a number of fishes which we keep in our aquaria require a vegetable element in their diet, and *algae* often supply this element. However, it is only when growth of *algae* becomes excessive that they need concern the aquarist—except for aesthetic reasons.

If an aquarium does become infested with excessive growths of an *alga*, or of *algae*, what can be done? There are a number of steps which can be taken to either control the growth of *algae*, or attempt to kill them. The former is the safer method as it can usually be effected by modifying the environment in the aquarium without the use of chemicals; while the latter method usually entails the use of chemicals which actually kill the *algae* plants.

If an aquarium contains an appro-
Continued overleaf 1st column.

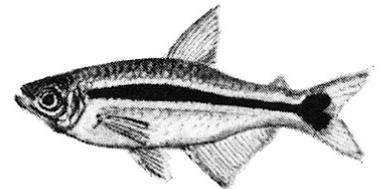
SPAWNING THE BLACK-LINE

THE black-line tetra was introduced to tropical fish hobbyists in Europe (Germany) from Brazil in 1936. In the same year, the late Dr. Ernest Ahl, a distinguished German ichthyologist, named it *Hypphessobrycon scholzei* for science.

The black-line or Scholz's tetra is well suited to a community set-up in which no fishes with voluminous fins are present; for, in common with not a few other tetras, it has a tendency to snap at and tear waving or fluttering membranous appendages as, for example, the caudal extremities of guppies.

But let's take a look at its appearance. The back is olive, the compressed though fleshy sides leaden to shiny silver reflecting greeny-blue to brassy tints, the underparts milky to ivory white. A dense black stripe, margined above and below by a thin piping of gold, extends from the shoulders to the caudal base, where it terminates in a bold black blotch that spills over on to the forked tail-fin. The anterior rays of the anal and ventral fins are white. The other fins are almost, if not quite, colorless or, in the precise language of the zoologist, hyaline. A full-grown *H. scholzei* measures 2 in. The female is the heavier bodied of the two. But be this as it may, there is a method of sexing this fish which, though not absolutely reliable, will sometimes help the aquarist make up his mind regarding the sexual identity of what is believed to be a pair. First, the two fish are removed from the aquarium and

placed in a close-meshed bag or net (wet, of course). Next, the bag or net is turned upside down over the aquarium. The first fish to drop out, that is immediately, is almost certain to be a female. Why? Because a number of the smaller characins — *H. scholzei* among them—have microscopic hooks in the anal fin of the male, and these get tangled in the fine-woven fabric.



Because the male is an ardent suitor, and chases a roe-filled female to and fro with great vigor, the tank for spawning this species should be at least 2 ft. long. It should be filled with well-matured water preferably on the acid side of the pH scale. Feathery- or bristly-foliaged plants, Java moss or warm water-grown hornwort, to name suitable species—should be weighted to the bottom.

Prior to being introduced into the tank set aside for spawning, the sexes should be isolated for about a fortnight to three weeks. During this period, they should be given their fill of rich food. As soon as the female shows fuller sides and the male a more glistening appearance, it is time to bring them together—in the breeding
Continued overleaf 3rd column.

appropriate number of healthy forms of higher plant life, it is probable that these plants will keep *algae* under control by using up the plant "foods," in the water, which are necessary for the *algae* to thrive. Higher forms of plant life—including floating plants such as duckweed and floating Indian fern—will help to shade the aquarium from excessive light; and most forms of *algae* require a reasonable amount of light if they are to thrive. Tall plants and floating plants will cut down the amount of light which enters the tank from above, while thickets of plants along the sides and back of the tank will cut down on light which enters the tank from the sides and back. Sheets of thick paper, or light cardboard, can also be stuck on the outside glasses of the tank to cut down excessive light. If you supply your higher forms of plant life with artificial plant fertilizers in any form, and are also bothered with excessive *algae*, cut out the fertilizers. Make sure that you do not over-feed your fishes either, as uneaten food can be broken down by bacteria to provide extra plant "foods." An air operated aquarium "vacuum cleaner" can also be used to remove excess fish foods, and fishes' droppings, which could encourage algal growths.

If the temperature of the water in your tank is kept well over 75°F, it can sometimes help control growths of *algae* if it is lowered to about 75°F. (This should be done gradually so that the fishes are not subjected to a sudden temperature drop.) You could also try reducing the amount of light which you supply to your tank. This can be done by cutting down on the number of hours for which the tank's electric lights are on each day, or by reducing the wattage of the bulbs or tubes fitted in the tank's hood. The former is usually the better of the two methods.

Certain species of fishes—such as mollies—eat *algae* as part of their diet, and can help keep them under control; but two particular fishes do a good job in keeping *algae* under control: the Siamese or Indian *algae*-eating *Gyrino-*

cheilus aymonieri and *Plecostomus plecostomus*, a catfish which is very fond of *algae*. Either of these fishes could help to solve the problem. Some kinds of snails will also eat small amounts of *algae*, but they do little good in this context and I certainly would not introduce snails especially to try to control *algae*.

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A more potent alternative is to use one of the chemical algicides available from most dealers. These need to be used with great care, and the directions supplied with the product followed to the letter. I have tried a number of such products over the years, and have found them to be reasonably satisfactory — although there are some species of higher plants which may be affected. (I have found that hornwort is sometimes killed by such products; and they may "burn" the growing tips of some higher plant species.)

If you are having trouble with *algae* in one of your tanks, you might care to try some of the methods of control which I have suggested, reserving the chemical forms of control as a last resort. Once you have managed to gain a hold over the *algae* in your tank, make sure that things stay that way by adjusting the aquarium's environment in a manner such that *algae* will be kept in their correct place; better still, adjust conditions *before* the *algae* get out of control, and then the problem should not arise. A planted aquarium is rather like a garden: few gardens are without weeds, but the good gardener ensures that he keeps his weeds under control. Few aquaria are without *algae*, but the good aquarist ensures that he keeps his *algae* under control. 

tank, of course. I suggest you do this last thing at night. Then, with good fortune on your side, mating will take place the following day. To begin with, the temperature of the breeding tank should be the same as the tank or tanks from which the fish have been taken, but after the fish have been set free in the breeding tank, the thermostat should be adjusted to give a slight rise in temperature.

Egg-scattering takes place during the many energetic drives. Most of the eggs—a hundred or more are scattered at spawning—come to rest in the plants, but those that don't are soon gobbled down by the keen-eyed and cannibalistic parents. To protect the eggs, then, the parents must be removed from the spawning tank as soon as spawning is over.

The eggs take two or three days to hatch out and the tiny fry hang tail-down among the plants, that is until they have absorbed their yolk sacs. Then they assume a horizontal position and swim off in all directions in search of food. Without question, the best food is fresh infusoria. Next best, flour-fine dried food or one of the proprietary liquid first foods. After about a week larger food should be given. Micro worms, micro eels, or brine shrimps are recommended. Within the space of a month the fry will reach a length of about ½ in. Maximum size will be attained in under a year.

The adult black-line tetra is always on the go and frequents the middle and lower levels of the water. It is a schooling species and, for this reason, is well suited to sharing a tank with other schooling species of a contrasting color such as the neon tetra or the bloodfin. It is about as hardy and as long-lived as these two species too, and can endure, temporarily, a temperature down to the middle sixties (°F) provided the fall is very gradual. 

THE AQUARIST'S NOTEBOOK

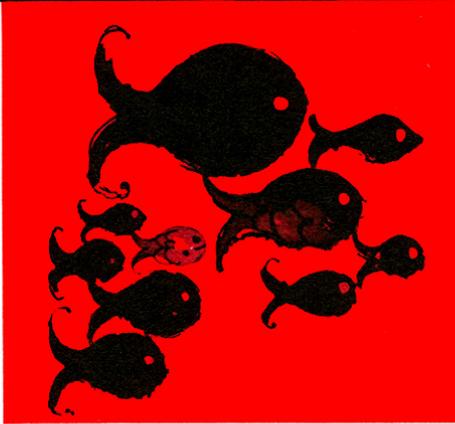
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Aquarist's Notebook - Volume VIII





The Aquarist's Notebook



About Swordplants

THE Small-leaved Amazon Sword Plant, *Echinodorus brevipedicellatus*, is an old and well-known aquarium plant. It gets its English name from the fact that there are other *Echinodorus* species with larger and broader leaves, and from its origin in the Amazon in Brazil. The latin name "*brevipedicellatus*" refers to the plant's short-leaf-stalk.

This is one of the really large plants for large tanks and the larger the tank the greater the plant will be shown to advantage. It is one of the standard plants in angel and discus tanks, as both these fishes like to spawn upon its leaves. Moreover, the plant develops a strong net of roots and can thus be used in most cichlid tanks even when the cichlids in question are generally regarded as plant-uprooters. If necessary small stones can be placed in a circle around the plant to help protect the roots from being dug up. It should not be planted in tanks with a water height of under 30 cm (12 ins.), in fact preferably not under 40 cm (16 ins.), as the leaves would then eventually lie along the surface of the

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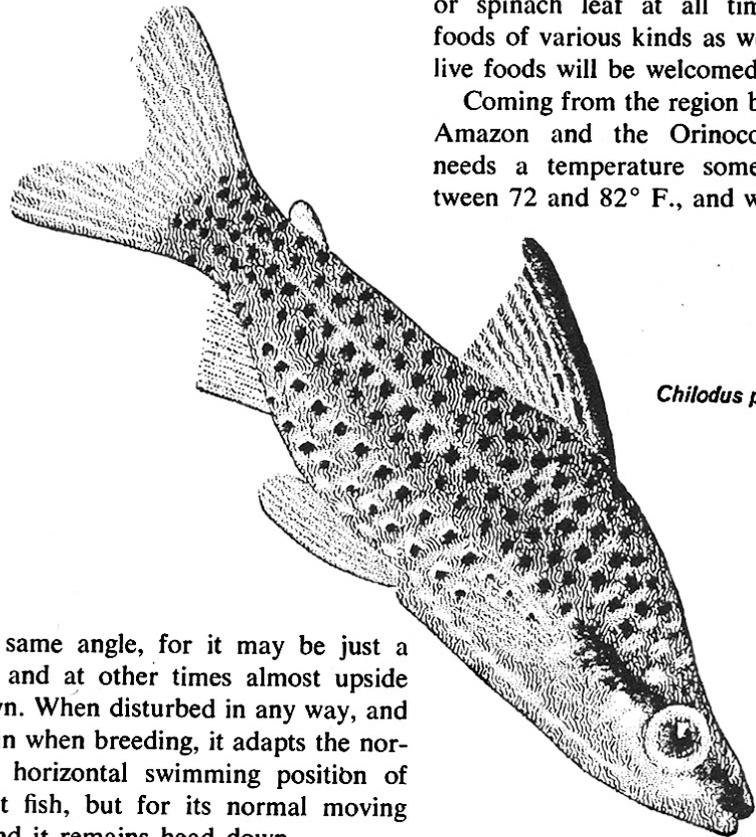
THIS FISH ISN'T

ON THE LEVEL!

THE Spotted Headstander, *Chilodus punctatus*, sits at an angle in the water. Instead of head up it is head down, and this stance is not always at

and is equipped with many small teeth near the lips, so that it can browse effectively on plants. In the aquarium it is usual to provide a piece of lettuce or spinach leaf at all times. Dried foods of various kinds as well as some live foods will be welcomed at times.

Coming from the region between the Amazon and the Orinoco this fish needs a temperature somewhere between 72 and 82° F., and with slightly



Chilodus punctatus

the same angle, for it may be just a tilt, and at other times almost upside down. When disturbed in any way, and again when breeding, it adapts the normal horizontal swimming position of most fish, but for its normal moving round it remains head down.

This, of course, tends to make it a bottom feeder, but it would be truer to say it feeds from the middle reaches to the bottom, usually on food that is below it. This is mainly vegetable matter, consisting of plants and *algae*, but it does take some live food, also. The mouth is small, at the end of the snout,

acid to neutral pH. The water should be very soft. It will be noticed that these conditions are similar to those needed by the pencilfish, and the two species will do well together—often causing some amusement because of their opposed positions in the water.

Continued overleaf 3rd column.

AMAZON SWORD *continued.*

water so that only the leaf-stalks would be visible.

This is a perennial plant with a short rounded rhizome from which the leaf-stalks extend in a rosette. The leaf-stalks grow to a length of from 5-18 cm (2-7 ins.) and are triangular in cross-section. In old plants, the stalk is quite sturdy, with a thickness of about 1 cm (1/2 in.). The leaves attain a length of from 25-55 cm (10-22 ins.) and a width of 2-7 cm (3/4-2 3/4 ins.). The longest leaf from any of our specimens measures 30 cm (12 ins.) in length and 7 cm (2 3/4 ins.) in breadth, with a leaf-stalk length of 17 cm (7 ins.) The leaves are light-green, lancet-formed, and possess five veins as shown in Figure 1.

E. brevipedicellatus is often confused with *E. paniculatus*, the large Amazon Sword Plant, but these can easily be distinguished from the veins alone, as in *E. paniculatus* the veins all start from the beginning of the leaf where the leaf-stalk ends, as shown in Figure 2, whereas in *brevipedicellatus* the inner pair of veins begin further up the leaf (Fig. 1). In *E. magdalenensis* the

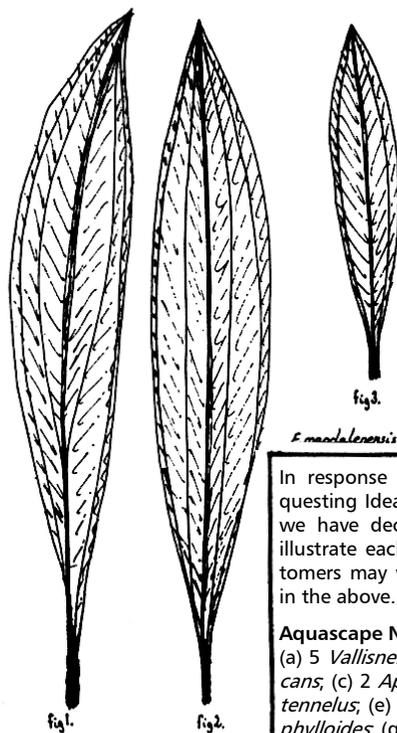


Fig. 1. *E. brevipedicellatus* Fig. 2. *E. paniculatus*

Fig. 3. *E. magdalenensis*

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Dwarf sword plant, the veins begin at the base of the leaf as in *paniculatus*, but there are five veins in the latter plant as opposed to three in *magdalenensis*. Young *brevipedicellatus* and *magdalenensis* plants can thus easily be distinguished from one another both by these characteristics and by the fact that the leaves of *magdalenensis* are stiffer and a darker green color. The leaves of *paniculatus* are a lighter green color than those of *magdalenensis*.

Under favorable conditions, which means a temperature of from 72°-77° F, much light, and a bottom layer of rough gravel, the plant grows very quickly and regularly produces shoots. The DH and pH values seem to be irrelevant. If the plant grows in a marsh it will develop smaller leaves with a glossier surface.

It is not difficult to grow. Long flexible segmented stems are regularly produced, from which shoots develop at the nodés. The distance from the base to the first node we measured to be 25 cm (10 ins.), with the following segments measuring from 10-15 cm (4-6 ins.). If the end of the stem is hindered from developing due, for example, to inadequate light, a new stem will then develop from one of the

other segments. In this way we have had up to four secondary stems. Two primary stems on the same plant also occur now and then. Later roots develop from the shoots and one should then weigh the shoots down to the bottom with a few small stones. In a week's time when most of the young plants will have attached themselves to the gravel, the stem can be severed from the mother plant.

HEADSTANDER *continued.*

The Spotted Headstander reaches about 3 1/2 in. long.

Tanks well furnished with plenty of *vallisneria*-type plants are suitable for keeping or breeding these fish. A good clear swimming space should be arranged centrally in the tank, and the temperature should be increased by two or three degrees. Place some lettuce leaf on the surface for the pair to nibble. An active pair should be introduced. When spawning there is a change in coloration, for a large round dark shoulder spot appears, and the rows of dots pale somewhat. The eggs are non-adhesive, falling to the bottom without the parents molesting them, but remove the parents after spawning. The eggs hatch after about 4 days, but the youngsters are difficult to see at first. Tiny creatures such as newly hatched brine shrimps should be offered, as well as shredded spinach, but take care not to foul the water.

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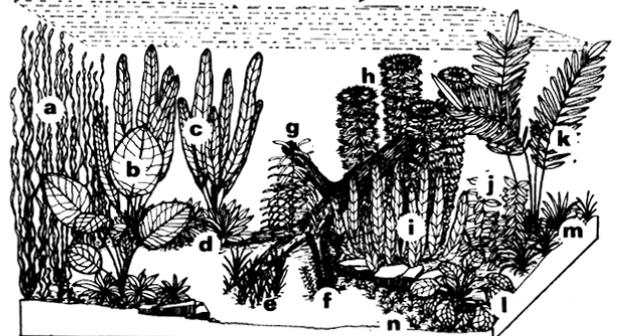
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In response to many enquiries from hobbyists requesting Ideas and layouts on aquascaping aquaria, we have decided during the next few months to illustrate each month an aquascape which our customers may wish to use. Below are the plants used in the above.

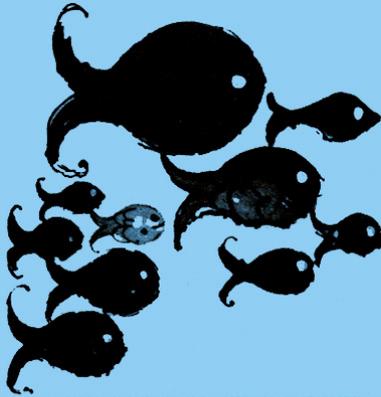
Aquascape No. 2 (suitable for a 30 in. aquarium):
 (a) 5 *Vallisneria contortionist*; (b) 1 *Echinodorus radicans*; (c) 2 *Aponogeton undulatus*; (d) 5 *Echinodorus tennelus*; (e) 5 *Sagittaria natans*; (f) 5 *Bacopa myriophylloides*; (g) 5 *Hygrophila polysperma*; (h) 5 *Ambulia heterophyla*; (i) 1 *Microsaurium pteropus*; (j) 5 *Ludwigia mullerti*; (k) 1 Nipa Palm; (l) 1 *Cryptocoryne* species; (m) 5 *Echinodorus tennelus*; (n) 5 *Echinodorus pusilis*.

The Aquascape Corner





The Aquarist's Notebook



Mistakes

ONE SATURDAY I was (as usual) in one of the local aquarium stores and listened to the customer before me buying fish: "I'll have two of those—do they fight?"

This reminded me of the mistakes newcomers always make when first beginning. In this case furnishing a community tank with incompatible species. (I've lost \$8-worth of fish this week!) Well, of course, we all do it—like the guy who made an all-wood tank, except for the window, to a friend's specification and set it up in the spare bedroom for breeding Platys. His wife rather objected when she was almost swept out of the front door, when ascending the stairs, by approximately forty gallons of water descending rapidly. The watermark on the stair carpet is quite pretty, though.

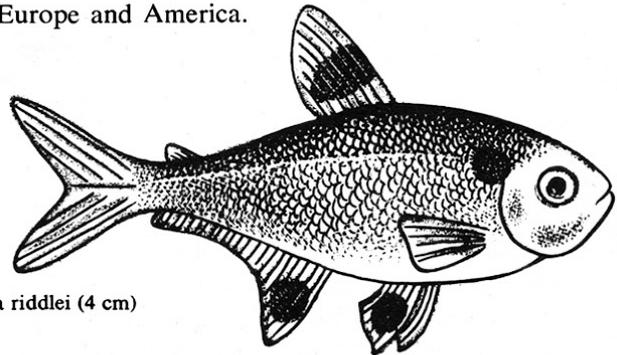
And then, of course, there are the mistakes which aren't really mistakes, as well. You could call them environmental effects. Like the controversy which used to exist regarding changing aquarium water. Some people have aquaria for years and only top them up—others change a percentage each

Continued overleaf 1st column.

AN AQUATIC RIDDLE

OTHER popular names for this lovely little schooling characin are pristella (after its scientific name of *Pristella riddlei*), and Riddle's tetra (after Oscar Riddle, the collector). It is found in the natural state in the rivers and streams of north-eastern South America and was described for science as long ago as 1907. Yet it was not until the 1920s that it became known to aquarists in Europe and America.

A more precise method of telling the sexes apart is known as candling. A strong light is placed behind the fish to disclose the outline of the abdominal sac. In the female this is rounded posteriorly whereas in the male it tapers backwards to a point. Further, in common with several other tetras, the male pristella has tiny hooks at the tip of the rays of some of the fins. Therefore



Pristella riddlei (4 cm)

The enamel fin is always on the go and frequents the middle of the water. It minds its own business, does not tear or eat the plants, and is hardy enough to withstand a temperature range of about 70°F to 85°F, but 75°F or thereabouts is to be preferred for general maintenance. It asks for nothing special in the way of food and flourishes well on any well-balanced dried food enlivened every so often with tiny pieces of raw red meat or some small live food such as gnat larvae or white-worms.

Externally the sexes are much alike but may be distinguished by the body of the female being taller and more robust-looking than that of the male.

If a fish is taken in a close-meshed net, which is then reversed, the female fish will immediately slide back into the tank while the male will stay behind until a series of vigorous shakes releases its minute hooks from the fabric.

To breed *P. riddlei* separation of the sexes for a week or two is advised. This is to encourage the spawning instinct when the two sexes are brought together again. Yet not every separation brings about the desired result. Feeding to repletion on live food and a slight increase of temperature will help. When the germ-cells are ripe, the male will show brighter colours and greater activity and the female egg-

Continued overleaf 2nd column.

MISTAKES *continued.*

week. Of course, both are right, but if you do either in the wrong area it is curtains for the fish. The reason? Well—if you live in an area where the water is hard and alkaline, you will be well advised to top up only, as the urine from the stock merely helps to reduce the pH which is all to the fishes' benefit, but in an area of soft and acid water the pH would reduce to too low a level for health, so water changing is ideal in these conditions.

Another mistake is to be dogmatic about undergravel filters. I personally used to have the firm conviction that one couldn't grow plants properly using them—until I visited a friend whose tanks all contained these filters and which were all chock full of plants. The answer to this was again simple—my tanks had one inch of gravel at the front and three inches at the back, whilst his tanks had three inches at the front and five or six inches at the back. The depth of gravel was the deciding factor and the reason I used the shallower depth was that my tanks were shallower than his—being only twelve inches deep.

Another deep-rooted fallacy which we all follow at first is the balanced aquarium theory that you must have a tank containing gravel, plants and fish in the correct proportions to be successful, particularly if you want them to breed. These are, of course, attractive and practicable also if you only have two or three, but as soon as you set up a fish house you have to think again unless you want to live in it. Practically all commercial breeders, and a large proportion of advanced amateurs, use bare tanks and spawning mops (or peat for the killies) and maintain them for years perfectly successfully with a minimum of labor, no gravel and never a plant in sight. Growing plants is a separate branch of the hobby.

Over a period of more than ten years, containing disappointments and periods of elation, but always a quiet satisfaction with the hobby, I have

found that one cannot generalize, or even accept information at its face value, but rather must analyze it, and compare the conditions with one's own before taking any action. Indeed, in some cases, action could be disastrous.

Simplicity (no gadgets), and commonsense (look before you leap) are all that are required, and if you have an analytical mind, so much the better.

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PRISTELLA continued.

distended sides. It is best to introduce the 'ripe' fish into the breeding tank last thing at night.

The water in the breeding tank should be about 8 in. deep, well-matured and neutral to slightly acid. Cleanliness is essential. Well-washed feathery-leaved plants should be massed at one or both ends of the tank and the temperature, after the introduction of the fish, brought to about 80°F. The light should be good.

The spawning act is unmistakable. The roe-swollen female will dash about the aquarium hotly pursued by the male. Every time they reach the plants there will be a trembling pause while body-pressings take place and a small number of eggs are extruded. Then the couple will repeat the performance several times over until the female is spawned out. When spawning is com-

pleted, the parent fish should be removed to another tank to preclude the eggs being eaten. About a hundred to two hundred eggs are scattered at an average spawning.

The eggs take about a day to incubate and within three or four days of hatching, the fry will become free-swimming and avidly seek food in the shelter the plants afford. It is best to drip feed small infusoria for the first fortnight of their lives, after which micro worms, and the like, and powder-fine dried food should be placed on the menu. Thenceforward, all should go along satisfactorily providing the aquarium is about two feet long or longer and the water is not poisoned by left-over prepared food or any other form of neglect.

The general body colour of *P. riddlei* is translucent brown to greenish yellow melting into almost glass-clear underparts. A black stripe extends from the shoulder to the root of the red caudal fin. The dorsal and anal fins are enamel white at the tips, intense black in the middle and lemon to pale yellow at the base. There is a black spot in the anterior part of the green-tinged ventrals. The pectoral fins are clear. Less frequently seen is an albino form. In this tank-developed form the body is a sort of translucent silvery pink, with some deeper pink markings. Like other albinos, the eyes are red-currant red. As red-eyed fish are sensitive to a strong light, the albino pristella should be kept in a tank well-stocked with tall-growing plants to afford patches of shade. It is hardly necessary to say that *P. riddlei* is ideally suited to a community tank.



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THE FAMILY of loaches (*Cobitidae*) is sandwiched between the tiny family of sucker fishes called the *Gyrinocheilidae* and the several families of catfishes comprising numerous genera and hundreds of different species. Loaches are distributed over Europe and Asia and a limited area of Africa north of the equator. In general outline they are either elongated



Misgurnus anguillicaudatus

club-shaped with flattened underparts, as in the genus *Botia*, or worm-like as in the genus *Acanthopthalmus*. They have up to four pairs of barbels around the underslung mouth, small or hardly discernible scales and, in not a few species, a movable spine situated near but below the eye.

Interestingly, some species have the capacity to use the intestine as a supplementary breathing organ as, for example, when the water becomes low in oxygen. Then, every so often, a mouthful of air is taken by the fish at the

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A MOLLY FOR THE BEGINNER

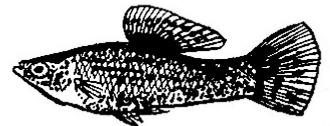
MOLLIENESIA SPHENOPS is a live-bearing tooth carp and is found in fresh water coastal areas from Mexico down to Columbia. The male grows to about 8 cm. and the female to 12 cm. The most popular form of *sphenops* is perhaps the pure black variety as opposed to the speckled variety found in nature. *Sphenops* are quite easy to keep but only if certain conditions are observed. Their diet must contain green *algae* or other plant food and they prefer to have plenty of room and warmth. Lyre-tail *sphenops* is a new and beautiful development but the best specimens must be used for breeding, otherwise the line will deteriorate.

With maximum feeding *sphenops* take only two months to mature. In our experience the number of young ranges between 15 and 68 though in theory *sphenops* can have up to 80 young. The interval between broods is about a month.

When the female for the first time shows a particularly plump appearance we move her to a small (11 in. x 9 in. x 8 in.) thickly planted tank. We use about twenty *Sagittaria* plants per tank in addition to floating plants—*Elodea callitrichoides* and *Ceratophyllum submersum*. This latter is only partially suited to tropical tanks as in winter-time it needs to rest in colder water, but there is a wide variety of alternative plants from which to choose. Floating plants have the advantage that they grow rapidly from the moment they are placed in the tank. These plants

help conceal the young from the mother and thus prevent them from being eaten. If one wants to be completely safe one can place the mother in a breeding-trap.

We find it a good idea to keep a supply of *daphnia* in the tank as this ensures that the mother is adequately fed and thus unlikely to attack her young. It is also important that there are no other baby fish in the tank as these can have the unfortunate habit, even when only a few days old themselves, of attacking the new-born babies and biting open their abdomens. We once lost all but six of a large

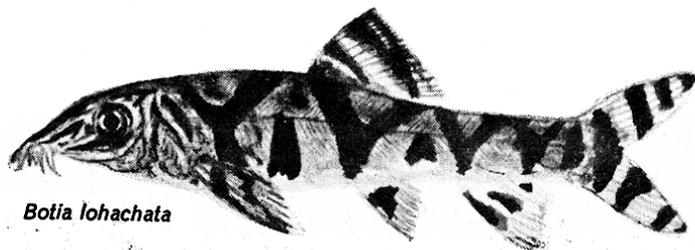


Mollienesia sphenops

brood of *sphenops*, the rest being attacked and killed by one-month-old platys. This can happen even if there is plenty of live food in the tank.

When the female gives birth she generally stands quietly in the same spot near the top of the tank and delivers her young in the course of a few hours. They are very helpless for the first few days. Immediately after birth they fall to the bottom (or sometimes lie at the top) where they will stay for an hour or two, and thereafter we can find them amongst the thick *Elodea* plants or lying on *Sagittaria* leaves. We gener-

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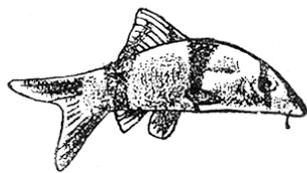


Botia lohachata

LOACHES *continued.*

surface of the water. In its passage through the body oxygen is absorbed by the lining of the gut. The deoxygenated air is expelled as a bubble from the vent.

*Essentially loaches are bottom dwellers. Occasionally though certain species will leave the lower regions and swim excitedly into the middle and upper levels of the water. The loaches known to science as *Misgurnus* spp. almost always do this when stormy weather is about. For this reason they have earned themselves the popular



Botia macracanthus

name of weather-fish. Again, there are species that swim after other fishes in order to suck at their protective slime. A loach from northern India—*Botia lohachata* — is very given to this practice.

All loaches that aquarists are acquainted with like to lie singly or in a group under a canopy of plants, muddy debris, stones, and the like. Therefore you will see that they spend a lot of time out of sight. Observant aquarists will have noticed that the worm-like species are more given to hiding than the compressed-sided ones.

Occasionally loaches will adopt bizarre resting positions on the bottom. Indeed, it is not unusual to find one standing on its head or lying over on its side. Another characteristic is their habit of lording it over what they consider to be their territory and driving all intruders away.

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The natural food of loaches is thread-like worms (*Tubificids*), aquatic larvae, small crustaceans (*Daphnia*), and the like, and vegetable matter. Yet most captive specimens will accept the regular dried foods and the rest.

By and large, loaches do not make ideal fishes for a community tank. Apart from their habit of burrowing into the sand and churning up the bottom, the larger species will uproot all plants. But on the credit side many of the tropical species have strong colours sometimes outlined with black.

In size loaches range from about 2 in. to a foot. Breeding in the aquarium is rare, but of the species that have produced young for their owners we may mention the well-known *Acanthopthalmus kuhli* from the Malay peninsula and the much larger *Misgurnus anguillicaudatus* from China and Japan.

MOLLIENESIA *continued.*

ally remove the mother when she begins to swim around in a more lively fashion and seems to have her usual figure back. The date of birth is noted down and the female returned to the male until roughly 30 days after (at 78°F) the story is repeated. At a lower temperature there is a greater interval between confinements.

After a fortnight, by which time the young have almost doubled their size, we move them to a larger tank. A good result is achieved if one can move the fish to a larger tank every fortnight—space permitting!

A note about our tank conditions. The local water is quite hard, with a DH of 14° and a pH. of 7. The temperature in the tanks ranges between 75°F and 82°F according to the room temperature. In winter we rely entirely on our central heating to maintain the tanks at an adequate temperature and in summer no heat is needed.

Adult fish one intends to use for breeding should be fed well beforehand, preferably with live food, e.g., *tubifex*, *daphnia*, cyclops, or mosquito larvae. Young *sphenops* can from birth be fed with cyclops and small *daphnia* and can then reach a size of 3 cm. in the course of eight weeks, by which time they can, if desired, be sold. As previously mentioned, they need green algae in their diet and so are a help in tanks where this is a problem. Micro-worms, which one can very cheaply breed, are another good stand-by for feeding in the first weeks. These must be given frequently in small quantities so as to prevent fouling of the water.

TROPICAL QUERIES

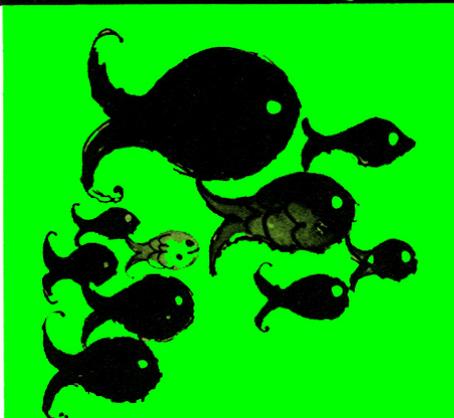
I have a pair of angel fish which I've had 6 months. These angels have spawned on the leaf of a Malayan sword plant. The following day I noticed that some of the eggs had become a chalky white. I understand they have gone off. Will these bad eggs affect the others and what steps could I take to prevent this?

It is quite usual for a number of the eggs in a spawning to be infertile. When the eggs are left in with the parents the adult fish will quickly pick out and discard any eggs that become white. If the eggs are to be hatched in a separate container the water in which they are placed should be colored a fairly deep blue with methylene blue to prevent the dead eggs from developing fungus. In any case the presence of infertile eggs should not affect the others deleteriously.

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Tropical Queries

'Unheated' Aquarium

Is it possible to keep Australian rainbow fish in an unheated aquarium, as I thought I could use these with guppies and White Cloud Mountain minnows for a tank without a heater?

The word most commonly used in the literature in connection with these fishes is that they 'tolerate' the lower range of temperatures associated with tropical fish, i.e. from 65°F to 70°F (*Melanotaenia nigra* survives at 60°F) but it is unwise to assume that such temperatures mean that the tank is unheated. In this country in the winter the ambient temperature would have to be permanently very high to keep the water in the tank even at these lower ranges, and in a tank in an unheated room or one that cools at night the result could be disastrous. A suitably low-wattage heater should be used to keep the tank temperature at a steady 70°F, at which temperature all the fishes will look more colourful, eat better and be much more lively. And then, if a heater is to be used at all, the temperature might just as well be maintained at the usual 75°F.

One-eyed Goldfish

I find that one of my goldfish in the small garden pond appears to have only one eye. I am quite certain that it had two when I bought it last summer. It seems to be quite healthy

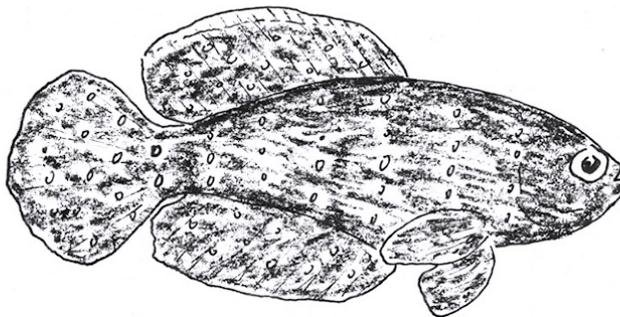
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BREEDING THE PEARLFISH

THIS KILLIFISH (*Cynolebias nigripinnis*), though having many desirable qualities for the tropical fish enthusiast, is seen too infrequently in our local aquarium stores. It is an annual species coming from bodies of water in Argentina that completely dry up, and then when the rainy season comes again the pools once more teem with the fish which have hatched from eggs laid in the mud the previous season. The rotting remains of the dried out plants provide abundant supplies of *infusoria* for the newly hatched fry.

tubifex, and blood worms; dried food is taken grudgingly or not at all. Being an annual Killifish it does not have a very long life span and so some preparations must be made to breed it. This fish appreciates soft, slightly acid water (rain water filtered through boiled peat fills the bill) to be kept in good condition.

Breeding is accomplished as follows: A tank of about five gallons capacity is given a layer of peat (boiled to remove excess acidity) about four inches deep as the species *Cynolebias* like to



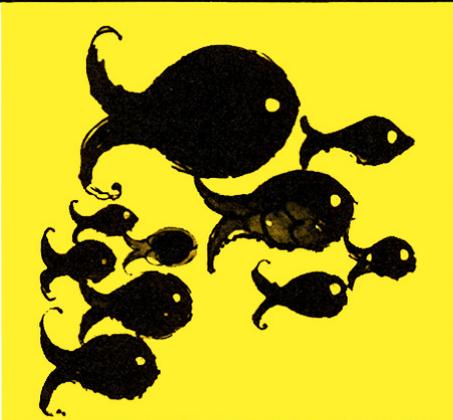
The male *Cynolebias nigripinnis* is truly a gorgeous sight being completely coal-black, dotted irregularly all over the body with bright blue spots. The fins also contain the same body colour. The female, as in nearly all Killifish, is comparatively dull, being light brown with some irregular markings over the body and fins. The male reaches a maximum size of two inches and the female is about one-an-a-half inches long. *Cynolebias* will eat various foods but preferably live ones in the form of *daphnia*, white worm, grindal worm,

dive deep into the substrate to deposit their eggs. The soft acid water is added to a depth of about five inches above the peat. The temperature of the whole thing should be maintained at between 70°F and 74°F. The breeding group consists of one pair or one male and two females to prevent the females from being driven too hard. After the fish have been added they should be left alone for two weeks and given good feedings of live foods everyday. The other method of breeding is to

Continued overleaf 1st column.



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Giant Hygrophila

THIS plant, which is one of the most attractive and popular of aquarium plants, is generally known as 'giant *Hygrophila*' but is properly called *Nomaphilia stricta*, of the family Acanthaceae. The Acanthaceae are plants not generally found in Europe but in the tropics there are about 250 genera with 2650 species and are consequently not at all rare. Only a limited number grow submerse, but it is likely that



more of them will eventually become popular aquarium plants. The best-known of those already grown in aquaria belong to the genera *Hygrophila*, *Synnema* and *Nomaphila*. The members of the genus we are interested in, *Nomaphila*, are found in south-east Asia, tropical Africa and

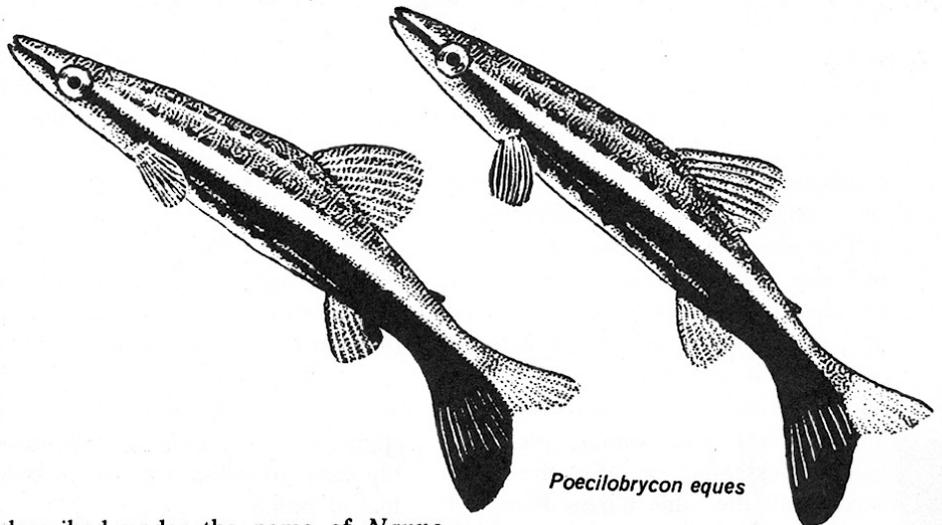
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HEADS UP!

THE AQUARIST who sees one of his fishes swimming at an odd angle is inclined to suspect swim-bladder trouble, and in many cases he would be correct. But in the fish described here the odd angle taken in the water is merely a peculiarity of that species—probably adopted in the first instance as a camouflage measure.

With a normal swimming angle of 45 degrees or thereabouts, the Pencilfish, *Poecilobrycon eques*, sometimes

difficult to spot because of its position in the water. Normally it congregates in small shoals, and these shoals drift along in the water, concealed by their resemblance to the vegetation around them. They look like pieces of leaf or twig, and maintain this appearance even when swimming along slowly. Gentle movements of the smaller upper tail lobe and its other fins waft it along smoothly in a manner reminiscent of the sea horse. Internally, the swim



Poecilobrycon eques

described under the name of *Nannobrycon eques eques*, is one of the kinds that swims head upward. This stance is maintained for all normal movements, but when the fish is startled or excited it will assume a normal horizontal position long enough to swim rapidly out of danger.

Collectors who have seen this fish in the wild—it lives in Guiana and the Amazon basin—say that it is extremely

bladder is larger towards the front of the fish, and this helps it maintain this position.

In the aquarium three or four pencilfish should be kept together, for they are never really happy except in a small school. This is a shy fish, about 2 in. long, with various brown shades forming the well-marked pattern on its

Continued overleaf 2nd column.



GIANT HYGROPHILA *continued.*

Madagascar and altogether seven species are known.

N. stricta comes from Malaysia, where it grows as a robust swamp plant with both submerged and emerse leaves. Above the water level it builds strong stalks with leaves set opposite each other and reaching a length of 4 in. (10 cm.) and a width of 2 in. (5 cm.). These out-of-water leaves are like a broad spear, almost heart-shaped but drawn out into a long point and with saw-like edges. The whole plant, including the stalk, is a delicate velvety brown or reddish green.

When these clusters of leaves are placed under water they quickly form new roots and lose their hairiness. After a period of between 10 and 20 days they change to a bright-green color. At the same time they also change shape, becoming narrower (approximately 1 in.) and the saw-edge becomes less distinct. The stem is bright green and has a nodule where the leaves are attached — similar to the bamboo. The topmost leaves are sometimes tinged with red or reddish brown.

The plant can be grown in any kind of water in a fairly rich compost. In an aquarium it needs a well-lit spot although artificial lighting is perfectly adequate; it also grows very quickly and does best at a temperature of around 68°F. In winter, plenty of light is essential or else the lower leaves will die: this means being left with just a stubby top-knot of foliage in the following spring. If this does happen, the top-knot can be snipped off and replanted. New *Nomaphila* plants can be produced either from the sprouting tops of the plants or alternatively from the middle part of the stems.

If the aim is to produce a large number of new plants, however, *Nomaphila stricta* can be grown in flower

pots as house plants or under glass, though they require daily watering when grown in this manner. In this emerse form, *Nomaphila* flowers without difficulty, producing a mass of bright violet blossom.

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PENCILFISH *continued.*

sides. It may be noticed that the upper lobe of the tail, which is the part used when swimming slowly upward, is practically transparent. Strongly colored areas keep perfectly still, while transparent fins are used to move it along, all of which helps to keep it inconspicuous.

Because it floats in the upper and middle reaches of the water, where the temperature is usually higher than at the bottom, the pencilfish does best in about 78°F. The water should be fairly soft, and the pH should be neutral or slightly acid. Plenty of vegetation of the long grass-like type helps them to feel at home.

Food for the pencilfish should be of the kind that stays near the surface, for anything below them is usually ignored. Live food of many kinds is taken readily, but there appears to be a preference for *enchytrae*. It is normal to use a pair only of these fish for breeding, and the temperature may be run up three or four degrees. When in breeding condition, the female lays her eggs on the underside of leaves, and

for this reason some of the narrow-leaved *cryptocoryne* plants may be used.

The parents will eat some of their own eggs at times, but those that fall from the plant are ignored. Because of this some breeders use a layer of glass marbles or large gravel with a plant set in a pot in the middle. Attempts are then made to dislodge the eggs from the plant leaves, so that the parents cannot get at them. There are about 50 eggs, and after the spawning is over the parents should be removed. It will be seen when this is tried that these stiff-looking fish can move fast when they want to.

The fry take about 24 hours to hatch out, but are not free-swimming for about six days. It is advisable during this hatching period to darken the tank a little. When the tiny fragile fry start moving around the darkening should be removed, and very tiny live food offered. Infusorians should be given freely, for this is all their small mouths can manage at first. They grow very slowly, but with care many of the brood can be reared.

Tropical queries

I would really like to be able to supply my fish with garden worms regularly and I spend some time looking for them each day. But the 'bag' is often very small. There are a few special stones I turn over to find them but short of digging the garden up, it seems rather a hit-and-miss way of doing it

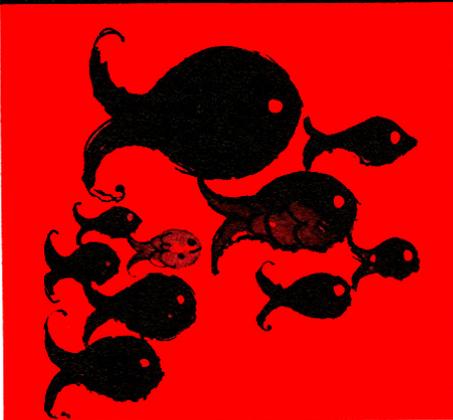
A garden compost heap should keep you supplied with plenty of worms and what's more they'll be nice and clean and 'juicy' looking. Build the compost heap over a patch of earth and raise it with rotting leaves and grass cuttings mixed with earth. Potato peelings and tea leaves can also be added to the pile. A piece of sacking or an old bristle mat placed over a section of earth and kept wet should also entice a quota of worms to accumulate on their undersides.

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Tropical queries

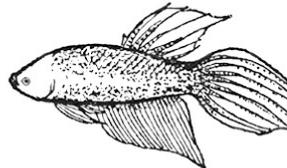
Fry Food

I planned to start an Infusoria culture for a spawning of dwarf gouramis but each time the Infusoria has become so smelly that I have had to throw it away, since I have been frightened to feed it. How can I prevent this?

There is no need to prevent this as it is all part of the process whereby the Infusoria grow. Your scalded lettuce leaf-water mixture is merely providing the bacteria on which the Infusoria, spores of which occur in the air, will feed as they arrive in your culture. The rapid growth of the bacteria causes the water to become cloudy and somewhat smelly but as soon as the Infusoria start feeding and thriving they will reduce the bacteria, until about 10 days after the culture is first made the water will have 'cleared' and become quite odourless. After a few more days the culture is ready to feed to your fry. If you plan to rear the fry on this Infusoria, rather than use a food such as Liquifry, then you must have a good supply available. If you start your first batch 12 days or so before the fry will be ready to feed, the next batch 2 days later, the third batch 2 days after that, and so on, you will not risk running out of this food at a crucial point in rearing the young. You have been scrapping your cultures too soon.

ALL YOU WANTED TO KNOW ABOUT BUBBLENESTERS BUT WERE AFRAID TO ASK

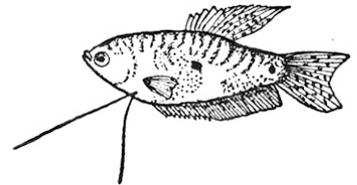
SINCE MOST bubble-nest-building fishes are members of the anabantid family and most anabantids build bubble-nests, an introduction to this family is in order. The anabantids, or labyrinth fishes as they are frequently called, have a distinguished circle of relations including scats, archerfishes, sunfishes and cichlids. One of the features that sets the anabantids apart from these relations is the presence of an accessory respiratory organ (the so-called labyrinth) that enables them to breathe atmospheric air thus freeing them from dependency upon the oxygen dissolved in waters for breathing.



Betta splendens
Siamese Fighting Fish.

The majority of the species exhibit parental care of the young and usually construct a bubble-nest of some sort. The bubble-nest itself is constructed of air and mucus at the water's surface. Some species incorporate bits of plant in the nest to strengthen its construction. The overall appearance of the nest may be flat to dome-like. The workmanship of these nests varies with the species of fish concerned. There are species that construct rather sloppy nests just as there are those that complete near works of art.

It might be expected that fishes developing accessory breathing organs are found in nature in stagnant or foul waters. These waters are generally low in oxygen, very warm and slowly moving, if they move at all. However, fish eggs, like their parents, need oxygen. What better way to ob-



Trichogaster trichopterus
Blue Gourami

tain this oxygen under these conditions than by association with a frothy mass on the water's surface? This is a major reason for bubble-nest construction by fishes, that is to get the eggs into a well oxygenated environment.

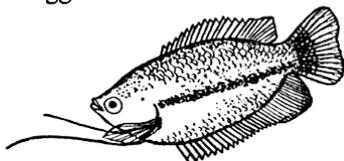
The eggs do not get into the bubble-nest in the same manner in different species. Some, for example, lay eggs that are deliberately placed in the nest by the male fish. On the other hand, the eggs of many anabantids are lighter than water and, if the parents spawn below the nest, they will rise of their own accord right into the nest. Of course, if some eggs miss their mark, the male fish will retrieve them and place them where they belong. In some cases, the eggs are allowed to float free

Continued overleaf.

from the nest and to develop as best they can.

A number of generalizations can be made about the breeding of the bubble-nesters. These are helpful to keep in mind when aquarium breeding is attempted.

1. Anabantids require somewhat higher temperatures than is usual for breeding. For instance, in the case of the pearl gourami, this may range upward to 85° F.
2. Where parental care is given, it is the male who guards the eggs.
3. The male will seldom eat the eggs.
4. The fry are small when hatched and usually require the finest of food, i.e. infusoria or egg yolk.
5. The fry are very sensitive during their first 8 weeks to changes in the temperature of the air above the water's surface. It is during this time that their supplementary breathing apparatus is being developed.
6. The raising of the fry is more successful in shallow water depths (up to 6 inches), than in deeper circumstances.
7. Spawnings produce large numbers of eggs.



Colisa labiosa
Thick-Lipped Gourami.

In accordance with these generalizations, a typical spawning would be attempted as follows:

- (a) Prepare a heavily planted breeding tank, 10 gallons or larger.
- (b) Place a glass or plastic divider in the middle of the aquarium. Introduce the male into one section and the female into the other.
- (c) Condition well, with frequent feeding.
- (d) Raise the temperature to a minimum of 80° F. Later, this can be raised if no signs of willingness to breed are noted (like the male blowing a bubble-nest).

- (e) If all goes well, the female should fill with eggs and the male should start construction of the bubble-nest.
- (f) Remove the partition.
- (g) Breeding should commence after a short while. With some fishes, Bettas in particular, the males are very rough with the females. If the female is not ready to spawn, the male may injure or kill her. If signs of this are detected, remove the female and try again either another time or with another female.

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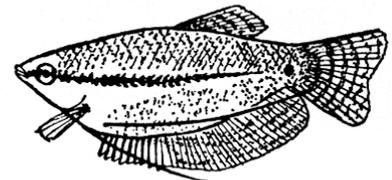
- (h) After spawning, remove the female.
- (i) The male can be left with the eggs but as the care that he gives the eggs is unimportant in the aquarium, he can be removed. In any event, the male should be removed by the time the fry are hanging from the nest, a matter of about 48 hours after egg laying.
- (j) Cover the aquarium with a tight-fitting cover and insure that no drafts will reach the tank.
- (k) After the yolk sacs on the fry have been absorbed, commence feeding with fine foods such as infusoria or egg yolk (such as is sold as strained egg yolk for babies). If infusoria is used, this should have been started before the spawning took place.
- (l) Switch to larger foods, i.e. prepared, frozen, etc. as soon as the fry are large enough to eat them. As a rule of thumb, use food no larger than the eye of the fish.
- (m) After 8 weeks, the young can be moved to larger quarters if it

is desired to save most of them. Otherwise, thin out their ranks mercilessly to allow the remainder to grow rapidly.

As a list of bubble-nest-building fishes that make good breeding subjects for the beginner, the following is offered:

Bettas (*Betta splendens*)—do not keep the female together with the male any longer than necessary. A temperature of 80° F. is optimum for breeding this fish.

Striped or giant gourami (*Colisa fasciata*) — Use a large tank for breeding, i.e. 15 gallons or larger.



Trichogaster leeri
Pearl Gourami

Dwarf gourami (*Colisa lalia*) — A smaller tank (about 8-10 gallons) can be used for this fish. Fry are very small and harder to raise than other gouramis.

Blue or opaline gourami (*Trichogaster trichopterus*) — Use a 15 gallon or larger aquarium. The male may tend to bully the female. A very easy fish to breed and the young are hardy and raise easily.

Pearl gourami (*Trichogaster leeri*) — A shy fish. Disturb as little as possible. Temperatures of 85-90° F. may be necessary to induce spawning. A more difficult fish to spawn than the others listed.

Thick-lipped gourami (*Colisa labiosa*) — 10 to 15 gallons is about right for this fish.

Snakeskin gourami (*Trichogaster pectoralis*) — Produces large numbers of young. Very peaceful and very easy to breed, young hardy and easy to raise.

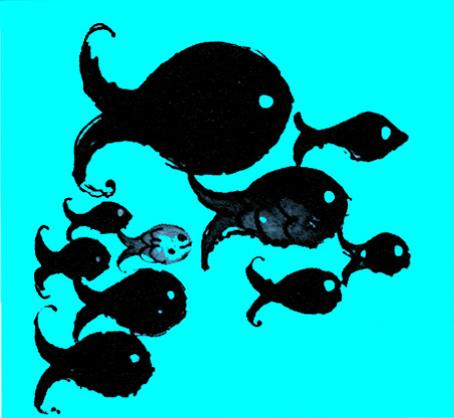
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Zebra Danios

As an easily kept and attractive community fish the zebra (*Brachydanio rerio*) sooner or later turns up in most people's tanks. It is also an ideal fish with which to commence breeding egg-laying species. It can be brought into condition in the community tank, by feeding with flake food, tubifex and daphnia when available. Zebra fish are easily sexed, the females being deeper-bodied and heavier than the slender males.

The breeding tank I use is 18 in. by 10 in. by 10 in., the base of which is covered with marbles. Artificial hair grass is placed in clumps, to give the females somewhere to seek refuge, after spawning, from the ever-chasing males. Water is added to a depth of about 4 in.; this shallow depth is to prevent the parents from eating their eggs. The parent fish can turn so quickly that in a deep tank they would eat their own eggs before these reach the safety of the marble layer.

The temperature of the water in the breeding tank is between 68° and 70°F. I place five 'ripe' females in the tank and, after 2 days in which they

Continued overleaf.

SOMETHING ABOUT

LIVE FISHFOODS

ALTHOUGH it is possible to keep a fish healthy with the use of non-living foods, we usually go to considerable lengths to provide them with a change of diet in live form, especially when conditioning for breeding or showing is in mind. I suppose this is all worth it—we have been assured by (virtually) generations of fishkeepers that the results speak for themselves. Or do they?

I sometimes wonder whether there isn't something of the 'muck and mystery' about all this from the nutritional

should look fit and be fit. In my experience this is just as things turn out and I should never worry if I knew I had to feed my freshwater fish on dried foods alone. I am rather less sure of their value as actual conditioners for breeding, but perhaps in this regard much depends upon the species. There is ample evidence that for individual species live food is totally unnecessary for average results.

I assume therefore that we feed with live food because it gives fish a little something that the other sources

	Earthworm	Whiteworm	Tubifex	Daphnia/cyclops	Gnat larvae	Fruitfly	Brine shrimp fry	Brine shrimp adult	Microworm
January	×	A	A			A	A	A	A
February	×	A	A			A	A	A	A
March	×	A	A			A	A	A	A
April	A	A	A			A	A	A	A
May	A	A	O	A	A	A	A	/	A
June	A	A	O	A	A	A	A	/	A
July	A	A	O	A	A	A	A	/	A
August	A	A	O	A	A	A	A	/	A
September	A	A	O	A	A	A	A	/	A
October	A	A	A			A	A	/	A
November	×	A	A			A	A	A	A
December	×	A	A			A	A	A	A

A, Readily available. ×, From storage pans. O, Deteriorates rapidly in hot weather.
/, At their most prolific.

point of view, as the analysis of most of the available flake foods reads like a cradle to the grave insurance policy. Any fish which take such material as readily, indeed, greedily, as they do,

haven't got, but so far nobody has quite quantified this so far as I am aware. No doubt live food acts as a stimulant to some bodily process which enables

Continued, 1st column

ZEBRAS *Continued.*

settle into their new surroundings, on the night of the second day the males (one male to two females) are placed with the females.

Spawning usually takes place in the morning. Each male selects a female, spreads his fins and darts in front of her, eases off and butts her in the belly region. He then takes up a place close beside her and for a split second 'holds' her with his tail and dorsal fin. As the fish separate the eggs fall to the base. This behaviour continues until the females are spent.



Brachydanio rerio

When spawning is completed both males and females are moved back to the community tank. The eggs hatch out in 36 hours and fry become free-swimming on the seventh day. The fry can be immediately fed on fine dried food, brine shrimp and micro worms. Young zebras are quick growers, reaching 1¼ in. in about 3 months.

For the beginner I can think of no other fish which requires so little attention; it is in fact the ideal fish for the beginner.

FOODS *Continued.*

the fish to live more completely. From the viewpoint of the casual observer fish benefit most obviously when they are actually in the process of catching and eating live food, and perhaps in the wild there is some logical reason why they should act like this. It might be a warning to competing fish to sheer off, or further to force their prey into submission when they appear to glisten more brilliantly, to deepen their colors or to 'rattle' or extend their finnage or opercular regions. Whatever the explanation, it is of considerable satisfaction to both fish and their owners that live food is available from time to

time, if only because the former have the time of their lives—or so it seems—whenever the opportunity is offered.

Just as it is unwise to concentrate on one dried food for your fish—they seem to appreciate variety as much as we do—it may be equally unprofitable to rely on one live food or one type of live food all the time. Just because whiteworm and tubifex are available throughout the year it would be totally mistaken to regard these as the sole prescription. Even these have their failings or limitations, and if one studies the whole range of what is available at one time or another, it will be found that, like pork or hen eggs, there are optimum periods as well as quite awful ones for their utilization.

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I have attempted some form of tabulation here to show how the main sources could be regarded throughout the year. This indicates not only when the foods are at their best, but when they are normally available, and in this respect it could act as a memory tickler to those in need. I think we all get a bit hidebound at times and need to be jerked from the easy routine to one which, though a little more energetic, is that much more rewarding.

Although the table given is neither exhaustive nor completely accurate, it is fairly obvious that only the cultured media can be relied upon to provide a continuous service throughout the year. This emphasizes the need to call in the seasonal species like daphnia when they are actually available.

The actual value of the fruit fly is related to the space you can devote to its culture and the fish you are trying to feed. I think it is overrated as a food source. On the other hand, a

greatly underestimated food is the adult brine shrimp, and many aquarists find it quite a problem to rear these fascinating creatures. I have found it simplicity itself by hatching the eggs normally and then transferring a medicine dropper full of the young into a small tank containing salt water at normal strength (density about 1.022 at 73°F). This tank should be in a sunlit window—a south-facing greenhouse is ideal—and the resultant vigorous algal build-up during the summer period should provide ample means for growth of the shrimp both in size and quantity. A few drops of green Liquifry helps considerably in the first week or so.

It is interesting that the adult shrimp will continue to tolerate winter temperatures down to freezing point (they just move around rather more slowly under these conditions), and may be regarded as a most desirable reserve by the marine aquarist who finds himself with a reluctant feeder in the middle of winter. The brine shrimp can, of course, be reared even under these cooler conditions, but the rate of growth is far lower. Nevertheless, the availability of several sizes of live shrimp during almost any period of the year is a factor which the advanced aquarist will call into play when experimenting with 'impossible' or difficult species of almost any sort. Gnat larvae are an extremely valuable food, and quite free for the taking, and even a large bowl of rainwater left in the sun will provide a rich harvest in a week or so, given a reasonable sort of summer.

The development of frozen food is complementary to all this, but not everyone has a refrigerator. But, as we established, the appeal of live food comes not from its content but its conduct, and in this sole respect, perhaps, the aquarist and the angler come together.

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The Aquarist's Notebook



ALL ABOUT

THE CRYPTOCORYNES

AS THE TROPICAL aquarist progresses with his hobby he tends to lean more and more on the cryptocorynes for display, using large clumps of the different leaved species to add that professional look to his aquarium. The majority of them are so steady and slow-growing that they can be depended on to remain ornamental while other plants around them become stringy and need replacing.

But there are so many similar looking Cryptocorynes that it is not always easy to recognize the kind offered for sale. If there is an identifying name on the plant it is not always certain that it is correct—there has been so much mis-naming in the past. *C. beckettii*, for instance, which has broad tapering leaves, is often offered as *C. cordata*. Nevertheless, this situation has been improving lately, and the better nurseries of tropical water plants always name them correctly.

If you can acquire *C. beckettii* (*cordata*) then do so, for it is a robust plant that reaches a height of about 8 in. or so. It will grow well in a thickly planted aquarium, for it prefers a slightly diffused light and thrives in slightly acid water. It comes from Ceylon, and grows there in water that varies in temperature between 20 and

26°C. (68-80°F.), and so suits our tropical aquarium range of temperatures well. It should never be allowed to become too cold or too hot.

To persuade Cryptocorynes to give of their best they should be rooted in a compost that has some clay or soil in it, and to avoid this soiling the water requires a lot of care. One method is to place a 1 in. layer of soil at the



CRYPTOCORYNE BECKETTII

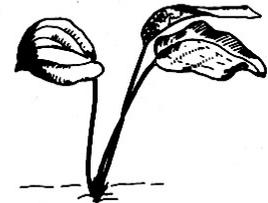
bottom of the tank and cover this with at least an inch of gravel. But if you are in the habit of placing in new plants from time to time, the base of the soil may become stirred up with consequent troubles. When used for a complete initial planting, and not disturbed afterwards, this permanent base method is good.

A good soil compost for the tank bottom could be made from three parts of clay or good rich loam, one part of fine peat, and one part of sand. This is mixed very thoroughly in the dry state, damped down a little (not wetted) and then placed in the tank in an even layer, tamped down gently, and cov-

ered with a generous layer of gravel.

When planting the Cryptocorynes the theory is that you set the roots in the gravel on top of the soil compost and they send out new roots into the compost. In practice the process is somewhat more messy, for roots are of various sizes, and some of the rhizomes of Cryptocorynes are bulky, and so one finds that the soil is disturbed also.

I find that a good method is to have 2-3 in. of water over the gravel, and plant everything at that level. When all the plants are in I syphon off the resulting muddy water, and then put an additional half-inch of gravel over everything—having allowed for this in my planting to keep the crowns of the plants at the new higher level. Then I gently syphon in some clean water, and if necessary remove this later, and sy-



CRYPTOCORYNE GRIFFITHII

phon in a new lot of clean water—making sure, of course, that each batch of water is at about 22°C. (72°F.) all the time. Usually this results in clean water above the gravel, but if not I repeat the water changes until it does.

Another method, more useful for the man who wishes to add plants occa-

Continued overleaf

sionally, is to use an all gravel base in the aquarium, and to set all the special plants that need it in individual pots. These pots should be about 2 in. deep, and fairly wide, and are not easily found. I came across a large stock of rigid thin plastic pots of suitable size some years ago, but have never seen any since. But there are many plastic containers on the market that can be cut down to size. Try the polythene washing-up liquid containers.

An inch of the same soil compost is placed in the pot, the plant is set in that, and gravel added on top—making sure that the crown is level with the top of the gravel. Lowering this into the water requires a little care to avoid soiling the clean water. Do it extremely slowly until the surface is just awash, and then lower the pot into a hole prepared in the gravel base. If you have done it correctly there should be perfectly clean water, and then a banking-up of the gravel at the pot edge should conceal it well.

A *cryptocoryne* that contrasts well with *C. beckettii*, with its broad green-bronze leaves, is *C. willisii*, which has narrow wavy leaves, usually of a lighter green shade—though fully adult leaves

are diffused with reddish-purple. This grows to about 8 in., also, and forms fine clumps, though it takes a long time to do so. When fully mature this plant produces stolons, with young plants growing at the nodes. By this means a good supply can be built up over the years for if detached when well rooted the youngsters soon become established as individual plants. Not many plants reproduce as easily as this one does, and so it is a most useful *Cryptocoryne*.

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A really broad-leaved plant can make a wonderful central feature in any good aquarium lay-out, and there are many to choose from. If restricting the choice to *Cryptocorynes* then the spectacular *C. griffithii* is the obvious plant, for it has large leaves that are almost as broad as they are long, held up on stout stems. The upper surface

Crossword Solution

LAKEMALAWITICARP
 ARILIAVADHIDRA
 BRILLICERIGER
 EBILITRILINGA
 DESLIPSLIP
 SIVANSINION
 SHIMIESLOE
 ESUEMUDURN
 RLVAVGNCN
 PARENALCARE
 AVLOLIFEN
 EBLANKETMED
 ELLELAVL
 SERGAVANTINOR
 T

of the leaf is a darkish emerald green, with the underside lighter, so that the clump gives a variety of shades. It grows to about 12 in. high when fully mature, but younger plants stay smaller for a long time.

All these *Cryptocorynes* prefer medium lighting conditions, of not more than about 12 hours each day, and given a suitable root run in good compost will rarely disappoint the aquarist who goes to the trouble of treating the plants as important inmates of his aquarium.

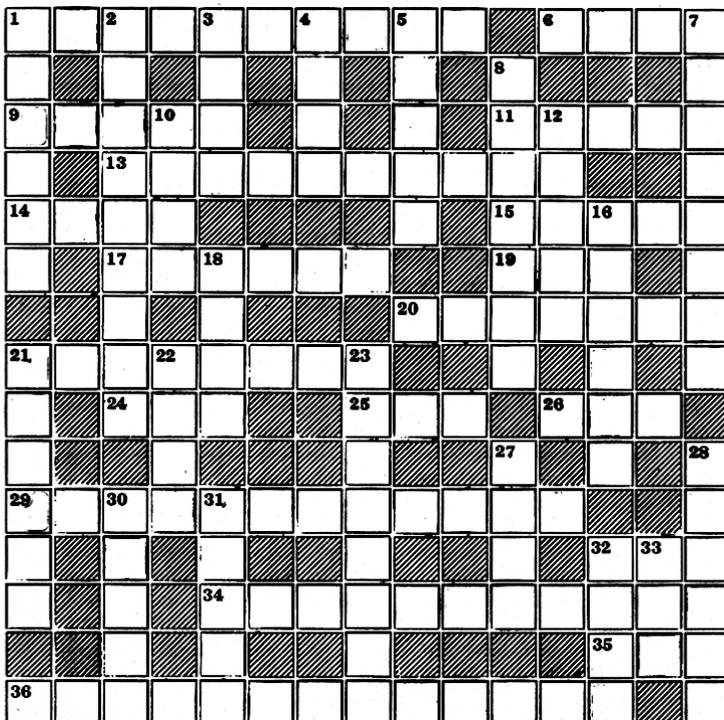
CLUES ACROSS

1. Famous for many exotic cichlids
6. *Cyprinus carpio*
9. Large flatfish
11. Has a white spider on its north side
13. *Rhodese sericeus*
14. Poetic songs
15. They're ready for that outside edge
17. Sagittaria
19. Electrically charged atom, etc.
20. You may Single if you go
21. Are caused by a chill
24. Prosecute
25. Is it thrown by *Periophthalmus*?
26. It holds the ashes
29. Some fish show this for their offspring
32. Marshy land
34. Does it keep the pond warm in summer?
35. Muhammed is the greatest
36. He's in charge on the coral reef

CLUES DOWN

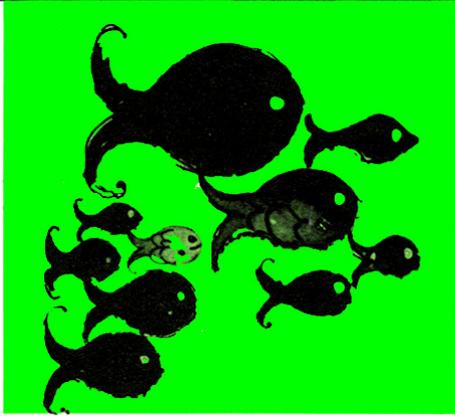
1. They have lips
2. Also known as the Dwarf Rainbow Cichlid
3. Soft roe
4. Beautify the angel by covering her in this?
5. Cry from a Dogfish
7. Most diseases are caused by one
8. It's measured by a hydrometer
10. Miss Doolittle from "Pygmalion"
12. Home of ice
16. Inheritance is always so
18. This and tide waits for no man
21. Similar in appearance to the Minor Tetra
22. Obstinate animal often tempted by a carrot
23. Dangerous receptacle to catch a large fish with
27. Beginnings of a pearl
28. Is *Corydoras metae* the villain of the tank
30. Connects catchment areas to the sea
31. Gold and platinum are such metals
32. A reaction natural when threatened with a piranha pool
33. *Anguilla anguilla* is the common one

The Notebook Crossword



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The Aquarist's Notebook



Selecting

SELECTING fish to be bought is all of an art. I usually make one or two reconnaissances before buying. There are those who descend upon a shop's newly arrived consignment and accept fish unquarantined. Whilst I do not place much importance on a dealer's quarantine I do like to see how new fish settle down before committing myself to them.

The demeanor of a fish speaks volumes and the practiced eye can detect a lot from a mere glance. Lively little fishes such as tetras and rasboras should be shiny and clear finned and if they are just slightly bouncing in their movements, as though they are real thoroughbreds, they may be just what you are looking for. Tattered fins are sometimes tolerable: if there is a likely predator sharing the tank the damage is probably acceptable since injured fins soon mend. If there are no larger 'terrors' in evidence, you may be viewing perfect specimens of fin and tail rot, so have none of it. Any dots or white patches on fins should be regarded as ruling out the purchase of fish from the tank in question, since this would indi-

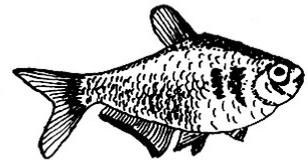
Continued, 1st column

THE FLAME TETRA

IT IS not always easy to find the right introductory phrase to start an article recommending a certain species of fish. I would like to be able to begin: 'This is a really ideal fish for everyone'—but how often can this be said, with a clear conscience, of any fish? Most aquarists buy their fish in accordance with their own tastes. And just as with dogs, where the most attractive and the bravest is always the one you own yourself, so with the aquarist the fish he tends to favor is the one with which he has had the greatest success. As I have kept a great many different species of fishes, I find it extraordinarily difficult to recommend one fish rather than another, except from the point of view of cost.

It would be simple if every aquarist had at least ten tanks and could keep just what pleased him—some livebearers, some cichlids, a few characins, etc. Unhappily, the situation is usually quite the reverse, for most tropical fish fanciers own only one or two tanks, and so advice is important. The fishkeeper must ask himself, when deciding what to put in his tank: shall I get attractive and expensive fishes that will make other fishkeepers envious, or shall I get the kind of fish that I know I can provide a suitable environment for? (And I hope he will decide on the latter course.) This month's article is for the aquarist who wants to keep a beautiful, peaceful and not too delicate species. And certainly the flame tetra fits this description.

Hyphessobrycon flammeus grow to a size of about 1½ in. and have found a welcome in aquarists' tanks since 1920, when they were first imported into Europe from their home in the Rio de Janeiro region. They are content with small tanks, need little light, and water conditions are not critical, but for optimum conditions they require a well-planted tank. A temperature as low as 68°F will be tolerated and they can survive temperatures even lower than this without damage. Although I've said that they require only smaller tanks, this does not mean that they



Hyphessobrycon flammeus

can't be put into the larger community tank. On the contrary a shoal of flame tetras or a mixed group of peaceful tetras will liven up any community tank. Their food requirements are also no problem as they will take live and dried foods.

Flame tetras are similar in body shape to the beacon fish (*Hemigrammus ocellifer*) but are rather smaller. I will not repeat a description of their appearance for they are such a well-known species that I am sure everyone will have seen a flame fish. Perhaps I should just mention the sex differences.

Continued, 2nd column



RESTRICTED Continued.

cate either white spot or a form of fungus, or both. Lumps or swollen bellies are to be avoided like the plague, and likewise fish with shrunken bellies. Try and find out when feeding time is and then look around the tanks about an hour before this. Fish which look normal or a little on the chubby side are probably in the right physical condition, but look carefully for unusually large areas of missing scales when sizing up physical characteristics.

A devastating disease of neons and its relatives ('neon disease', caused by the organism *Plistophora*) can be detected by a milky of the normally glowing body colors, and this shows up particularly well under Gro-lux lighting; absolutely reject any fish that show a mattness under their scales: compare them with their fellows in the tank for fair discrimination of this dreadful killer. Dropsy can also be caught out by this means, and scales which appear to be standing away from the body are a further symptom of this usually fatal condition.

The slower moving fishes like cichlids and pencils are probably sound if they are steady in the water and move gracefully. Any hint of struggling locomotion is suggestive of disease or physical shortcoming. In fact any fish which struggles towards the surface, only to drop downwards again, must be suspect. Catfish and loaches are exempt from this, as are the sharks, which roll all over the place and join the upside-down catfish in running counter to any of the accepted views of normality.



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FLAME TET continued.

The male is the slimmer fish, somewhat smaller than the female, and his anal fin is black-bordered. The female is larger and considerably fuller in the belly and paler in color.

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Flame tetras reproduce very easily and present no obstacles to the breeder; and for this reason it is an ideal fish for anyone looking for an easy egg-layer. Again, a small glass tank will be sufficient for the purpose—containing

up to a gallon of water—and there need be no gravel but a quantity of fine-leaved plants, *Myriophyllum*, *Cabomba*, *Hygrophila* and so on, should be present. Normal tap water that has stood for 2 days and been well aerated will be suitable. If the fish are put into the tank in the evening they can be expected to have spawned by next morning. After the spawning the parents must be removed since, like many characins, they are also egg-eaters. For the body size of the flame tetra, the number of eggs is fairly large and often amounts to more than 200. The brood are free-swimming after 6 days. For the first 3-4 weeks of their existence the young fish spend their time near the bottom of the tank, where they search for food. They are quite small and must be fed with very fine fry food. After 6 months they are sexually mature and can reproduce.

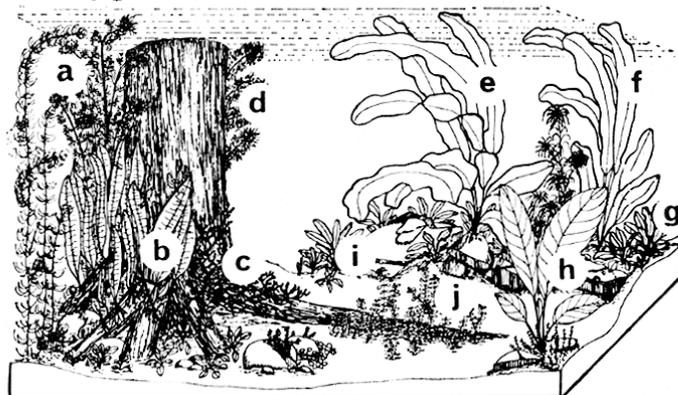


The Aquascape Corner

AQUASCAPE No. 3

- A = 5 *Ceratophyllum submersum*
- B = 5 *Cryptocoryne wendtii*
- C = 1 *Fontinalis antipyretica*
- D = 5 *Ambulia heterophylla*
- E = 1 *Aponogeton ulvaceus*
- F = 1 *Aponogeton undulatus*
- G = 5 *Sagittaria eatonii*
- H = *Aglaonema simplex*
- I = 5 *Cryptocoryne nevillii*
- J = 5 *Micranthemum umbrosum*

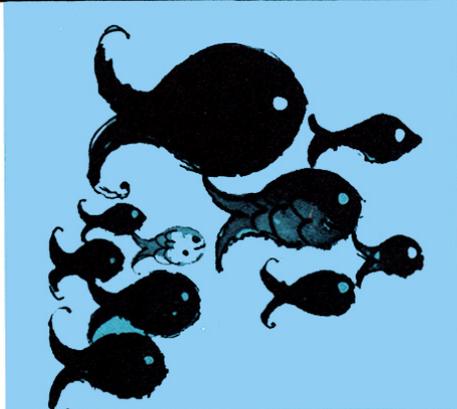
In response to many enquiries from hobbyists requesting ideas and layouts on aquascaping aquaria, we have decided during the next few months to illustrate each month an aquascape which our customers may wish to use.



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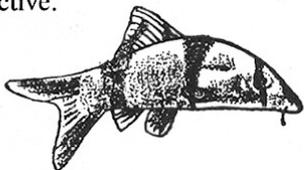
The "Restricted Species"

Tank Owner



The Clown Loach

SOME FIVE months ago I paid a visit to a tropical fish shop, and on this occasion the tank which caught my eye contained a large number of the very colorful fish, *Botia macracantha*, the Clown Loach. They were about $\frac{3}{4}$ inch in length, and as I have usually found with this particular species where a large number are kept together, were very active.



Botia macracantha

Anyone who has seen this loach, I think, will agree that the colors are so striking, that providing a tank of suitable size can be found, they are a must for the home aquarium. I therefore purchased three.

On returning home my three Clowns were placed in a 48 in. x 15 in. x 15 in. tank, the water, which was from the tap, was heated to a temperature of 76 degrees. The tank was lit by a 4 in.

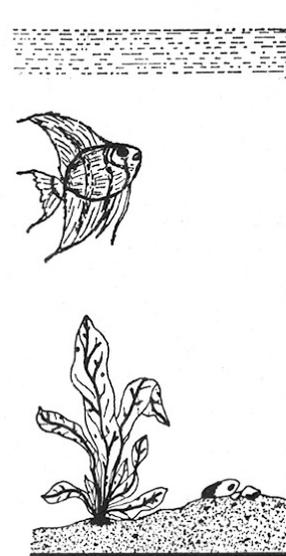
Continued, 2nd column

THOSE fortunate aquarists with virtually unlimited space for their hobby seldom appreciate the difficulties confronting the individual whose resources limit him to a single tank of perhaps 18 or 24 in. The long-term value of tanks of these dimensions depends very largely on what you decide to put in them, and as community containers they cannot be rated very highly. The main reason for this is that a mixed tank is automatically rated by its owner as a potential receptacle for almost anything, cichlids apart, which might appear in the retailer's list, and as a result it gets filled to capacity—and frequently beyond this point—very early on. This leads either to failure or disappointment as well as unnecessary loss of life and avoidable exits from the hobby. In fact, for the owners of the small tank the community concept is probably one of the worst on which he could be weaned.

I have always urged that beginners should leave some reserve in their holdings for the 'irresistible' chance purchase or for the temporarily unattainable object of their desires. This reserve, of course, can be in the time dimension as well as that purely of space. In other words a small tank can be restricted to just one species or just one or two species. Within this constraint as many specimens may be kept as will mature satisfactorily, and some fishkeepers even overstock somewhat in order to 'dwarf' immature initial purchases. This technique can be quite

successful, though whether it can be recommended unreservedly is another matter.

By exercising similar limitation as regards plants it is possible to determine, over a period, what species both of fishes and plants will do best in your locality, and if you record your findings the information can prove extremely useful if, at a later date, you decide to set up a larger tank or expand your activities some other way—for example, by setting up a fish house.



The 'restricted species' tank owner will find that he has rather more scope than the 'community' owner when it comes to changing décor. A lot of aquarists are rediscovering the possibilities of ringing the changes on colored gravel, which is a good investment pro-

Continued, 1st column

RESTRICTED *Continued.*

vided that one resists the temptation to mix one color with another—they are terribly difficult to separate if the desired effect fails! However, a selection of the colors which most appeal will provide a succession of alternative settings for your fish whenever you decide on a change of scenery.

The choice of fish is a highly subjective matter, but once you have decided on a 'restricted' tank the claims for the single species is very great indeed. The single shoal of cardinals or

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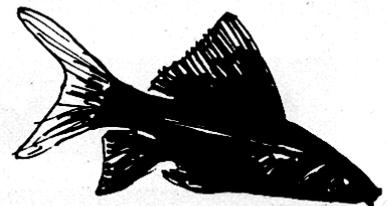
glass fish is such a compelling sight that one wonders why we bother with jostling and clashing mixed collections at all. Nonetheless two species of contrasting characteristic can be just as good, and I suppose it would be difficult to surpass the cardinal associated with the platinum tetra. The pygmy catfish and the botia (*B. sidthimunki*) might provide variety of body shape, as would also, to a lesser extent, the tiny green-eyed rasbora. Others will certainly suggest themselves, but these are some of the smaller and finer of the jewels we have at our disposal, with the outstanding virtue that they remain small, good natured, live long and retain their lustre till a ripe old age.

To have accepted the principle propounded above will be something of an admission that the aquarist is thirsty for change. It is better to admit this at the outset—most of us dabble with one species after another in the course of our hobby, and perhaps it is as well that we do.

CLOWNS *Continued.*

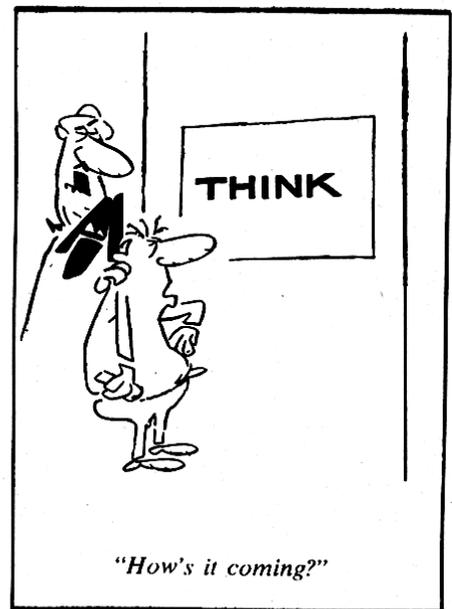
Gro-lux tube which, with a good background of plants, really brought out the rich yellowish red and black colors of this fish. Suitable rock hiding places were provided, but after a settling in period of about ½ hour, the three of them started to explore, which took them to all levels of the tank. Feeding commenced with a good helping of *Tubifex* worms which they settled down to enjoy, and to date their meals have comprised the following assortments:—prawn, cod roe, well ground chicken, meat, and the occasional earthworm. Whilst they readily eat *Tubifex*, I am not too keen on feeding this food to any of my fish due to adverse remarks which, over the years, has been written about these worms, so my fish only get fed this about once a month. Clown Loaches will take dry food, i.e. flake or pellets, but I only feed this as a supplementary food. They are peaceful with other fish, and on one occasion I placed a dozen Neon Tetras into the same tank but no aggressive behaviour towards the Neons was witnessed. Obviously larger fish are more suitable companions for Loaches which, given sufficient tank space, should grow to about 4-4½ inches. Unlike some members of the *Botia* family, light does not seem to bother Clowns as they are continually on the move in the aquarium, either grubbing around the gravel or swimming three in a line around the lower to middle regions of the tank.

Whilst my three Clowns are far from being anything like fully grown for tank kept fish (mine now are about 2½ inches), I have noticed that of the three, two appear more deeper bodied, so perhaps this may be a basis for sexing these fish, the deeper bodied as with most species of fish, being females. It has been written before that Clown Loaches are very prone to white spot and this I can confirm. I recently broke the golden rule regarding the quarantining of new fish, by introducing



straight into the Clown's tank a couple of Giant Danios (*Danio malabaricus*) which, whilst not showing any signs of spot, must have come from water containing the parasite. This soon showed on the Clowns, but instead of raising the water temperature as stated for this Loach, I tried a mild dose of Malachite Green, and within 48 hours a cure had been effected. Providing one treats mildly with chemical dyes in the Aquarium, I have not personally found that any harm results to these Loaches.

Providing a varied diet is given and care is taken in supplying tank conditions to their liking, Clown Loaches will give their owner many hours of enjoyment with their antics, also the color of these fish is such that they can compare with some of the glorious colors seen among members of the tropical marine community.



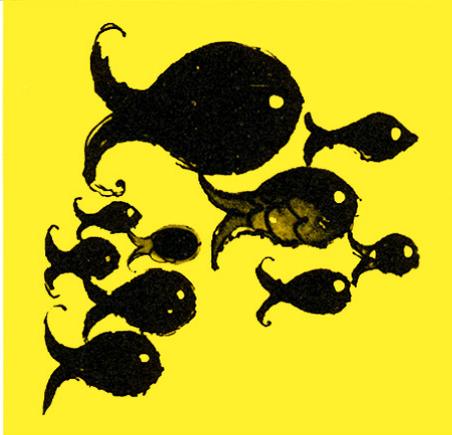
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The Aquarist's Notebook



A BEGINNER'S KILLIFISH!

Whiteworms

IN MY opinion white worms are the finest live food for the purpose of rearing young fishes. They have so many advantages over other live foods that it is a wonder that more of them are not used by breeders.

Several methods are known for breeding these worms, but I will just describe my method which I think has been very successful over the past twenty-seven years. I use small concrete boxes I made originally for raising cacti seeds. These are 14 x 7 x 3 inches in size. These boxes have the advantage that they do not allow the medium to dry out too quickly and they are solid enough to allow several boxes to stand on top of each other. I usually have six to eight boxes in use and they take up no more floor space in the garage than one box. They have to be kept dark and fairly cool. The medium I use is peat which I make fairly damp but not soaking wet. I fill the boxes two thirds in depth and cover with a sheet of glass. This glass must not be as large as the top of the medium but an inch or so smaller to allow surplus moisture to escape. A few worms are placed on the peat and a

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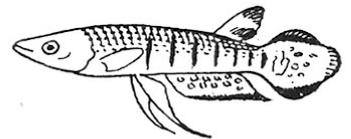
THERE is at the present time an ever-increasing interest in the keeping and breeding of killifishes. Many people are first introduced to these from the rather limited selection of them that appears in dealers' tanks from time to time. One of my favorites is *Aplocheilus lineatus*. Although by no means a rare fish, it is what must be called uncommon as few people seem to keep it. For the newcomer to killifishes it is just one of a large number of fishes which are highly suitable for him to breed. It is a hardy fish and is both prolific and very attractive.

The male will grow to about 3½ in. and the females to 3 in. Sexing the fish is easy when they are in good condition. The male has no vertical bars, whereas the female has seven, and a small dot at the end of the dorsal fin. The ventral fin of the male is tinted with orange. The males also have more pointed dorsal and anal fins; the female's fin is more rounded. A precise description of the coloration is difficult to give as the hues can change depending on the angle from which the fish is viewed.

I prefer to keep my fish in a 24 in. by 12 in. by 12 in. tank, filled to a depth of 9-10 in. One essential with these fish is a well-fitting lid, as they are great jumpers capable of going through the smallest hole. A 24 in. tank gives the fish plenty of room to breed and also gives the fry a chance to escape from their parents, which are to a certain extent cannibalistic. The tanks

are furnished on the bottom with a thin layer of boiled and well-washed peat. This serves to keep the water slightly acid and also to show off the color of the fish. Too light a bottom will give a pale and rather frightened fish.

What else goes into the tank will depend on whether one wants to collect the eggs or leave the fry to grow up with their parents. I prefer to let the fry grow up with their parents because this method allows only the healthiest fry to survive, as any weaklings are eaten by both fry and the parents. When the eggs are raised separately there is not this natural check.



When raising the fry with their parents sphagnum moss makes an ideal spawning medium for the fish. This moss is obtainable from florists, who use it as a foundation for wreaths and crosses. Try and obtain it as green as possible as then it will live and grow in the tank. Also a fine floating plant, such as *Nitella*, is very useful for acting as a hide for the young fish. A nylon spawning mop is also useful as it means that some eggs can be collected for giving away to friends.

A. lineatus are greedy eaters and must be well fed to keep in the best

Continued, 1st column

APLOCHEILUS Continued.

condition; they do well on glassworm, daphnia, tubifex, and the frozen mysis shrimp. When feeding with tubifex one must be careful that too much is not given otherwise the excess worms may well die and foul the peat in the tank. So long as the fish are well fed there is no reason why they should not produce 8-12 eggs a day for some months. The fish only need to be reconditioned if one is getting battered.

For breeding a temperature of 76°F would seem to be ideal; the addition of 2 tablespoons of salt per 24 in. tank is beneficial, as it will act as a preventive against velvet disease. The eggs are laid singly and will be deposited all over the tank. If it is wished to collect any eggs this can be done from the moss. The eggs are fairly tough and the best way of dealing with them is to place them in a small margarine container, which has been well washed, with some water from the tank from which the eggs were taken.

The eggs will hatch in 10-14 days, depending upon water temperature. Once the fry are first seen in the tank, I then start feeding with brine shrimp and micro worm. At this stage one can also remove the parents from the tank, and rear the fry on their own, thus leaving about a month's supply of eggs in the tank. After a couple of weeks the fry should be gradually introduced to dried food, otherwise if the change is left for too long some difficulty will be experienced in making this change. When the fry are about 1/2 in. long they can be removed to another tank to finish their growing on. If large fry are left with their parents, the larger fry will start to eat any other fry that appear.

In all, *Aplocheilus lineatus* is a most attractive and obliging killie for anyone interested in breeding fishes of this group.



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WHITE WORMS Continued.

piece of damp bread on top. The bread can be white or brown but it must not be soaked and placed directly onto the peat. All surplus moisture must be squeezed out first or the medium could become too wet in time and cause trouble.

The amount of food given at a time is most important as if too much is given it will not be cleared up and the present day types of bread appear to turn very foul in a short space of time and become a nasty stinking mess. The worms can be fed every two or three days and if one can regulate the amount of food given it will be found that the previous bread will have been cleared up. It is the same as feeding small fishes. It is better to err on the too little side rather than on too much. Other food can be given such as boiled potato, stiff oatmeal and portions of cheese.

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To collect some worms for feeding purposes it is only necessary to pick out a quantity from around the feeding medium or scrape a few from the under side of the cover glass. Small tweezers can be used. I find that once a culture is progressing well I can put in a small cube of cheese and after about three days, it will be possible to pick up thousands of worms which have congregated around the cheese. I have had them almost an inch thick all around the cheese. One should always run at least two boxes at a time so that worms can be taken from each one alternatively. Also, should one fail then the stock is not lost. After a time it may be found that the medium has

consolidated and become too solid for the worms to penetrate. The top inch of the medium can then be lightly turned over with a small hand fork.

Occasionally, perhaps after two years, I have found that the worms have apparently swarmed. There are many thousands packed round the sides of the box, on the top of the glass and even outside the box altogether. This may be because the medium has become stale or the worms have multiplied so that there are too many for the size of the box. In such cases I have prepared a fresh box or have removed one half of the medium, put in fresh peat in its place and after a few days, removed the other stale material and added more fresh.



"I've been watching your CLOWN FISH for ten minutes and I haven't laughed once!"

The Aquarist's Notebook



Algae

A PROBLEM often encountered in the freshwater aquarium is the build-up of unwanted algae, especially in those places one wishes most to keep clean. We see hairy growths appearing daily all over the leaves of our most precious plants, from whence it is most difficult to dislodge them, whilst the tank glass, comparatively easy to keep clear, remains virtually unsullied. There is, of course, lots of misspent hysteria over the undesirability of algae, and it should not be assumed that it is an unmitigated evil. At all costs one should avoid the usually quite erroneous notion that green water is in some way unwholesome or unhealthy, 'stagnant' etc. It is quite true that some green water or even clear water containing anchored algae may be evil-smelling, but this condition arises from decomposition, not from the growth of the millions of plant cells which is what algae are.

The young aspirant to fishkeeping may therefore be advised to counter any such old wives' tales with the simple statement that even if green water does come it can be defeated readily enough without the nostrils ever having

Continued overleaf

THE BLUEFIN

Chriopeops goodei, the Bluefin, is from Florida, and is one of those fishes that can hardly be classed as tropical. This is because it needs a temperature of 60 to 65°F., and cannot tolerate the temperatures in the 70s that we use for normal tropicals.

Because it is a colorful and well-marked species that attracts buyers of tropicals, beware of its special conditions. The base color is greenish or brownish-yellow, marked with a black line along its middle, and usually along its back, also. The tail fin is red, and the other fins are blue, edged with black. The male is larger (about 2 in. long) and has brighter colors.

As well as the lower temperature required by this fish it should have a large aquarium, for it is most active, and spends most of its time on the move. Plenty of plants should be provided, preferably of the fine-leaved kinds, and here the lower temperature is a help, for many fine plants also like the cooler conditions. It is essential to provide mainly small-sized live foods, for these fish rarely take dried food.

When installed in conditions like these the Bluefin will spawn readily. The male puts on a fine display, and he and the female will move into and above the finely-leaved plants. The female then expels a few eggs each day for about five weeks—a most leisurely and prolonged act of love-making—

and the eggs settle among the plants.

They hatch in about two weeks at 65°F, and if there are some infertile eggs it is usually because the water is too warm. When the eggs hatch and youngsters are seen they should be brought to the surface by placing a light over one part of the otherwise darkened tank. There they should be lifted out in a spoon or scoop—not a net—and transferred to another tank. This should have similar water, and is



usually filled by extracting a little water from the parent's tank each day in readiness for the move. Because of the protracted egg-laying session the young will be hatching each day, and should be removed every few days.

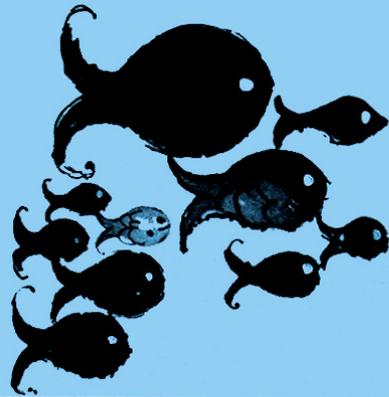
Feed the tiny young with infusorians for a week or so, and then, as they develop, they can be given newly hatched brine shrimp, and eventually the same food as their parents. Their colors soon develop, and then they make a most colorful display. 

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The Aquarist's Notebook



Echinodorus Anyone?

KNOWN also to aquarists under the now invalid name *Echinodorus radicans*, this plant belongs to the water plantain family (Alismataceae) and comes from the warm countries of South America, its distribution penetrating into Mexico. *Echinodorus cordifolius* is one of the few non-tropical species growing as far as the bounds of the temperate zone. It can consequently be cultivated even in garden ponds.



The plant develops a thick rhizome with a dense root network. On the roots oblong tubercles are formed, which are obviously food reserve organs. In more northern areas of habitation this plant drops its leaves for the winter. From the rhizome scanty leaves 16-20 in. long, grow up above the water surface. The petiole (stalk)

Continued, 1st column

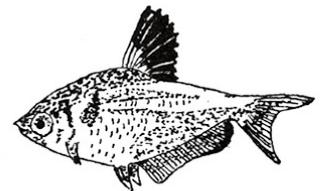
THE SERPAE TETRA

THE serpae tetra holds an honored place in the large and very popular family Characidae. This is not surprising since its blood-red coloring makes it a very desirable acquisition to aquarists. From a distance, a shoal of these tetras mixed with other tetra varieties and housed in a well-lit, thickly planted tank, makes an unforgettable sight. The fish's natural habitat is the Rio Guaporé and Amazon regions, and they were first introduced into Europe in 1924.

As I have already hinted, the serpae tetra is a shoaling fish so that one should keep 8-12 specimens in not too small a tank. They do best in a well-lit, medium to large tank, at a temperature of at least 68°F. The water should be clear, moderately soft to slightly hard and slightly acid (these water conditions apply for most of the other small characin species). Sex differences are not always easy to distinguish, for the male and female fish closely resemble each other and have the same coloring. But the adult male is slimmer and when his body is viewed against the light the male's swim bladder can be seen to come to a point in the rear.

For breeding purposes a male that is already displaying is selected from the shoal. The fish will be eager to spawn and a 3-4 gallon glass tank will be quite suitable for them. The water for this tank should be soft and the temperature must be raised to 75-78°F.

The male is put into the breeding tank a day before the female and some fine-leaved plants for the fish to spawn on should be supplied. The male will begin the display, fluttering in front of the female, swimming to the spawning place, encircling her, enticing her and eventually, immediately before the spawning act, will succeed in approaching her, usually from the side and with an upward movement. The pattern of movements that takes place while the eggs are released is not just haphazard.



Hyphessobrycon serpae

This applies to most *Hyphessobrycon* and *Hemigrammus* species—but there is a difference with serpae tetras—they never 'embrace' with their bodies. They simply press their flanks together (the male does not always even put his caudal over the female's body) and with a jerk the eggs are ejected, the fish part and the eggs fall downwards. All this takes place in the fraction of a second—'like lightning', and it really cannot be witnessed with the human eye. The spawning is repeated some 20 times during a period of 2-4 hours and several hundred eggs are produced—

Continued, 2nd column

ECHINODORUS *Continued.*

of each is substantially longer than the blade, which is 6-8 in. long and 4-6 in. wide, ovately cordate (heart-shaped: about half as long again than the width), with usually seven, rarely nine veins. The base of the blade is broadly cordate.

The flower stalk is racemose (simple), at first erect, soon creeping laterally, with flowers 8 to 10 lines (20-25 mm) in diameter. Flowers are white, self-fertile and readily form seeds that are clustered together in a globular, echinate (spikey) fruit. Seeds of *E. cordifolius* can germinate immediately when they are ripe. In the nodes of the floral stalk, leaves and roots of new plantlets develop at the same time as the flowers.

In the aquarium the submersed plants differ substantially from emergently growing natural specimens. The petioles of the submersed leaves are much shorter and usually are equal in length to the blade, which is moderately undulate at the margins and has an apex more rounded than that of the emersed leaves. Before the emersed leaves have developed, floating leaves, up to 8 in. long and 6 in. wide, sometimes round, blunt at the top, are formed, entirely shading the tank.

E. cordifolius is cultivated in moderate, indirect illumination in an aquarium with a poor bottom medium (sand) in order to be kept permanently in submersed growth. The temperature of the water is not important, and the plant develops in temperatures from 59° to 86°F. Submersed plants usually have four to five well-developed, large, light green leaves with red-brown veins, often with brown, irregular spots.

Vegetatively *E. cordifolius* is propagated from the 'bud plants' arising on the flower stalks, or from seeds. The seedlings are pre-cultivated in shallow dishes in emersed culture. Grown in this way the development of the plants is much quicker than if they are kept in deep water all the time after germination.

SERPAES *Continued.*

it is not unusual to obtain 300 young fish from a good pair.

Immediately after the mating both parents must be removed; it doesn't in the least matter whether or not the spawning tank is darkened. On the sixth day after they become free-swimming they can be provided with the finest live foods. They do not grow particularly quickly and not until they are at least 6 months can the sex differences be distinguished, and then only with difficulty. For spawning, fish at least a year old should be used. One pair can be spawned several times during a year and it appears that an increase in atmospheric pressure will usually cause them to spawn readily.



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Tropical Queries

Changes of Hardness

I know it is rather dangerous to put fish in water of a different pH from that they have been used to, but does this also apply to waters of different hardness? Our local tap water is very hard (about 230 p.p.m.) and I could never get really satisfactory plant growth in it, so when the time came to strip the tank down and set it up again afresh, I used a mixture of tap water and distilled water to bring the hardness down to 87 p.p.m., and a peat filter to breathe some life into this rather clinical mixture. This seems to have done the trick as far as plant growth is concerned but when I come to buy a stock of fish for the tank they will have come from tanks of local tap water. Could you advise me how to condition the fish to accept the softer water, if indeed they need conditioning?

It is not usual to take steps to adjust differences in water hardness when transferring adult freshwater fishes. Although some species may be temporarily disturbed by a major change in hardness this is not of serious consequence. When transferring eggs or fry it is, however, very important not to subject these to changes in hardness or pH. If you wanted to lessen the degree of change in water hardness you could arrange for the water in a quarantine tank for new fishes to be of hardness value midway between that of the source tank and your own aquarium. Adjustment would then occur during the 2-3 weeks period of quarantine.

Skin Holes

I have an oscar that shows a few white spots, bigger than 'white spot', that appear on the body near the base of the fins and on the head. These spots sometimes disappear without trace and sometimes leave a small hole. The disease doesn't seem to be contagious nor does it respond to a wide range of chemical cures.

These 'holes' appearing after apparent infection in the heads of oscars, it has been suggested, are caused by a condition resulting if the diet is inadequate. These fish require whole fish to eat, at least occasionally, and guppies or goldfish (depending on the size of the oscar) are commonly used as foods by oscar-keepers.

Injuries

Is it possible for a fish to injure itself against a rock? I keep reading instructions not to include sharp rocks in tanks in case the fish injure themselves but I thought that the fish's lateral line was one of the means by which it prevented just such a thing happening.

It is true that signals from the lateral line system transmitted to its brain enable a fish to become aware of nearby objects but a fish can injure itself on a rock if activated by a violent reaction that does not allow it to take heed of its usual signals. This is more particularly likely to happen in the close confines of a small aquarium. In fright a fish can dash itself against a rock or in the wild dashes made during the breeding procedure a fish can injure itself on an obtrusive thermometer or heater.

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Glowlight Tetras

I BOUGHT my glowlight tetras when starting my first community tank. Acting on the advice of my local dealer, I bought five since "they prefer to be in a school".

This I found to be true; they are lively fish, rarely swimming on their own. They settled in very quickly, along with all the other newly purchased inmates, accepting flake food on the first night.

Two weeks later, after consulting a book or two, I decided that I had two males and three females. Soon after this, however, I lost one female, through I think, a form of swim bladder disease, leaving me with two pairs. It was not until some while later, that I considered trying to breed them. Although they were only about one inch long, they were in fine condition, and as I had a new spare 24 in. x 15 in. x 12 in. tank, I set it up for them. I filled it only eight inches deep—half the water from their community tank, the rest being freshly drawn, but of course, dechlorinated. Into the breeding tank I put three clumps of weighted Cabomba plant. The back and one end were covered with green paper and the bottom glass was also darkened.

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THE THREE-STRIPED

GLASS CATFISH

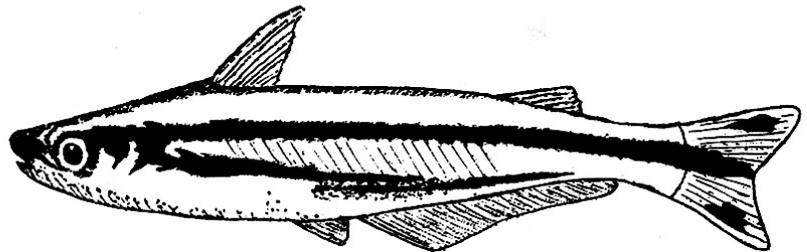
NOT FAR from the mouth of the River Congo on the west coast of Africa, is an area near Brazzaville where can be found a small fish that is a delight in any aquarium. This is the Three-striped Glass Catfish, *Etopiella debauwi*, sometimes called the Congo Glass Catfish, which has a silver and white body, decorated by three black stripes running from head to tail.

Young specimens are not so clearly marked as the drawing, which is of a mature 3 in. long fish. If you are offered one that is not so clearly marked it is quite all right, provided that you can be sure it is young. Size will be

keep well up in the water. This might make you think that the fishes you have bought are ailing, but this is not necessarily so, for the new fishes have peculiar ways. This is a peaceful fish, and can be kept with other tropicalls.

A soft, slightly acid water suits it best, so remember the old tip of keeping a few old oak leaves in the gravel. The temperature range of 75 to 80°F, which one often uses for other tropicalls, is ideal for this one.

The recommended food for this glass catfish is live *Daphnia*, white worms and *tubifex*, but I have found that it takes almost anything. It thrives ex-



some indication, for 1 to 2 in. fish are usually offered, and these do not show their real brightness until later.

For the aquarist who wants some catfish that are really different, this is the fish, for its manners in a tank are not like those of other catfishes. To start with it is a school fish, and will not last long if kept without the company of its own kind. Always have a minimum of three or four of this species; six are ideal.

Its swimming habits and posture are very restless, for this fish gives the impression that it has to swim hard to

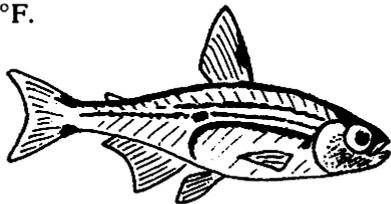
ceedingly well for it is quite hardy and long-lived—even on mainly dried food of good quality. Newly hatched and grown brine shrimps are taken avidly, so it is not difficult to keep healthy.

One of the main delights of this fish is its transparency, for the white and silver parts can be seen through—particularly in the younger, smaller fish. As it grows older the contrast between the white/silver and the black stripes becomes more marked, and it is at all times an interesting and exciting fish to keep. I have not heard of it being bred in captivity, but you may be lucky. ●

GLASS CAT *Continued.*

I also prepared a peat ball; about a dessert spoonful of peat tied in a piece of nylon stocking. I dropped this into one corner. The four fish were conditioned on chopped *tubifex*, small white-worms and live brine shrimp, along with an occasional feed of dried food.

Finally I selected the fattest female and the liveliest male. I introduced the female into the tank first and then, about eight hours later added the male. The water was 4° warmer than their normal temperature, making it just on 80°F.



Glowlight Tetra, *Hyphessobrycon gracilis*

At first the fish hid in the weed and nothing happened that night. I was up early the next morning and was able to observe part of the spawning activities; the two fish quivering together, dashing towards the plants and then rolling over each other in a lightning movement, and then the tiny eggs dropped into the plants. Unfortunately I could not witness the whole performance as I had to go out, but on my return I found the two parents swimming around having a thoroughly good feed—on fish eggs! I hurriedly removed the fish and then set about protecting the eggs from the light. This I did by covering the clear end and front pane with green paper. The following day I squeezed a few drops of Liquifry (red tube) into the tank to provide the *infusoria*. I used a fresh tube, since I did not want to risk using a tube which might have gone off.

On the evening of the fourth night I peered into the tank with a torch, but I could see no sign of life. On the sixth day I still could not see anything and so took off the paper coverings and was very surprised to see numerous fry, darting around. I added more Liquifry, and progressed with various graded fry food. Soon the forty-odd fry left went on to brine shrimp, and from then on they have never looked back!

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Tropical Queries

Dangers from Plastics

I have recently read, admittedly in connection with brewing home-made beer, that some plastic containers are unsuitable for use as the plastic may give off toxic chemicals, and in fact bright yellow polythene buckets (I myself use such a bucket for holding water for my goldfish tank) are particularly mentioned as not being suitable for use. Since such a lot of plastic is used in connection with our hobby are the same dangers likely to arise?

It is advisable to be aware that not all plastic are non-toxic to fish, although it is of course unlikely that any of the plastic used for aquarium equipment or, indeed, for small tanks themselves, would be in any way harmful. Some industrial plastics do contain potentially toxic substances; these are particularly likely to be released when alcohol is brought into contact with them (as would be the case in home beer- and wine-making) but hot water used in them could also become contaminated. So if you proposed to use any plastic tubing or containers not manufactured for aquarium use it is advisable to wash them thoroughly and treat them with hot water before bringing them into contact with water to be used for fish.

Oscar in Trouble

We have an oscar 10 in. overall length in a 39½ in. by 12 in. by 15 in. tank (75°F) by himself. He is approximately 1 year old and we've had him since 1 in. long. The tank is bare but for a few rocks and has a power filter which seems to provide adequate aeration. Occasionally he seems to be irritated by something that causes him to quiver and sometimes weave from side to side for a few moments; quite often he damages

himself against the rocks by darting away for no apparent reason. Other than scars he receives from these 'fits' the only outward signs are clusters of oxygen bubbles that seem to cling to a form of slime that appears to come from his body. He eats well and has live or lean meat as well as pellets daily.

You have very well described the symptoms induced by excess acid or alkali in the water (the symptoms being the same for either). The irritant action of excess of acid or alkali leads to heavy mucus production and darting, convulsive movements and may result in death. In most aquaria, dissolved solids tend to increase and the water becomes more alkaline with time; it may well be that if you were to test the pH you would find that this was so (a reading of 8-9 would be too alkaline and over 9 excessively alkaline). Although you have a power filter working it will probably not be correcting water alkalinity unless indeed you are using the appropriate resin. Partial water changes are the answer and you should be changing a quarter of the water in your tank perhaps once a month. Under the circumstances it would be advisable to change a third of the water at once, and another third in about 2 weeks' time.

It is also possible (since you do not list such foods) that the oscar's diet might be improved. Live foods and lean meat are excellent foods, but at the size it has now attained most live foods would seem to be rather too small and it should be receiving live food in the form of whole live fishes, such as small guppies or goldfish. It is the most natural way of supplying the minerals that it would be obtaining in the wild by the same means, and it is important that such food should be supplied once or twice a week (do make certain that the stock of live fish to be fed is your own and therefore healthy). Earthworms should also be included if possible and a certain amount of green vegetable matter in the form of floating plant, boiled spinach or scalded lettuce.



THE AQUARIST'S NOTEBOOK

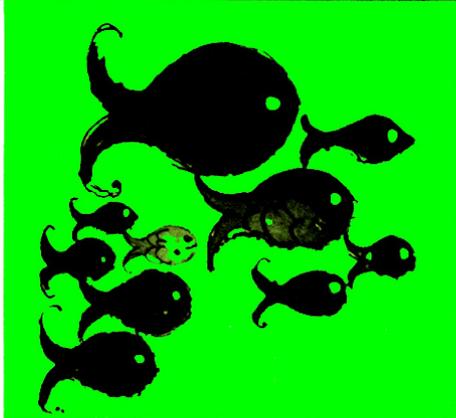
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THE EGYPTIAN MOUTHBROODER

THIS mouthbrooding species as imported from its natural habitat in the River Nile in Egypt as long ago as 1902. Classified as a cichlid, it was first known as *Haplochromis multicolor*.

in which they can hide. Their diet should consist of live food.

For breeding purposes I prepare a 7-gallon (18 in. by 12 in. by 12 in.) tank filled with fresh, normal, neutral tapwater at a temperature of 79°F. The tank is prepared with a base of fine, sieved sand. Care must be taken to use only a "full" female for mating — otherwise it can be rammed and bitten by the male and even killed. So it is quite a good idea to use two females to one male. Usually the fish require 2 or 3 days in their new tank to acclimatize themselves, but during this time there will be continuous dis-

In this article I am going to forego the task of giving a description of the fish's appearance — it would be a completely thankless job. "Multicolor" must suffice. This Egyptian mouthbrooder grows to a size of about 3¼ in. and in mature specimens sex differences are clearly visible — the female is the larger, more robust fish, fuller in the belly, somewhat yellowish in color

Giant Val

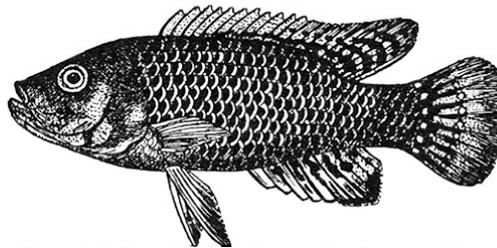
GIANT val (*Vallisneria gigantea*) belongs to the frogbit family (Hydrocharitaceae) and comes from the Philippines and from New Guinea. It has a bulbous rhizome with a tangle of fairly short roots. From the rhizome 10 to 15 ribbon-shaped leaves sprout. These leaves are a strong green color, are about ¾-1¾ in. wide and 3-7 ft. long with, usually, 15 longitudinal, obliquely connected veins.



The species is dioecious, i.e. female and male plants are separate. The flowers on the female plant grow up to the water surface on long, thin stalks. The male flowers are sessile (i.e. attached directly by the base without stalk or peduncle) and before maturing are covered with the calyx. When the mature male flowers open the pollen rises to the water surface and is carried to all parts of the tank.

Giant val needs a large, but above

Ctd. overleaf 1st column.



and with dark diagonal bands on the body. The male, unlike the female, is bedecked with the lovely bright coloring that its name suggests. During spawning time, and when the light falls correctly on him, these colors are brilliantly heightened. Also, the male's anal fin is decorated with orange flecks.

These fish are happy in a medium-sized, thickly planted and well-lit tank kept at a temperature that does not fall below 68°F°. They are peaceful and can be kept in a mixed community of similar sized fishes, but the tank must be supplied with plants and rockwork

playing on the part of the male, which includes blows made with his tail. All this time a pit is being prepared in the sand, and the female often helps in this.

The spawning itself takes place while the fish move round in a circle over the depression in the sand. Both the male and female fish mouth each other's rear ends, and the female expels some eggs that are immediately fertilized by the male. These eggs are then taken up into the female's mouth. The contact with the male's genital opening allows sperm to be taken into the fe-

Ctd. overleaf 2nd column.

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GIANT DANIO *continued.*

all a deep tank so that it can develop properly. It is not exacting with regard to its water or substrate requirements but it does need a rather higher temperature than the other common species of this genus, i.e. above 68°F. It flowers throughout the summer months but does not produce seeds. It is in fact propagated vegetatively by the separation of the young plants from the rhizome runners. Propagation is much slower than that of the smaller species and if the aquarist wants to obtain a great number of plants he has to separate the plants and replant them again and again during the months March to August. About 2 to 3 weeks after replanting, one parent plant will sprout two to three root runners on which three to seven new plants will arise. After this, as a rule, no new runners are made. As soon as the runners have grown sufficiently strong they are uprooted with the parent plant, separated and planted again. So the propagation continues.

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MOUTHBROODER *continued.*

male's mouth and so some of the eggs are actually fertilized in her mouth.

The end of the spawning, which may last from 1 to 2 hours, is signalled by the female's withdrawal into a corner. Her body is slimmer of course, and her enlarged throat sac full of the eggs that she has collected can be clearly seen. As soon as the female starts looking for a hiding place the male should be removed so that the female can rest. In her distended mouth she will now be hiding 50-100 fertilized eggs, over which she passes fresh oxygen-containing water as she breathes. During the 10-14 days of the hatching period she will take no nourishment and for this reason she must be really well fed before being used for breeding so that she can stand up to this rigorous fast without damage to her health.

The young fish are about 6 mm. long when they hatch and must be given the finest possible live foods. For some days after they become freeswimming they will retire into their mother's mouth at the slightest sign of danger, and at night. All this while, as long as she is caring for the brood, she usually eats nothing; she moves about very little, her breathing is heavy and she becomes very timid. At the end of the week after the hatching the fry are already so large that they cannot get into her mouth; and at this point it is better for the female and the young to be separated: It takes quite a little time before the female's mouth returns to its normal size, but, given plenty of varied feeding, she will be ready to spawn again 6 weeks later. The young fish are sexually mature after about 6 months.

Readers' Queries Answered

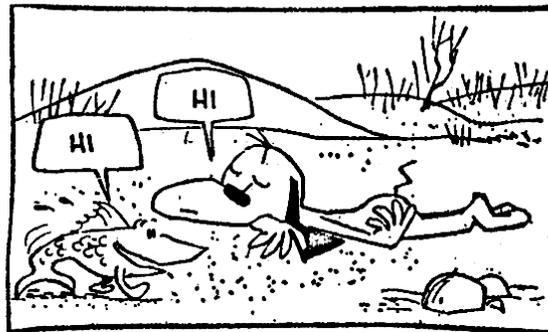
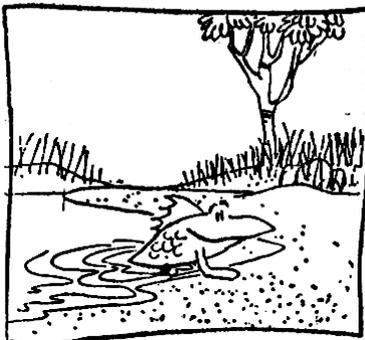
Fry Feeding

I have just lost most of a spawning of White Cloud Mountain minnows and am very disappointed about this as it was my first effort with egg layers. A friend has said that it might have been because the fry tank was not lit. Is this correct? And if so, why does the light make so much difference?

Correctly feeding egg layer fry during the first week or two of life is one of the most important factors in their successful rearing. They must receive plenty of appropriately sized food, preferably where they can obtain it easily without having to travel great distances to find a small amount of nourishment. With a light bulb illuminating the tank, the fry will be attracted by the light and gather around it; the food can then be dropped in this one spot. If Infusoria are being given, these, too, will be attracted by the light and will remain in the same vicinity as the fry. It is also easier under these circumstances to spot any turbidity in the water (which would indicate that some of the water should be replaced with fresh).

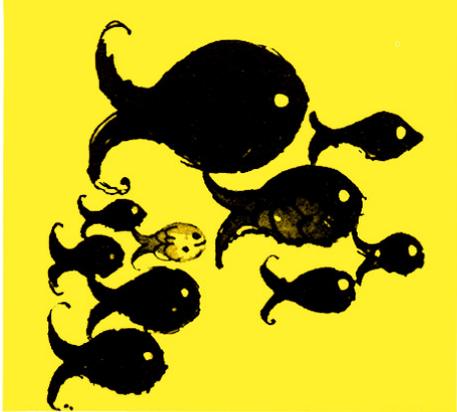
It is in connection with the correct feeding of the fry that most dangers arise in these early stages. Mountain minnow fry should be given Infusoria for the first week, but they must receive it in small, frequent, doses. At the same time it is necessary to keep a careful watch that no water pollution is occurring and if the water shows any sign of cloudiness some of the old water must be replaced by fresh (siphoning must be done through a fine net or fry may be lost).

ADVENTURES OF SAM - THE CLIMBING PERCH





The Aquarist's Notebook



Ludwigia

THIS plant, a member of the evening primrose family Oenotheraceae, is a very useful aquarium plant since it tolerates a wide temperature range (from 65°F to 85°F; and is therefore equally suitable for both coldwater and tropical aquaria.

It grows in its natural habitat, the southern parts of North America, in shallow waters as a marsh plant known



as false loosestrife, so it is also suitable for use in paludaria and terraria. The leaves, which are broadly lanceolate, grow up the stem two by two, opposite each other, and are about $\frac{3}{4}$ -1 $\frac{1}{4}$ in. long and $\frac{1}{2}$ in. - $\frac{3}{4}$ in. wide with only inconspicuous veining. The upper surface of the leaf is a dark glossy green and the lower surface — red or purple. When the plant is grown immersed, tiny

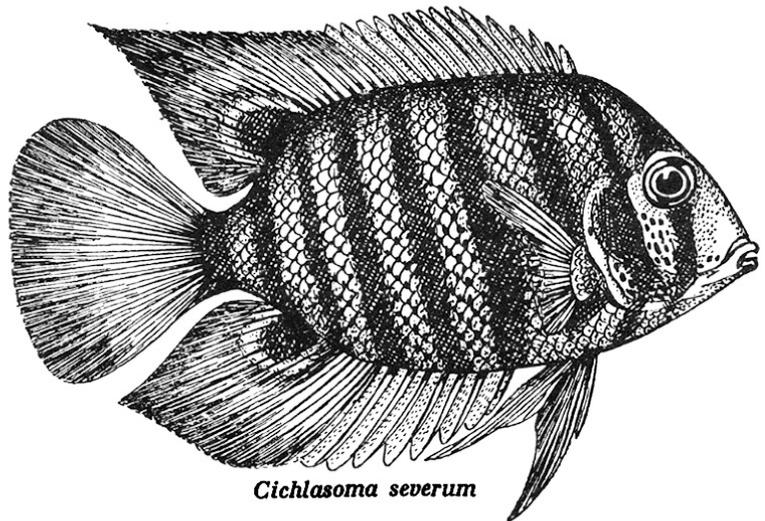
Continued overleaf.

KEEPING AND BREEDING

THE CONVICT CICHLID

THE larger representatives of the cichlid family are avoided by most aquarists because of their infamous habits — brawling and plant-eating and, of course, their sheer size. In spite of this, a few of them have become valued tank inhabitants — some species of *Aequidens*, for example, *Pterophyllum* and, not least, this fish, the “severum”.

of a pair of severum at spawning time. It has a deep, oval-shaped body compressed at the sides. Coloring varies according to the fish's mood and also, in wild-caught specimens, according to the locality in which it originated. The color range is from brown to green. The belly quarters always brighten in color during courtship and spawning



Cichlasoma severum

But first a few words of introduction. In its home waters in the northern parts of South America, the Amazon basin, the Magdalena river and Guyana, *Cichlasoma severum* grows to some 20 cm., though in captivity its maximum length is seldom more than 6 inches, but nevertheless it will live peacefully with much smaller fishes and can be put into a community tank with them. This is not true, however,

and when the fish is stimulated can turn to a gleaming gold. The very characteristic blood-red iris of the eye does not vary.

Severum cichlids require warmth, so their water temperature must not be allowed to fall below 72°F, particularly during the winter months or else you will have a case of fin rot to cope with. As I have said, except at spawn-

Ctd. overleaf 1st column.

LUDWIGIA *continued.*

yellow flowers appear just where the leaves join the stem.

In the aquarium it requires a reasonable amount of light. The really decorative variety of this species is that sold in the shops as *Ludwigia mullerti* hort. (*Ludwigia palustris* var. *americana* forma *elongata* Fassett.) Its leaves are bigger (up to 1½ in. (4 cm.)) and their lower surface is a deeper red than in the original plant.

SEVERUM *continued.*

ing time severum are peacefully inclined and swim majestically through a large tank taking little notice of their companions. Although they often remain quite timid for a long time, with patience one can win their trust. At feeding time, they will come gradually nearer until finally they can be handled. They thrive on plenty of the larger types of live food and they should be given a supply of vegetable food; otherwise they may turn to the finer plants to repair the deficiency in their diet.

Sex differences are very difficult to recognize. The male has been reported to have more red flecks on the scales and worm-like markings in front, but I did not notice this with my pair. What with the color change of both fish when spawning started the only way I could differentiate between them was by recognizing the female's extended ovipositor and rather shorter fins.

Breeding is not easy either. The best way is to wait for a male and female to separate themselves from a group of severum after noticeably seeking each other's company. Not every male is suitable. If you notice pairing behavior between two fish they should be placed in a large, plant-free aquarium. Water conditions are not critical but the temperature is and must be raised to 79-82°F. Roots and flat stones are used by the female to lay her eggs on — I utilized a sloping piece of slate.

The male's display consisted of body shuddering, placing himself in front of the female and ramming and butting

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Readers' Queries Answered

Water Evaporation

I find that I don't have time to siphon out my tank but I would be able to quickly fill it up to replace the water loss. I believe,

The occasional replacement of evaporated water without siphoning and removal of some of the tank water itself will do no harm. But if it were done continually the result would be a gradual increase in water hardness. When water evaporates the dissolved salts are left behind, so that mere replacement of evaporated water does nothing to eliminate these. Unless you are using distilled water, the replacement water is itself introducing yet more dissolved salts into the aquarium since no natural water is absolutely 'pure'. If some of the tank water is removed at the same time, you are at least exchanging a concentrated solution (the old water) for a dilute solution (the replacement water) and this will prevent the increase in hardness of water, that does occur very gradually in most aquaria with time, from taking place.

A Foreground Plant

What is 'micro sag.' please? I cannot find it in any of my plant books. My local aquatic store is selling it as a foreground plant but I do not want to plant it and have it grow taller than I require.

This plant, once known to aquarists as *Sagittaria microfolia*, is in fact now called *Echinodorus tenellus*, which is the name you are most likely to know it under, or the pygmy chain sword. The smallest variety of *Echinodorus tenellus*, which is presumably the one your trader is selling, does grow only to 2-3 in. in height and may keep even smaller than this.

her very gently. I never saw a bad bite or a wound with these fish. Intermittently the chosen stone was receiving attention and not only the stone itself but all the surrounding area was cleaned as well, the gravel in the vicinity being mouthed up and spat out again. Just before the spawning actually took place the display excitement abated and finally the female laid a great number of eggs (it can be as many as 1000 or so).

Some severum pairs will tend the young but some, on the other hand, will not and rather than take the risk it is better, in my opinion, to remove the parents once the egg-laying is complete. An air stone placed so the eggs are continually swept by a very gentle air stream then takes the place of the parents. Once the fry are free-swimming they must be fed with the finest live food and it really must be tiny food. The young fish become sexually mature in their second year of life.



"Just to make things worse, my piranhas have escaped!"

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4-Leaf Clover

THIS POPULAR name, like sharks for species of certain freshwater fishes as far removed from the sharks of the briny deeps as are cabbages from cucumbers, is a misnomer. It is derived of course from the resemblance they bear in general appearance to the clovers of our lawns and meadows and the various oxalis bought for their



flowers and much later disabused for their invasive habits more particularly in the rock garden. In point of fact, the so-called four-leaved clovers are ferns and referred to the family *Marsiaceae*.

The genus *Marsilea*, named after an Italian called Luigi or Giovanni Ctd. overleaf 1st column.

A BEGINNER'S LIVEBEARER- THE BLUE LIMIA

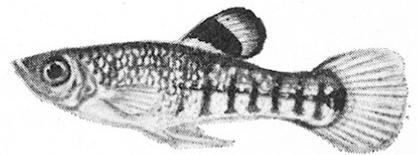
FOR MANY YEARS NOW not nearly enough attention has been paid to livebearers other than the ubiquitous guppy and the easily hybridized mollies, swordtails and platies. Yet I can remember a time before the war when various species of *Limia*, *Gambusia*, *Girardinus*, *Phalloceros* and *Cnesterodon* were readily available from the trade. Those were the days when the cult of the livebearer was largely responsible for the rapid spread of the tropical fishkeeping hobby over the world. Therefore I have been more than pleased to notice, just recently, that a few of the almost forgotten livebearers have been included in dealers' lists. The blue limia is one of the most rewarding.

Strictly speaking, the genus *Limia* is no more. We are informed by those who have the qualifications to speak on the subject that *Poecilia* is the correct generic name to use. Hence the fish once known to science as *Limia caudofasciata* (Blue Limia) should now be called *Poecilia caudofasciata*.

It is not a large fish, a mere 2½ in. or thereabouts, and the female is the larger of the two, that is in general build and length. The coloration of the male is singularly attractive. The back is olive-brown shading down to white splashed with lemon-yellow to orange on the underparts. The sides reflect a changing watery-green to blue sheen. Through this shimmering overlay of blue to green there extends horizontal rows of sparkling brighter green

to blue dots. To the rear of the body are several narrow black vertical bars. These cross a shortish black stripe. The dorsal fin is yellow to orange marked with black in the base and along the top edge. The anal fin is yellow in the base. The caudal fin is yellow melting into diaphanous green. The female shows little blue in the sides, but her vertical bars are strong. Her fins are tinged yellow, or green, with a dark spot in the rear base of the dorsal.

The blue limia is native to Jamaica and flourishes well in captivity at a temperature in the lower to middle sev-



enties (°F.). A pregnant female quickly assumes a very swollen abdomen colored blue-black. Batches of fry are delivered about every six to eight weeks. About thirty to fifty babies are delivered at a time. Very shallow water crammed with nitella or milfoil will keep down losses. For well-fed parent fish are not overtly cannibalistic. Many years ago, I bred untold numbers of blue limia in nothing more commodious than rectangular glass dishes (photographic trays) stood on top of heated tanks.

A few hours after delivery, the fry Ctd. overleaf 2nd column.

FOUR LEAF CLOVER *continued.*

Marsigli (1658-1730) who, throughout his fairly long life, maintained a passionate interest in botany, consists of some seventy moisture-demanding species distributed over the warmer parts of the world. Many species are found in inundated land in Australia, where they are popularly known as Nardoo Plants and harvested for their spore cases which, desert-dry and pounded to a sort of coarse grain, furnish the aborigines with what can loosely be termed bread.

Few species of *Marsilea* are known to aquarists, though the few that are have been around some forty years and do well in shallowish water in the habitually warm aquarium. Among the best known are *M. quardifolia* and *M. drummondi*, both of a rich green hue, and *M. hirsuta* of a soft grey-green color. The last, as its specific name suggests, is covered with a nap of silvery hairs.

I have tried them all, and a few others, and found them long-lasting and useful in foreground plantings in not too great a depth of water or in trays raised near the surface and masked by stonework. A good growing medium is a 50/50 mixture of peat and clay.

Marsileas flourish best under a fairly strong but not scorching light which, through a glass cover, browns and shrivels the aerial foliage. The rootstock is dark and wiry and spreads in every direction below and over the planting medium. From this network arise the numerous rooting stems. If the atmospheric air-seeking stems and divided foliage is pruned back less tall growth will still open out underwater. Floppier stems left unpruned lie along the surface. The stems unroll in a typically fern-like manner. They never unroll in any great hurry.

Four-leaved clovers are no use to the tropical aquarist as oxygenators. Their great merit in the aquarium is their distinctive appearance and the fact that their forest of stems and horizontal runners afford good spawn-

ing ground, play areas and shelter for diminutive fishes such as guppies and the smaller cyprinids and cyprinodonts. In general the four-leaved clovers are plants of soft and acid waters. 

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BLUE LIMIA *continued.*

will be darting about in all directions in search of food. Microscopic pond-life such as rotifers, and the like, are recommended for rapid growth, but if such natural live food are not available, then micro worms or micro eels will do. Alternatively, any dust-fine dried food may be fed.

Adult fish eat almost anything and pick frequently at mossy *algae*. In almost every brood there are males which develop richer pigmentation than the rest. It is not unlikely therefore that, given the right sort of attention with regard to growing room, food, segregation and the bringing together of carefully selected stock, improved forms of the blue limia could be produced.

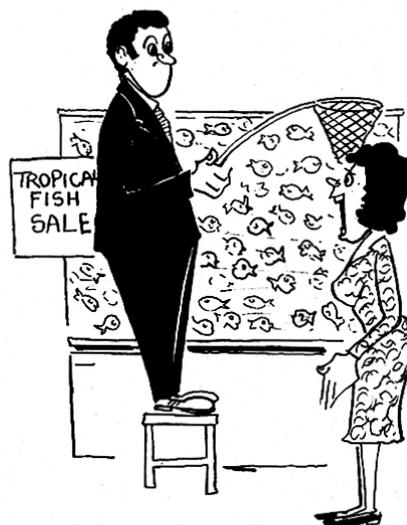
The blue limia is well-suited to a community tank because it does not molest other fishes, is always on the go, and dashes about in all levels of the water. Although a range of temperature in the seventies (°F.) has been recommended above, the fish will stand rest periods in the upper sixties (°F.) with no ill effect. At least, that was my experience. And fish that can stand a lower temperature than usual (for a short time) are valuable in these days of rising heating costs and power cuts. 

Readers' Queries Answered

I am proposing to make some concrete rockwork for a very large tank and I remember there is a way of speeding up the curing process, but I haven't the details. Could you help me?

The alkali from the concrete can be neutralized by using a dilute solution of hydrochloric acid. Place the rockwork in a plastic container and cover with water to which hydrochloric acid is added until a strip of neutral litmus paper shows a red color when dipped in the water. After some hours the acid will have neutralized the alkali and the litmus test paper will turn blue when dipped. Add further amounts of the acid for several days to keep up the acidity, so that ultimately when the litmus paper is applied to the solution the paper remains red all the time.

Leave the rockwork in the solution for another 4 days, and then re-move it, wash it and scrub it. Then soak it in a large volume of fresh water for a further week. After this the rockwork is safe to put into your tank.



"I want one that will be a good investment . . ."

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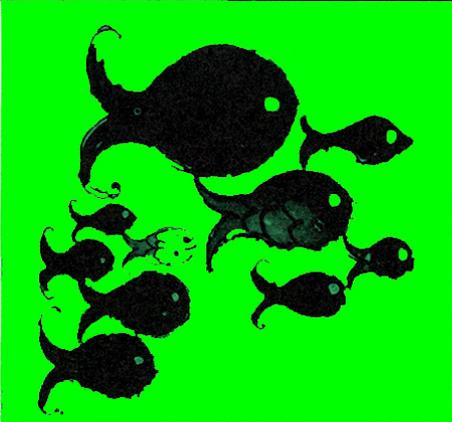
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TROPICAL QUERIES

I had two goldfish in a bowl and one died. Do you think the other one will mope because it is alone?

The fish will not be any the worse for being alone. Goldfish do not seem very intelligent and yours will no doubt grow better with more space. However, it would do much better in a properly set-up tank or aquarium, with growing water plants.

My domestic heating system maintains a temperature of 70°F (21°C) what ever the weather outside. Please give me the names of plants and fishes which would flourish in a well-lighted tank placed in my lounge and not given any additional heating.

The vallisnerias, sagittarias, spatterdocks, milfoils and *Elodea densa* are among those plants that would flourish at a temperature in the middle sixties to lower seventies (°F). As to fishes, the following should do well: White Cloud Mountain minnows, Australian rainbow fishes, golden and pygmy barbs, half-striped barbs, neon tetras, guppies, *Corydoras aeneus* and *C. paleatus*.

I should like to know whether a pair of *Aplocheilichthys dayi* would attack the other fishes in my community tank? Also, is *A. dayi* a ready-breeder?

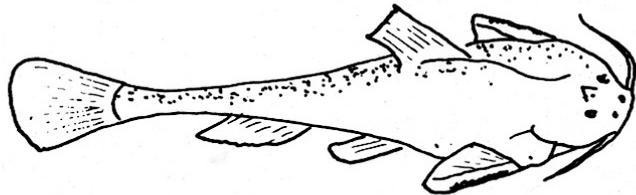
This attractively coloured killifish is not aggressive, but it is advisable to give a pair a tank to themselves. The fish lives and breeds best in a soft and acid water maintained at a temperature of about 75°F (24°C).

A PECULIAR KIND OF CATFISH

SOME TIME AGO some very remarkable fish that I had never seen before were offered to me. I had no clue as to what they were called or what their requirements might be but after a lot of thought I decided to buy them. From the construction of their bodies, their coloration and behavior I could establish that I was dealing with dwellers of fairly fast-flowing waters, where they probably lived on a dark bottom substrate. After consulting the international literature, I found

more or less forms a separating line between the broad and narrow parts of their body.

Their color is mainly brown, though this can change substantially depending on a variety of factors. Whilst the front part of their body is usually a bright brown, the tail-end is dark brown. The body is also provided with rather irregular granular marks that make the fish look exactly like a small twig with leaf attachment, that has fallen from a tree and has been lying



that the fish belonged to the genus *Bunocephalus*, which, so far as we know, live only in the northern parts South America. The species I have is probably from Surinam, Guyana and Guiana.

They are peculiarly shaped fish, provided with a strong bony armor on the back, in contrast with the belly, which is very soft, though the typical square plates are still visible. The fish are very broad and flat, with large pectorals like delta wings, and a long tail. The fin rays end in a very small hook that plays a part in the propulsion of the creature over the bottom. The dorsal is positioned just above the pelvic fins and this double set of fins

on the bottom of the water for some time. A good example of mimicry! On closer examination, long rows of small warts are visible all over the body with the exception of the underside. These small warts can change in color from white to brown and black.

Apart from the long barbels there are a couple of cavities (the nostrils) on the upper jaw, which may perform a function in smelling and tasting. Still another pair of very short barbels can be seen on the lower jaw. These are very sensitive and may serve to trace food as well. In fact, the sense of taste and smell and the ability to perceive vibrations are very well de-

Continued overleaf.

veloped in these awkward-looking fish. Sometimes one can see a *Bunocephalus*, hanging between the water plants or lying on the tank bottom, become immediately aware of food offered (mosquito larvae, tubifex etc.) even though it cannot see it and it is at a distance of 4½ feet! The eyes are small and project just above the surface of the very flat head. The name of the fish, *Bunocephalus*, is probably derived from the small irregular warts on their body: *buno* (Greek), hill or mound, *kephalo* (Greek), head, i.e. *Bunocephalus*, with a bumpy or hilly head!



These are evening or night animals and at first there was very little daytime activity from my new aquarium fish, but when dusk fell they came up to the front panel of the tank to look for food on the bottom. If *Bunocephalus* are kept in an aquarium for a long time they get used to their surroundings and will become more active during the day, claiming their share of the food. At first, though, in order to make sure that they are fed satisfactorily, they must be offered food at twilight. They eagerly accept daphnia,

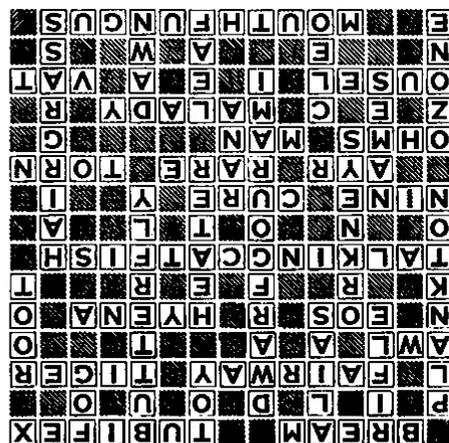
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mosquito larvae, tubifex and every kind of live food. They can eat so much that their flat belly becomes quite round.

Although *Bunocephalus* look so awkward, when danger approaches they can develop a surprising turn of speed. Possibly this may be the result of their taking in water through their broad mouth, which when forcefully closed expels the water through the tiny gill openings. This propulsion is further assisted by the very large pectorals and the long tail. Normally, however, they are rather slow moving and this great speed is only developed as fright reaction, when they sometimes whirl down through the water like a small leaf on a twig falling from a tree.

Just like a number of other fishes of this family, they like well-oxygenated

Crossword Solution



water but in an emergency they can switch to a peculiar intestine-breathing mechanism that enables them to survive in unfavorable circumstances. If they are suddenly taken out of the water, for instance by birds, a grunting noise can clearly be heard as a result of the air escaping from their body.

Because of their nocturnal habits, we know very little about these interesting fish since it is not easy to watch these dwellers in darkness. But they are worthy acquisitions for the real fish enthusiast.

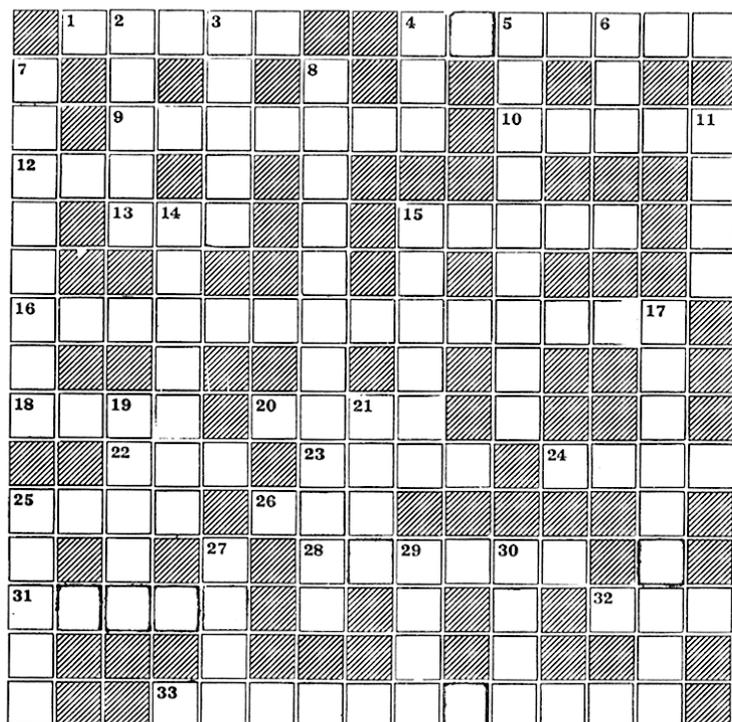
CLUES ACROSS

1. *Abramis brama*
4. Excellent live food but for its dirty habitat
9. Distance between the tee and green?
10. *Barbus tetrazona*, the - barb
12. Small boring instrument
13. *Hyphessobrycon* -, see 30 down
15. African wild dog with a hideous call
16. *Acanthodoras spinosissimus*
18. Maximum number of skittles which can be knocked down with one ball
20. Aureomycin is a good one for 33 across
22. West coast Scottish town
23. Excellent air high up
24. Ragged fins could well be
25. Units of electrical resistance
26. Common name of *Homo sapiens*
28. Descriptive of 33 across
31. Bird of the thrush family looking like a blackbird with a white bib
32. Large tank
33. It's caused by *Chondrococcus columnaris*

CLUES DOWN

2. Long gun
3. A fish's other name
4. Playful thing
5. Dairy insect?
6. A thick mist
7. Small creatures of the sea
8. Snow White's anabantid
11. Plant's anchor
14. They are found off the north of Scotland
15. Married to a thermostat
17. Plant required to cover a bald tank
19. They may be Latin or common
21. Frog genus
25. Enriched oxygen
27. She took to the viper
29. A plant's food factory
30. Early morning tetra ?

The AQUARIST Crossword



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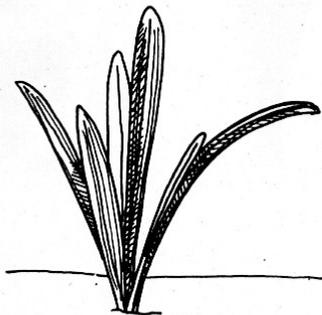
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A HONEY OF A GOURAMI

Sagittaria

ANOTHER marsh plant from the U.S.A. (this time from the eastern counties) that is obliging in its requirements is *Sagittaria subulata* (water plantain family, Alismataceae). All varieties of this species grow in both hard water and in water rich in organic matter. Nor are they over-sensitive to temperature or to the quality of the substrate in which they are grown. They do, however, require good illumination. Submersed leaves are ribbon-shaped without differentiation between blade and stalk. Before the plant flow-



ers, floating oval leaves on extremely thin, long, light green stalks appear. On the stalk there are usually two to five male and one or two female flowers. Flowers are white and about 1/3 in. in diameter. The fruit resembles a

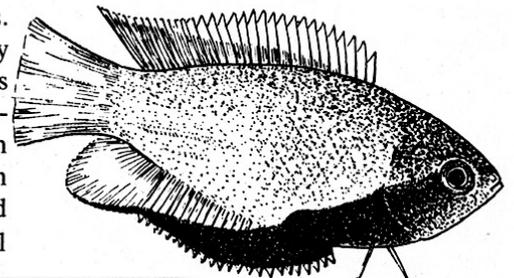
Ctd. overleaf 1st column.

IT IS NOT so very long ago since the first honey gouramis fell into aquarists' hands and I was myself one of those first happy possessors of this species. At a first, brief, sight *Colisa chuna* would rate as a close relative of the well-known species *Colisa lalia*. In fact, the female *C. chuna* is very nearly indistinguishable from the female *C. lalia*. The male, however, is quite differently colored and compares well with the dwarf gourami male in splendor of color and general beauty.

The arrival of this species from its home in north-east India made a great addition to our available *Colisa* species. It is peaceful, though unfortunately rather shy, and warmth-loving. It does also seem to suffer rather more frequently than other labyrinth fishes from swellings under the skin. When not in spawning condition both the male and female fish have a dark, horizontal

band running along the middle of the body from the eye to the root of the tail, but this stripe fades partly in the female during spawning and the male completely loses his dark band. My own fish do well in my 18 gallon all-glass tank in ordinary tap water at a temperature of 79-80°F. They are somewhat smaller than dwarf gouramis (*C. lalia*). This species does not require very deep water — 10-12 in. is quite sufficient. At the temperature mentioned above and at slightly higher temperatures, nest-building can take

Continued overleaf, 2nd column.



WHAT ARE WE?

My 1st is in POSTAGE but not in LETTER,
 My 2nd is in POORER but not in BETTER.
 My 3rd is in MAKING but not in MADE,
 My 4th is in FOREST but not in GLADE.
 My 5th is in TROPICAL and also in HEAT,
 My 6th is in CUSHION but not in SEAT.
 My 7th is in GREENSTUFF but not in NETTLE,
 My 8th is in COOKER but not in KETTLE.
 My 9th is in MARRIAGE and also in MATE,
 My 10th is in MACKEREL but not in SKATE.
 My 11th is in MEASURE and also in MILE,
 My 12th is in SLATE but not in TILE.
 My 13th is in STEEPLE but not in DOME,
 My whole are quite small—they like a well-planted home !

ANSWER ON NEXT PAGE



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SAGITTARIA *continued.*

green raspberry and contains a great number of minute seeds (achenes) moderately dentate on both the front and back side.

When growing in its natural habitat, should the water dry out *S. subulata* develops land forms. In this case the leaf blade is usually ovate, 1-2 in. long on stalks that are the same length or even two to three times longer. There are three distinct varieties of this species:

Sagittaria subulata var. *subulata*.

This variety is suitable for planting in the foreground of an aquarium as it develops submersed leaves only 2-4 in. long (5-10 cm.) (though, rarely, to a foot in length, 30 cm.). This variety seldom flowers in the aquarium.

Sagittaria subulata var. *gracillima*.

This variety grows immensely long leaves, 12-36 in., which, when they reach the top of the tank, wind along under the water surface and form a dense thicket. It is particularly suitable for planting in the corners of the tank, where it forms a shelter for some species of fishes.

Sagittaria subulata var. *kurziana*.

This is the most decorative plant in this species. It resembles some species of *Vallisneria*. With the same length of leaf as *S.s.* var. *gracillima*, the leaves are much wider, 1/4-3/4 in.

In full sunlight all varieties of this species adopt a dwarf form and develop a very low 1-2 in. green lawn of grass-green, ribbon-shaped, outward curved leaf. The plant propagates easily, developing new plants from the root runners.

COLISA *continued.*

place in the community tank and the male is then beautifully and gaily colored.

I prepared an all-glass tank holding about 2½ gallons. At the back I planted *Cabomba* and put *Samolus valerandis* in the foreground. On the surface I lay a bunch of floating plant. The temperature of the tank water was raised to 82-86°F. As I always do with labyrinths, I put the female into the tank the day before the male so that she could settle in and be prepared to defend and hide herself. Early the following day the male joined her.

Immediately the "greeting" ceremony typical of this species began. The male hung almost perpendicularly in the water with his head turned towards the surface and the side of his body turned to the female. The male soon builds the nest but it bears no comparison to the neat structure made by *C. lalia*.

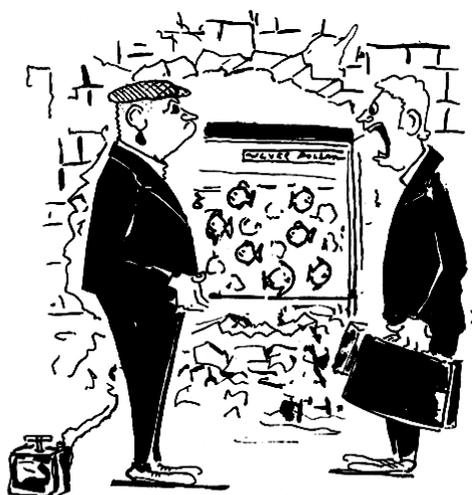
While the nest-building is going on the male also hunts the female, rams her and carries out the various procedures to induce her to spawn. This foreplay seems very important with the labyrinth fishes and must play a vital part in the procedure. I wonder if this also plays an important role in the wild?

We know that in response to the fast chase and the ramming maneuver the eggs of the female mature and the egg opening is slackened and full hormonal activity builds up in the male. I have seen a similar spawning procedure with *C. lalia*. The male often crumples his body under the nest as if he were already embracing the female. But I have not observed this with any other species.

When the nest was ready the male positioned himself enticingly close to the female. She came nearer and touched his anal fin. Immediately the male swam yet nearer to the nest and both moved backwards to the nest in a zig-zag path. Then it was the male's turn to be rammed in the belly as a

sign of the female's willingness to spawn. After the embrace and the expelling of the eggs, the female remained quiescent for a short time as though dazed while the male collected the eggs and the procedure began again. Altogether it lasted for about 2 hours and some 150-200 eggs were laid.

After the mating the female was removed as the male takes over further care. By the second day the fry were swarming in the nest. After 4 days the almost transparent young were free-swimming and were being fed with finest live foods. The young grow very slowly but are mature and ready for breeding after a year. It is often said that it is not advisable to keep *Colisa chuna* in a community tank because then they lose their color. But it is my belief that the decisive factor is temperature. If a community tank is kept at a temperature of about 80°F, *C. chuna* will remain beautifully colored.



"The biggest robbery,
you said . . . Thousands
of silver dollars, you said!"

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ANSWER TO WHAT ARE WE?: APISTOGRAMMAS

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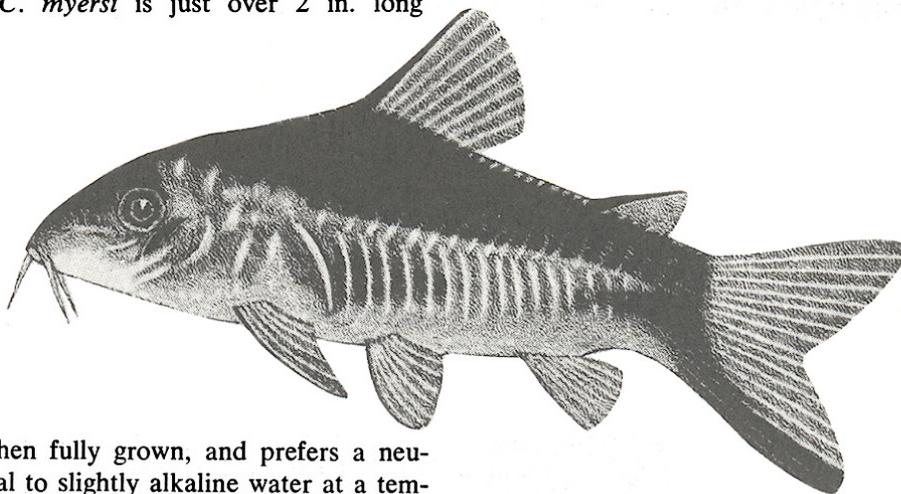
BREEDING MYER'S CATFISH

THERE ARE many *Corydoras* species available, so it is not surprising that sometimes they are confused with each other. It is possible that there are plenty of aquarists in this country who have Myer's Catfish in their collection, but who purchased it under the name of *C. rabauti*, for these are sometimes confused. *C. Myersi* comes from small tributaries of the Amazon, well up river, while *C. rabauti* is a smaller fish from a different area.

C. myersi is just over 2 in. long

all the food on its way down. A catfish does not feed on the mulm at the bottom, but is merely searching it for proper food.

When a pair of Myer's catfish are kept in their own aquarium it is possible to watch them spawn. Pay great attention to the water neutrality and temperature, and see that there are stones as well as sand at the bottom. With the fish in good condition they both become more active and during



when fully grown, and prefers a neutral to slightly alkaline water at a temperature of around 76 deg. F. It is entirely peaceful in a community tank, although it is a little more active than some other of the *corydoras*. Its color is reddish to yellow brown, with a dark stripe along its upper parts and the base of the tail. It will take all sorts of food, but because it remains more or less at the bottom, care should be taken to see that other fish do not take

this activity a portion of stone (or the glass side of the aquarium) is cleaned off. Then the male lies on his side on the bottom. Do not imagine that events have proved too much for him — it is merely his lazy way of taking part in the procedure.

The female approaches and nuzzles his vent so that he releases sperms. At

Ctd. overleaf 1st column.

Convicts

ON A RECENT visit to a fellow aquarist's fish house, when showing me his various tanks and fishes he came to a tank containing an adult pair of convict cichlids (*Cichlasoma nigrofasciatus*) and said 'I had great fun breeding these fish'. Well, I was surprised, to say the least; this was the first time I had ever heard anyone describing breeding of fishes as fun; I had always looked on the spawning of a particular species as somewhat of an achievement!

When he suggested that I should borrow the pair and try to spawn them in my own tank I was delighted. At my home I placed the convicts in a tank containing other cichlids of their own size, where they were fed on tubifex worms, liver and ox heart. On this diet the fish soon came into breeding condition. During this time I set up a 15 in. by 15 in. by 12 in. tank, with gravel to a depth of 2 inches; clumps of artificial hair grass and a large flowerpot furnished the tank. The water temperature was adjusted to 80°F and the whole was left to settle for a few days. The female and male were then placed in this tank. The

Ctd. overleaf 1st column.

CORYDORAS *continued.*

the same time she releases a few eggs from her vent into a pocket formed by her ventral fins, and there they are fertilized. She then moves to the previously cleaned spot, mouths it to make it sticky, and presses the eggs to the sticky spot with her belly.

When the resulting young are very small their colors are totally different from those of the parents, for they are green at the front and red at the rear. This bright coloring may have something to do with protective camouflage but it does not last. As the youngsters develop the green of the front part darkens to a very dark green and changes shape to the long dark stripe, while the red fades to the yellowish-brown of the underparts so that the youngsters become like their parents.

CONVICT CICHLID *continued.*

female took on golden bars in the belly region, really filling out with roe, and the male's color also intensified.

Two days later I went into the fish house and saw inside the flowerpot row after row of brown convict eggs. I had just missed witnessing the spawning! However, what followed over the next few days soon made up for this.

The female continued to watch over the eggs while the male watched the flowerpot and eggs from the shadows. It was when the eggs commenced to hatch out and fall to the bottom of the flowerpot, the tails of the fry thrashing the water, that the fun really began.

The parents started to dig pits in the gravel, and then one by one the wriggling fry were gently picked up in the parents' mouths and spat into a pit. These were the first cichlids that had spawned for me who carried out this form of duty. Two or 3 hours later the fry were back in the flowerpot.

After each flit I saw that the fry were gradually becoming fewer. I couldn't believe the parents were eating them, as they moved them so

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gently. Then I noticed that when the fry were being moved from the pit the parents would also lift some gravel, and it was as the parents spat out the fry and the gravel they were unknowingly killing their young when the gravel struck the fragile fry.

I also noticed during removals that the female would drop some fry on the way to the pit; the male, seeing this, would for some reason pick up the fallen fry and spit them into the flowerpot rather than into the pit, whereupon the female would re-lift them and transfer them herself to the pit. This happened time after time.

The moving around continued for another few days, and by this time the



fry were taking short excursions outside the flowerpot. The number of fry was down to 50, from about 200. I decided that the moving around was causing too many casualties so I removed both parent fish. On removal the fish lost their intense coloration — grey blue in the male, with heavy blue-black bars, which incidentally I believe give the fish their name; the female was similar except that in the lower region of the belly were irregular orange blotches, extending into the lower fins.

The following day the fry were free-swimming, and food provided for the first few days was Infusoria, while the

brine shrimp eggs were hatching. As well as hatched brine shrimp the fry were next given micro worms and when about 4 weeks old this diet was supplemented with chopped tubifex. I had to agree with my friend — the convict is a very interesting cichlid to breed, giving many hours of pleasure — and fun!

TROPICAL QUERIES

Filters

Does it matter in what order filter media are packed in a large power filter? If it does, what order gives the best results?

Unless the manufacturers state otherwise, media should be placed in the filter so that the flow of water first meets a medium that will remove coarser particles of suspended matter and then media that deals with unseen (dissolved) waste substances. The water to be filtered must therefore first pass through a fibrous material such as nylon floss or glass wool, whose sieve-like action will remove the suspended matter. This sieve-like action will produce clear water, though this may yet be impure, just as a crystal-clear solution of salts of arsenic is lethal! It will still contain dissolved waste substances produced by the fishes in their urine that are harmful in too high a concentration and so the water must be passed over a material, usually granules of carbon, that will absorb these dissolved substances. Another reason why the water flowing over the carbon or carbon substitute should already have been passed over the 'sieving' material is that carbon granules themselves have some sieving action for fine matter although this restricts their effectiveness to absorb. Finally, if required, the water can be passed through the special resins that are available to remove specific dissolved solids in the water, or to stabilize water reaction (pH).

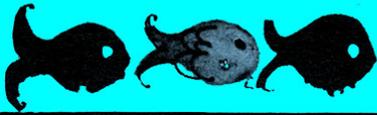
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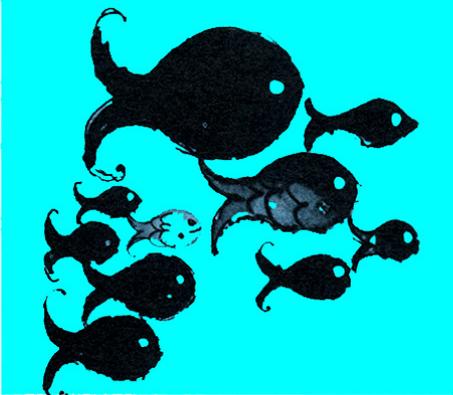
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KEEPING AND BREEDING

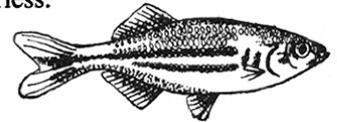
THE GIANT DANIO

ALMOST every aquarist is acquainted with the little danios, *rerio* and *albolineatus* (zebras and pearl danios), rather more perhaps than with *Danio malabaricus*, and this is almost certainly because the giant danio is neither so easy nor so willing to propagate as its related species. If this were not so, this peaceful, shoaling fish that grows to a length of about 4 in. would receive rather more of our attention.

Danio malabaricus belongs to the large Cyprinidae family and was first imported into Europe from its home in the western coastal areas of northern India and the island of Ceylon in the year 1909.

Its elongated body is elegantly slim and rather pinched-in at the sides. The steel-blue back blends into a gleaming green on the sides of its body. The head is silvery and the belly colored a delicate pink. From the gills two or three gold-colored horizontal bands

stretch back along the body, the last band tending to be rather broken up. The gold bands divide up the three or four steel-blue stripes that adorn the sides. The gills are decorated with a gold-green fleck. The eye is proportionately large, with a gold-colored iris. Apart from the caudal, the fins are colorless.



Danio malabaricus

Even in adult fish sex differences are not always easily recognized, although the male is the slimmer fish with a more intensive coloration. At spawning time his pectoral fin becomes orange and sometimes a white spawning "rash" appears on his head. The female, on the other hand, is fuller in the body and slightly less intensively colored.

Continued overleaf.

Readers' Queries Answered

I have been keeping mouth-breeders for the last 3 months and have bred quite a few. Recently, in one of the tanks I have noticed a few little white worms clinging to the glass. I have studied them under a microscope and watched their behaviour and find them so far to be quite harmless. But I would like to know what they are.

The small white 'worms' are in themselves harmless creatures (they are actually giant protozoans), but their presence does indicate that they find the water conditions favorable to their growth. They feed on bacteria and the overgrowth of these and other micro-organisms happens when organic materials on which they feed have dissolved in such amounts that the water has become a culture medium for them. The source of these materials can be the fish (particularly in overcrowded tanks without plants), the plants (when they are dead or dying in unlighted situations), or uneaten dried foods which have rotted in the water. It is this 'rich' water that could be harmful to the fishes and not the worm-like protozoans (*Spirostomum*) themselves. The water in the tank should be changed, a third a time over a period of several days. Is gravel being used in the tank? And if so, is it quite clean or has it gone black underneath? If it has, the gravel should also be re-moved and the tank set up again.

Find the fish

Answer Overleaf.

The first is in **CRY** but not in **HOWL**,
The second is in **FROWN** and also in **SCOWL**,
The third is in **MERRY** but not in **GAY**,
The fourth is in **YESTERDAY** and also **TODAY**,
The fifth is in **DYE** and also in **DIP**,
The sixth is in **HOP** but not in **SKIP**,
The seventh is in **PORCH** but not in **HALL**,
The eighth is in **BAT** and also in **BALL**,
The ninth is in **SIGNET** and also in **SWAN**,
The tenth is in **JANET** and also in **JOHN**,
The eleventh is in **TRUNK** but is not in **CASE**,
The twelfth is in **FRILL** and also in **LACE**,
The next is in **LID** but not in **STOPPER**,
The last is in **POLICE** but is not found in **COPPER**.

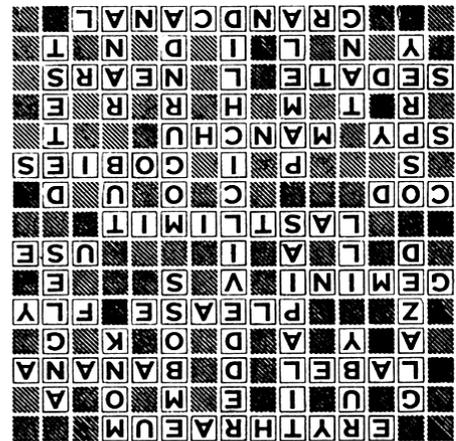
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I keep my *malabaricus* in a large, long, not overplanted tank at a temperature of 68°F. No special water need be used but when a partial water change is made the water for re-filling the tank should have stood for some time. As I have already indicated, the giant danio is a peace-loving community fish, becoming a danger possibly to small fish only in old age. It should be kept in a shoal — a tank in which these fish are shoaling is always full of interest; they are both skilful and fast swimmers. They resemble the pearl danio a little in their coloring and, with correctly placed lighting, where it falls slantingly into the tank from front to back, their delicate coloring stands out beautifully. Since they are good jumpers it is very important to keep the aquarium well covered. They are not choosy feeders and take prac-

tically any type of food. But it goes without saying that they should be given a varied diet or they will not thrive or reach the desired size.

As I wanted to photograph the spawning I prepared a longish tank planted in a usual manner but with some fine-leaved plants laid in, as shown in the photograph. It is not necessary to use a sand base for the spawning, just small stones layered on the bottom, between which the eggs can fall. This preparation must be made because giant danios are very keen egg-eaters. I prepared the tank with tap water and raised the temperature to 79°F. From then on the procedure was much the same as that shown by *Brachydanio rerio* and other danios. After the chasing of the female came the importuning, displaying, stimulating and so on. The actual egg-laying takes place at great speed — the male wraps his caudal fin over the hind part of the female, the fish part, and the eggs fall on to the bottom. The eggs themselves are fairly large, slightly golden in color and several hundred are laid at a spawning. The whole process lasts about 3 hours. As soon as the egg-laying is completed the adult fish must be removed from the tank so

Solution to Crossword



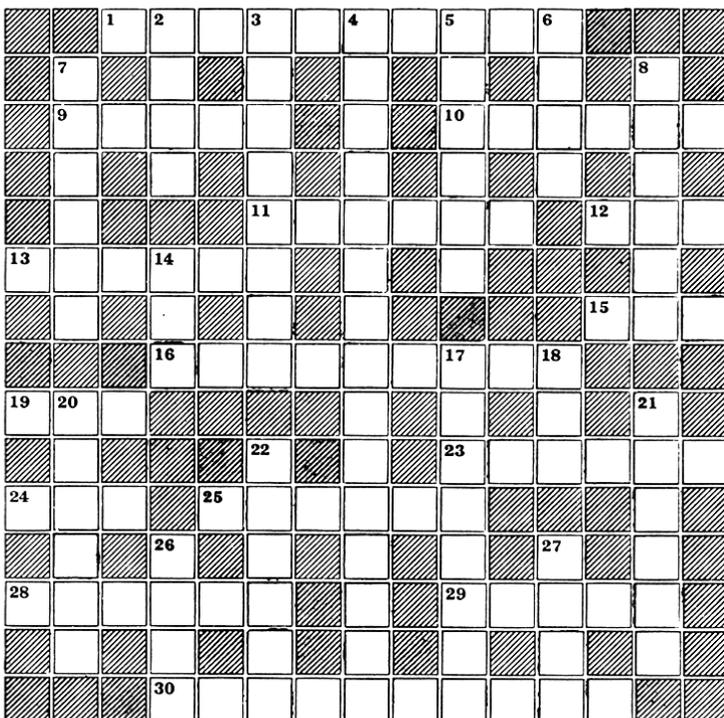
that the eggs are saved.

The fry hatch after 36 hours and are free-swimming after a further 4 days. Any fine dried food may be given. The spawning may be repeated with the adult fish after a few weeks — in fact they may be spawned about four times a year.

Solution to "Find the fish"
Answer: **CORYDORAS JULII.**

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The AQUARIST Crossword



CLUES ACROSS

1. Species of Cichlid
9. Ticket
10. Does this plant provide food for aquarist's fishes ?
11. Make happy
12. The target of the archer maybe
13. May 22-June 21, or part of a space project
15. Employ
16. There are no restrictions after this
19. Morse maybe, without a note to form this fish
23. Family of fishes to which 17 down belongs
24. You do it with your little eye
25. An invader of China
28. Cichlasoma Severum is sometimes called this
29. Comes closer
30. This sounds like a wonderful place for fish

CLUES DOWN

2. This barb is a real gem
3. They're from the cichlid family
4. The common name for 1 across
5. Stamp
6. He probably ate Carp
7. Your aquarium probably is
8. Angels maybe, but they could be obtuse
14. Seedy
17. Go mad around the vessel for this fish
18. Vessel
20. It could be called a fish fancies
21. Hate the sound of two rivers ?
22. Girl
26. A dance with nothing off produces something for the marine enthusiast
27. A Genus of frog



The Aquarist's Notebook



A BEGINNER'S GUIDE TO THE SLENDER RASBORA

THE SLENDER rasbora is not a fish of dramatic appearance and is too inconspicuous to be found in everyone's tank, but it is nevertheless an elegant member of the Cyprinidae family. It is found all over the Ganges basin, in Burma, Thailand and the Greater Sunda islands. In the aquarium it will usually reach only about 3½ in. in size, though in Nature it can reach the considerable length of 8 in.

At first glance the fish resembles the much better known pearl danio and in fact this resemblance is noticeable not only in its appearance but also in its behavior. Even its spawning behavior is similar to though more peaceful than that of *Brachydanio albolineatus*. The slender rasbora has an elongated body, banded horizontally from the gills to the caudal peduncle. The belly is silvery white and the fins, which are without markings, are just faintly yellowish. The iris of the eye is a golden color. The jaws are without barbels. Sex

differences are not always easy to recognize even in the adult fish; one needs experience to recognize the sexes with certainty — it is simply a case of difference in body build, the female being the fuller in the belly, for the coloring of male and female is usually the same.

They are at home in the usual community tank conditions. A temperature of 72-77°F is suitable with neutral to slightly acid water. My own rasboras were kept for several days in a temperature below 62°F with no ill-effects except that they showed no interest in feeding. Once the living conditions were adjusted and the water temperature was raised the fish soon got back to normal.

Ideally they should be kept in a shoal but they will soon lose their timidity in an ordinary community of other peaceful fishes of similar or slightly smaller size. For breeding purposes it is a good idea to separate the male from the female fish for 2

TROPICAL QUERIES

Breeding Mollies

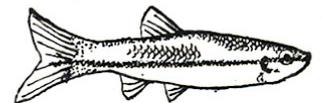
I have bought a pair of golden sailfin mollies which have bred successfully in the shop but refuse to breed successfully for me. Could you advise me on what to do to them? I have had the mollies for over 4 weeks.

The fact that your mollies have not yet bred in your tank is in no way surprising. Although mollies produce fry throughout the year, unlike other livebearers such as guppies they are not indiscriminate breeders, and the gestation period may vary from 4 to 10 weeks depending on the temperature. Mollies, in particular, react very badly to being moved before breeding and to the absence of plant shelter, and it may well take far longer than 4 weeks before they settle down again. It would speed the process if you could find out from the shop from which you purchased the fish the exact temperature at which they were being kept and the pH and water hardness reading of the water; also whether small amounts of salt were being added to the tank water. Make sure your fish are well fed with regular feedings of scalded lettuce or spinach as well as dried food and daphnia and in due course they will surely breed again.

What am I?

My second is in SATIN and also in SILK,
My third is in YELLOW but not in CHROME,
My fourth is in CARPET but not in HOME,
My fifth is in MOWER but not in TOOL,
My sixth is in JESTER but not in FOOL.
My seventh is in GREENFINCH but not in TIT,
My eighth is in BROKEN but not in SLIT,
My ninth is in TEARFUL but not in CRY,
My tenth is in SECRETIVE but not in SLY,
My eleventh is in SINNER but not in SAINT,
My twelfth is in COLOR but not in PAINT.

Ctd. overleaf 1st column.



Rasbora einthoveni

ANSWER ON
NEXT PAGE



RASBORA *continued.*

weeks beforehand — this increases the male's desire to breed. They are not fussy about food, though before spawning it is advisable to provide live daphnia and cyclops; but normally they do not require a particularly varied diet.

It is easy enough to breed this rasbora. I succeeded without difficulty and found them to be very prolific. I experimented with breeding them under various conditions. The fish spawn

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willingly in both a small and a large tank, at a temperature of 77°F in neutral tapwater. As I have already mentioned, their spawning behavior is similar to that of the pearl danio. My spawning photographs were taken at midday, after a short period of "fore-play" (the female had been put in with the male in the early morning). Although the breeding process was not particularly stormy quite a lot of eggs remained unfertilized.

The newly hatched fry numbered about 200. They were fairly large and were fed with dust-fine particles of food obtained by sieving fish food. The young grew very quickly and I was surprised to find that so regular was the growth it was unnecessary to sort the fish after 6 weeks. The youngsters like subdued lighting — in bright light they become restless. When they reach about 3/8 in. long, they can be fed with chopped tubifex. They will also take dried food quite happily.

Apart from the ease of maintenance and breeding of the slender rasbora, it is not particularly prone to disease; and so altogether I can recommend this fish to other fish-keepers with complete confidence.

TROPICAL QUERIES continued.

Digging Fish

I have a Pelvicachromis pulcher that is a digging maniac and although the literature usually describes it as 'will not harm plants' the plant roots are being damaged because they spend so much time out of the gravel. What can I do?

In fairness one should say that 'will not harm plants' is a valid comment as it almost certainly refers to plant-eating, not incidental harm to plants through digging activities. But it should be possible to pre-vent the plants being pulled out like this. Make sure that the gravel is deep (3-4 inches depth at the back of the tank) and place really large stone slabs that reach down to the tank bottom along the edge of the planting zone. Two or three thin strips of stone can then be inserted into the gravel towards the back of the tank, slanting down to the tank bottom to divide up the planting area and thus confine any digging activity within some bounds. Another method of protecting young plants is to thread them through the hole in the upturned end of a flower pot, which can then be broken off to leave enough pot side to reach down to the bottom of the gravel from the surface.

Filter Charcoal

Is it absolutely necessary to use charcoal in my power filters? I would prefer just to use the filter wool that I am having to buy as well at present?

The purpose of charcoal in a filter is different from that of, say, nylon wool, sand or gravel. Fiber media such as nylon wool will remove the detritus and mulm created by decaying vegetable matter and the solid excreta of the fishes. When fresh, charcoal is capable of removing from the water dissolved impurities (which in excess are just as likely to pollute the aquarium) such as the dissolved organic substances from foods and fish urine. Fiber and particle filter media alone cannot do this. Charcoal must be renewed periodically, however, as it becomes saturated with these impurities. In a planted aquarium containing a community of small fishes, the use of charcoal can be dispensed with; and also in an unplanted tank provided that periodic partial water changes are made, say one-third of the water every month. Of the tanks you list, we would advise retaining the charcoal filter in the 100-gallon tropical freshwater tank.



THE AQUARIST'S NOTEBOOK

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The Aquarist's Notebook
P.O. Box 139
Fairfield, Ohio 45014



"Are you sure that fish you sold me last week was a guppy — it's just eaten the wife's cat . . ."



The Aquarist's Notebook

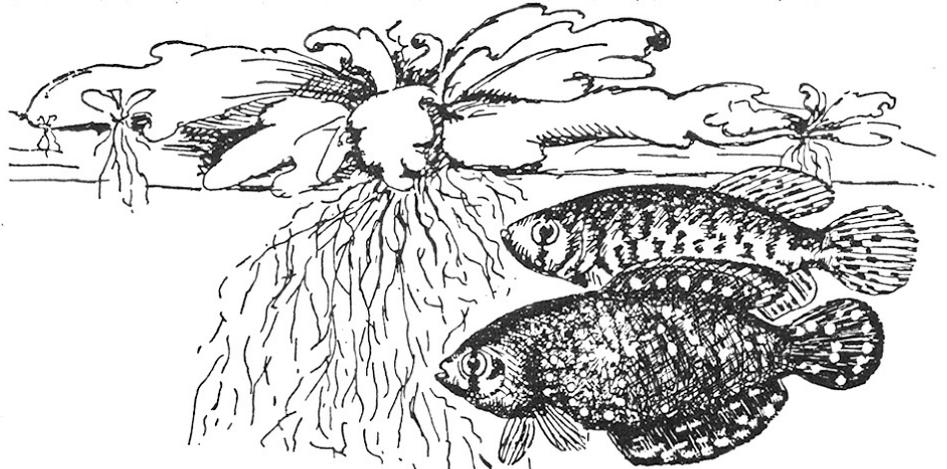


KEEPING AND BREEDING THE ARGENTINE PEARLFISH

MANY OF OUR best tropical fish come from South America, and this one, the Black-finned Pearl Fish (*Cynolebias nigripinnis*) rides high on any list of good and easy-to-breed species. The male is velvety black relieved with spots that shine either light green or light blue. The female is different in shape and color, having shorter fins and a narrower body with a ground color of light tan to brown, marked with darker spots and mot-

sexes, an aquarium of black-finned pearl fishes can be really ornamental. Live food suits it best, particularly the smaller kinds, but it will take some frozen foods — reluctantly.

This is one of a group of fishes that live in streams and ponds that are liable to dry up at times. Therefore they have adapted to these conditions in their breeding cycle. Eggs are laid in the pond bottom, and survive the drought. When rains come again the



tlings. Normally an adult male reaches about 1¾ in., and the female is a little bit smaller.

The temperature range that suits this fish best is from 72 to 76°F, and the water should be very slightly acid and soft. In a community tank it is peaceful, and sufficiently active to keep away from aggressive neighbors. However, it does very much better when kept with its own kind, and because of the difference between the

eggs hatch, and the young fishes quickly develop and grow to maturity.

Because of this a sequence of operations has been worked out for breeding these fish in captivity. A layer of peat moss is laid on the bottom, in such a position that it can be lifted out easily. I use very shallow plastic trays with holes in the bottom. The male is an ardent lover, and soon persuades a female to mate. The pair

Ctd. overleaf 1st column.

Readers' Queries Answered

Breeding Tiger Barbs

How do I know when to remove the parent tiger barbs from the spawning tank? I have lost two batches of fry but it is difficult to know when to remove the male and female. What would happen if they were removed too soon?

If the spawning sequence was coming to an end no harm would befall the parent fish if they were removed before it had completely ended. They might possibly continue to spawn, as they most likely would do if they were removed when the spawning fever was at its height. But the fish do indicate themselves when the spawning is nearing its end. The rest pauses between bouts of egg-laying get longer until finally the female shows no further interest and will no longer join in. Then the parents can be quickly removed.

Loss of Color

Can you tell me what water conditions oscars prefer? A red oscar purchased a few months ago has largely lost its brilliant color but appears to be perfectly well in all other respects. It is eating well and has put on size and weight on a diet of tubifex, chopped garden worm and small pieces of meat.

Continued overleaf.

CYNOLEBIAS *continued.*

quiver side by side, heads pointing down to the bottom, and then ram themselves into the peat moss to lay and fertilize their eggs. This is a remarkable sight, for in a deep soft mass of peat moss they nearly vanish from sight.

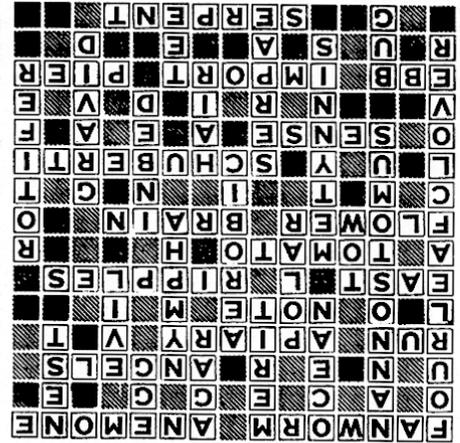
When the mating is over the peat moss is carefully lifted out of the aquarium, allowing it to drain slowly as you remove it, and then transferred to another tank — without any water. A glass on this aquarium should keep it slightly damp, and you must make sure that it does not dry out too much.

After about six weeks in this semi-dry state some water of the correct temperature and acidity is introduced — from the parents' tank for preference. Within quite a short time the babies will hatch, and should be fed and reared as for any small egg-layers.

TROPICAL QUERIES
continued.

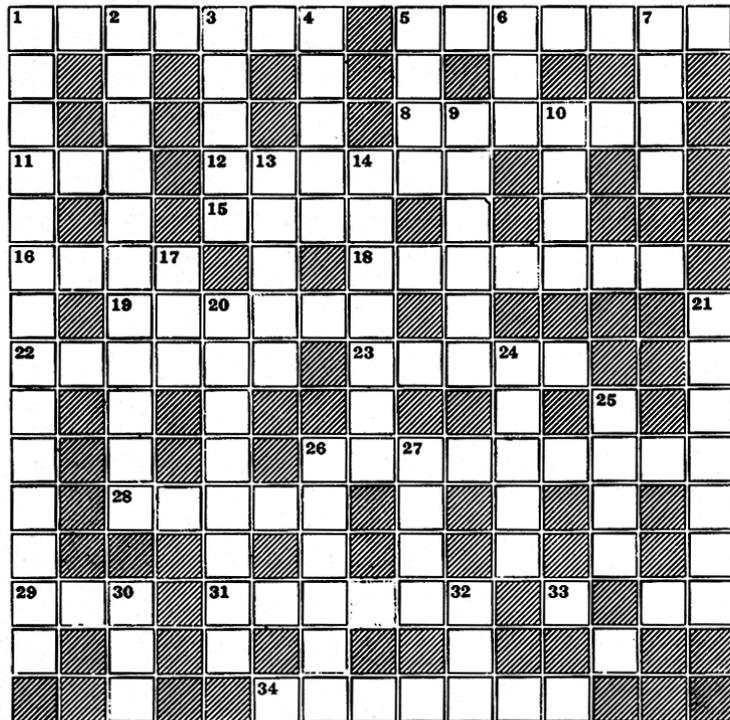
Water conditions are really not critical with oscars provided that normal tank maintenance is carried out, that is, some water changes and/or procedures to ensure absence of organic nitrogen compounds. Gravel and some large rocks and floating plants should be provided in the tank, which should be regularly siphoned out and topped up with fresh water. If all these requirements are being catered for, then one would suspect that the fish you have acquired is an import that has been colour fed and is now reverting to its more normal coloration. Importers are receiving, largely from the Far East and Malaysia, beautifully colored fishes that are being fed before dispatch on a secret formula that is producing these vivid colors. Red oscars and discus are bred in quantity in the East and it is known that the feeding plays a great part in the vivid coloration that is being obtained. Unfortunately, reversion to a normal diet causes gradual fading of these colors over 3 months or so.

Solution to Crossword



THE AQUARIST'S NOTEBOOK is free! It is available, just for the asking, at your local pet shop or fish store. It is your dealer's way of saying "Thank you!" for your patronage. Because THE AQUARIST'S NOTEBOOK is published at regular intervals, and because it is a permanent reference work chock full of valuable ideas and fascinating articles, you will want to ensure that you do not miss a single issue. Keep your reference library complete... visit your dealer regularly for your free copies!

The AQUARIST Crossword



CLUES ACROSS

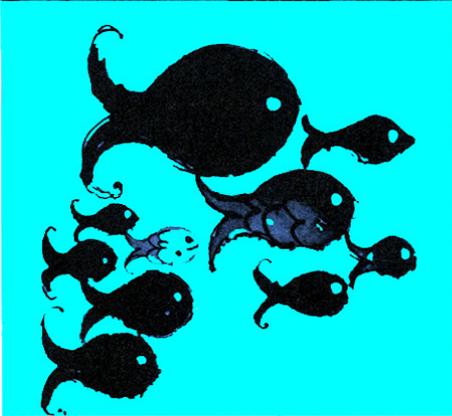
1. Spectator at the undersea soccer match?
5. Terrestrial plant but undersea animal
8. Not always the little darlings their name suggests
11. To move quickly on foot
12. Perhaps the best place to keep *Brachyobius xanthozonus*
15. It will have a tone
16. Direction for the morning sun
18. Mini-waves?
19. Red fruit of the potato family
22. Some aquarium plants may do so if you have the knack
23. Nerve control centre
26. *Barbus* - the golden barb
28. Smell is one
29. That receding tide
31. All good wholesalers do so
33. Jetty
34. Villain of the piece at the beginning of Genesis

CLUES DOWN

1. Botanically *Marsilea quadrifolia*, the answer to a child's dream
2. Genus of small pencil fishes
3. Large sea
4. Remit in return for your achievement
5. Seaweed jelly used in bacteriology
6. Preceded the children or did it?
7. The place to find little anabantids
9. A lady-like name for the villainous dragon fly larva
10. The forces of darkness traditionally
13. Tropicals certainly will not be found in these regions
14. Air breathing organism
17. The canal path
20. Vegetarian piranha?
21. Pond food slightly larger than infusoria
24. However early you may be you'll be unlikely to find your fish so
25. Watch this spot it is pregnant
26. Tetra similar to *Hyphessobrycon callistus minor* but is a black and red over the body
27. All mammals have it
30. It can be an insect or just an indescribable bacterium
32. When driving with the boys you always start here



The Aquarist's Notebook



KEEPING AND BREEDING

THE CHERRY BARB

FOR THE ORDINARY aquarist with a community tank, a pair of Cherry Barbs (*Barbus titteya*) is a worthwhile addition. The Cherry Barb is a fair-sized fish which is not only very peaceable, but also very hardy and easy to keep.

"Titteya" is the native name for the fish, and its natural habitat is the inland waters of Ceylon. Cherry Barbs imported from these regions lack the intensity of coloration displayed by the latter probably being due to the good care lavished upon them by their "foster parents."

When not in breeding array, male and female are somewhat similar, both sexes having a light brown background colour, with a deeper rich brown line running the length of the body. Above this line can be discerned a pale golden stripe. The fins of both are of a brownish hue, turned reddish in the male where they may also be edged with black in some specimens.

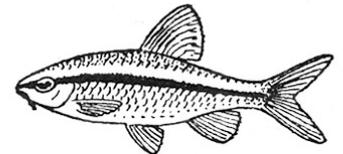
However, when in breeding garb, any similarity ends abruptly. Then, the male flushes up to a deep ruby red, the central line disappears and he positively glows as he spreads his little, fan-shaped fins to splitting point while he circles round his intended mate.

For breeding purposes, the standard 24 in. by 8 in. by 8 in. tank will suffice. The use of pure rainwater is recommended, but I have been quite

successful in using one third rainwater to two thirds tap water. The temperature of the water is best kept around 78°-80°F. (26°-27°C.).

The Cherry Barb likes to spawn in plant thickets so the best method is to cover the floor of the aquarium with small, well-washed plants, such as young Broad-leafed Indian Fern, gathered into clumps; with, perhaps, a number of *Ambulia* or *Cabomba* in the rear corners.

The pair intended for spawning should be placed in the tank about



The cherry barb, *Barbus titteya*

two hours before dusk, to enable them to become acquainted with each other. If all goes well, spawning should have been completed sometime the following morning, and the aquarist should be on the scene early to remove both parents as soon as their intentions stray from that of the heart back to the dominant stomach. Cherry Barbs are avid little egg-eaters and will soon devour a good spawning if left to their own devices.

The fry will hatch in about 24 hours and for the first week should be fed on infusoria. By the second week brine shrimp can be given; this can

Continued overleaf

Readers' Queries Answered Old Water

I have just set up a fish tank and have left the water standing for one week.

Is this long enough to create the 'aged water' I have read about, or should I leave it a little longer before I introduce my fish?

You are getting confused, but don't let that worry you for the subject of 'old' and 'aged' water often confuses experienced hobbyists. Letting the water stand will allow the chlorine gas (introduced into the domestic water supply) to escape and make the tank safe for your fish, though this is often over-rated by some authors. 'Aged water' is water that has been changed by the chemical and biological action of both fishes and plants in an aquarium. For the next tank you set up why not try half new and half old water from a tank already containing fish; you could introduce fish to this immediately and it would be much more acceptable from the fishes' point of view, provided that it was brought to the correct temperature.

