# TROPICAL FISH HOBBYIST

More Color Photos, More Information And More Readers Than All Other Aquarium Magazines Combined.

OCTOBER, 1966

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COLOR PLATES INSIDE

AQUARIUM WATER CHEMISTRY, by Dr. Rolf Geisler. 50 cents from your dealer or direct from TFH.

Another in a series of tropical fish books designed to help both the novice and the advanced hobbyist is Dr. Rolf Geisler's *Aquarium Water Chemistry*. This thirty-two page book has eight information-packed chapters, and is profusely illustrated throughout.

All hobbyists will find it of extreme interest because of the vital information the book contains. Leading topics include Physical and Chemical Properties of Water and the Methods of Measurement; The Native Waters of Fishes; What Water do Aquarium Fishes Need?; How to Create Special Water Characteristics; Filtration of Aquarium Water; and Water Care and Fish Feeding.

*Aquarium Water Chemistry* reveals how to soften hard water, how to harden soft water, how to neutralize or acidify alkaline water, how to make acid water neutral or alkaline, and how to make black water.

Of special interest to the novice fish keeper is the section on how to properly test for water characteristics. Products are also discussed, detailing the functions of each.

Of definite interest to the salt-water hobbyist is a recently developed scientific formula for making a singulary successful synthetic ocean water. Salt-water effects on aquariums are also discussed. Equipment needed to successfully keep a salt-water aquarium is described.

A total of twenty-one illustrations picture either fishes, accompanied by a description of their water requirements, or aquarium chemistry products, with an explanation of their use. There are also photographs showing the natural habitat of tropical fishes.


TROPICAL FISH HOBBYIST

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COVER
Some fishes have never lost their possessivity with hobbyists and just never will. Such a fish is the one shown spawning on our cover this month, the harlequin, Rasbora heteromorpha. This is one of those fishes that really look good in schools. Many a hobbyist has become so enthusiastic about harlequins that he has kept them in a single-species aquarium. A 20-gallon high aquarium, well planted and having a thick mantle of floating plants to cut down on and vary the intensity of the light from one part of the tank to another is ideal for about 30 harlequins. They will swim about together casting coppery glints as the filtered light strikes them at various angles. Spawning this species is a bit more of a challenge than spawning many other aquarians. For the complete story on breeding them including a number of fine photos see the story beginning on page 72.




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## EDITORIALLY . . .

It grieves me to hear from so many hobbyists who tell me that they have sick fishes, and then to find out how they are treating the illnesses. A surprise comes when occasionally they tell me the happy news that their fishes became well again. It leads me to wonder whether they became well because of or in spite of the treatment. Too many people have the attitude that if a drop per gallon will put their fishes on the road to recovery, a whole bottleful will do it that much faster. Then there's the guy who just can't wait until one form of medication works before he uses another, with the result that his tank is a mess that even the hardiest fish couldn't live in. When disease strikes your fishes the important thing is not to get frantic. Segregate your sick fishes to keep them from infecting the healthy ones. Remember this, a healthy environment is a wonderful tonic. The most successful hobbyists I know make it a practice to change one-quarter to one-third of the water at regular intervals. This is not absolutely essential for the continued well-being of the fishes, but when they get their fresh water they swim into it as you add it, and you get the feeling that they're saying: "Ahhh! Boy, doesn't that feel good?"

William Vorderwinkler





A pair of bettas in their beautiful spawning embrace. The eggs are clearly visible, a few emerging from the female and a cluster just below the fish's entwined bodies. Photo by Hansen.

# Color Breeding Siamese Fighting Fish


BY GENE A. LUCAS

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Among the many wondrously beautiful species of freshwater tropical fishes that are kept by aquarists the siamese fighting fish, *Betta splendens*, probably has the most spectacular array of brilliant color variations. These colors, coupled with the unusually large fins which can be produced in the fish





Two Siamese fighting fish with which the author has worked. The upper fish is a truly spectacular red in color. Red coloration is caused by pigment cells known to scientists as erythrophores. The lower fish exhibits coloration that is the result of several different kinds of pigment cells. Photos by Gene A. Lucas.

are undoubtedly the source of its great popularity. Since bettas have been domesticated for many years, color variations presumably have been developed from mutations that have occurred in the stocks of fanciers. Continued interest in these fish and their color development suggests that breeders would find it valuable to know something of the genetic and developmental nature of betta color production.

The wild betta, native to Thailand and neighboring southeast Asian countries, is a brownish fish with dark stripes or bands; areas of iridescent reflecting spots on its sides; and streaks along the rays of its dorsal, caudal, and ventral fins. It is also said to have red along its fin rays, especially the paired pelvic fins, which appear to be red in almost all color variations of the domesticated fish.

Although wild bettas are not particularly attractive, having in fact been originally kept for their fighting ability rather than their beauty, they have undergone such change that they are now known to breeders and fanciers by such exotic descriptive names as "Yellow," "Red," "Cambodia," "Purple," "Cornflower Blue," "Lavender," "Emerald Green," "Gunmetal," "Steel Blue," "Brown," "Black," "Butterfly," and many others, depending somewhat upon the fertility of the breeders' imaginations.

## COLOR DETERMINING FACTORS

While at first glance the problem of determining how these color variations arise seems enormously complex, it may be simplified by careful consideration of the factors involved in betta color and the modifications in these factors which can produce known variations. Basically the factors and modifications are few.

First, there is the *background tissue* with its background color, which is more or less transparent and may be altered by such visible constituents as blood and tissue fluids, organs, ingested foods, and other materials which are visible through it.

The only other factors we need consider are specialized cells called *chromatophores* which contain the various colored substances that are collectively called pigments. These chromatophores, or pigment cells, occur at various levels in the skin and are visible through the background color. The visible color of the fish is the result of interaction of the various types of chromatophores with one another and with the background tissue.

Four chromatophore, or pigment cell, types have been described in bettas. These have specific names stemming from the color of the pigment each contains. Yellow chromatophores are called *xanthophores*. Red chromatophores are called *erythrophores*. Brownish or black chromatophores are called *melanophores*, and finally, there are the pearly, reflecting chromatophores; they

*Continued on Page 37*



A pair of Congo Tetras, the male above. Photo by Dr. Herbert R. Axelrod.

**Some valuable tips**

# Care and Breeding of the Congo Tetra

BY HEINZ-HERMANN BUSCHER AND JAKOB TANNER,
Basel, Switzerland
Microphotographs by H-H. BUSCHER

The Congo Tetra, *Phenacogrammus interruptus*, was first imported into Belgium in 1950 by A. Dubois. After only a year's time this fish was successfully bred by Dr. E. Meder in Germany.

In spite of this, the lovely fish is still looked upon as a "problem" by many aquarists today, and really good breeding specimens are seldom offered. In





this article we would like to give you an account of successful spawnings and describe the methods which have led to success. It must be said, however, that when one is working with biological objects there can be no "general" instructions which alone can lead to the desired success. As we have had maximum results with the simplest methods, we can assume that we have followed the right path.

First, some instructions about how to keep Congo Tetras should be given. Because of their lively habits, their aquarium should be of at least 20 gallons in capacity and at least 32 inches long. Plant arrangement and the use of rocks and tree roots must be left to the discretion of the hobbyist; the only stipulation is that there be enough swimming space for the fish. One must arrange the aquarium so that their natural colors are displayed to best advantage. This is best done by showing them against a dark background. A particularly attractive background can be provided, for example, with tree bark. The pieces of bark are mounted on a wooden board, which is then placed behind the rear glass of the aquarium. A dark background can be combined with a dark bottom by placing a layer of black colored gravel on the bottom.

The aquarium lighting should not be too bright, and the best choice is dim toplighting. Although the relatively high price of the fish would stop some hobbyists, an aquarium with a whole school of Congo Tetras is a beautiful sight, and it must be remembered that Congo Tetras are school fish by nature.

There are no exacting requirements as to water chemistry. Even if its native waters are quite soft, medium-hard water is accepted as well, and the Congo Tetra thrives in it. Here in Basel we keep them in pure tap water which has a hardness of about 6 to 8 DH. The pH value is slightly acid, about 6.7. Water temperatures should never exceed 79°F., and 73 to 77°F. seems to be the best temperature range.

According to the experiences of Herr Tanner, the method of feeding is responsible for success or failure in breeding Congo Tetras. Surely one can use fish which were fed dry food alone. With luck, they might even breed, but best results cannot be obtained with such specimens. Congo Tetras are heavy eaters; they need more than a portion of *Daphnia* every day. We feed ours glass larvae, mosquito larvae, bloodworms, *Tubifex* worms, *Daphnia*, *Cyclops*, May-fly larvae, caddis-fly larvae, house flies, fruit flies, fresh-water shrimp, white worms, and chopped grasshoppers. Unfortunately no frozen brine shrimp are available in Europe. Feeding with insects is worthy of particular attention, that is, with fruit flies and house flies, both of which are eagerly accepted and easily raised at home in large quantities. Feeding with insects and their larvae is frequently overlooked by most hobbyists, yet in fishes' natural waters insects form the greatest part of the natural diet of many fish species.

Perhaps reading this varied menu has caused many goose-pimples among you and you might wonder how such food could be come by at times. We do not have things so easy in Basel at all times either, and we often have to travel 20 to 30 miles to good spots for food. As a substitute we would like to tell you a simple way to get insects. A net with a mesh width of 3 to 4 mm and a long handle is pushed back and forth in a grassy meadow, about halfway up the grass blades, with a motion somewhat similar to that used in netting food from a pond. You will be astonished at the variety of insect species which can be caught in this way. Of course, frozen brine shrimp is the only good substitute.

Because of the size of the breeders and the activity with which they drive before spawning, an aquarium which is not too small should be chosen. A tank which measures approximately 24×13×12" is thoroughly cleaned and three-quarters filled with completely de-salted water. This water is arrived at by means of an ion-exchange unit which consists of a plastic container filled with a mixture of anion and cation exchange synthetic resins. One lets ordinary tap water flow through this exchange unit and arrives at a water which is equal to distilled water, that is, with a very low conductivity of micro-siemens. (Translator's note: a siemen is equivalent to the measure of electrical conductivity known here in America as a "mho.")

The main advantage of this treated water over distilled water is its relatively low price. Water is frequently distilled in copper stills, making possible the presence of an uncontrollable amount of metallic ions. Besides, distilled water is often stored improperly in containers which are not completely clean, giving it a hardness which is not measurable but still makes the water unsuitable for breeding. After the ion exchange unit has been exhausted (the small ones on sale can bring down about 80 gallons from 10 DH to 0 DH) it must be regenerated again and after regeneration is fully operable once more. (In the U.S. water softeners do the same job.)

In the breeding tank the water temperature is held to 79° F. To protect the eggs from being eaten by the parents, a grid is placed at the bottom. This grid can be easily made by criss-crossing nylon threads on a Plexiglas frame. In this breeding tank there is a simple peat moss filter. This is put into operation for between 30 and 40 hours. In this time the water becomes a light amber color. After the filter is stopped (it need not be removed) the water is lightly aerated.

The breeders, one male and one female, are put into their aquarium late in the evening. On the following day, or the day after, they spawn, almost always between the hours of 11 A.M. and 2 P.M. During this time the tank is not lighted and should receive no direct sunlight.

During the spawning act the female is pursued for hours by the male. At this time the room in which the tank is placed should remain absolutely quiet.









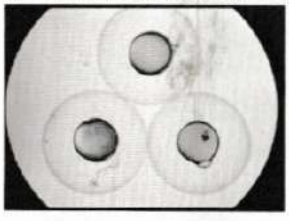


The least movement, even if it takes place yards away, serves to interrupt them and, from our experience, stops them completely.

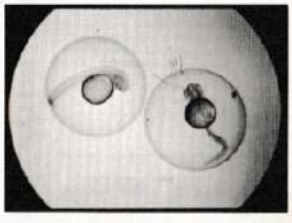
When spawning has ended the parents are netted out, but the eggs themselves remain in the spawning tank for another three days. Dead and fungused eggs are not taken out by us. Even so, other eggs close by are not attacked. We don't use bacteria-killing chemicals which are usually added to tanks which hold spawn.

Surely you will be very impatient during the three days and try to count the eggs. At this point be advised that with the use of this method we have seldom gotten fewer than 500 eggs. In the opinion of Herr Tanner the large number of eggs and their high percentage of fertility depends solely on the continued optimal feeding of the breeding pair.

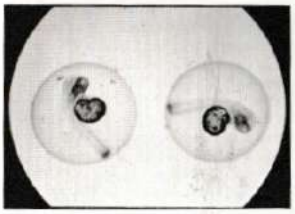
If it is desired to raise a large number of fry, the problem of feeding comes up at once. Besides, we must also remind ourselves that because the fry are in a small space we must maintain a high concentration of food. At the same time the water must not be allowed to become dirty, and for this reason a



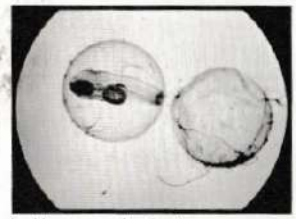
Three eggs of the Congo Tetra about 6 hours after being laid. The yolk, about the same size as that of most other fish species, floats inside of a shell which is about 2½ times its size. (The little bubbles to the right under the egg are the result of damage to it.)



Two embryos in their eggshells, 1 day after fertilization. The one embryo is seen from the side and the other from the belly, partly hidden by the yolk-sac.



Two embryos on the second day after spawning. The yolk-sac shows the first traces of black pigment.



On the fourth day after spawning the first young Congo Tetras hatch if the temperature is right. At the left is an embryo a few seconds before hatching; the eyes are strongly pigmented and above the yolk-sac a swim-bladder has formed. At the right is an empty eggshell.

filter must be used. This filter should not run so fast that the youngsters are pulled into it. Herr Tanner has given the matter a great deal of thought and come up with an amazingly simple solution. Three days after spawning, the eggs are simply transferred to a filter, where they hatch and live for their first 12 to 14 days.

The filter, or more exactly their "living room," consists of a preserve jar of about 2 quarts capacity where the bottom is covered with about 3 inches of quartz sand (grains about 2 mm). This quartz sand acts as the filtering medium. In the sand is placed a small plastic container with 1 mm holes in the sides. In the cover are mounted an air intake and outlet tube for the filtered water. The outlet tube is cut off half way up the preserve jar. At this point the air necessary for lifting the water is released, making any additional aeration unnecessary. This "raising filter" is stood in an aquarium in which a thermostat and heater have been placed.

As has been already stated, the eggs have been transferred into the filter three days after spawning. Naturally this filter is filled with the same type

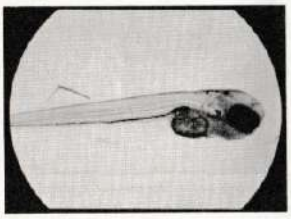




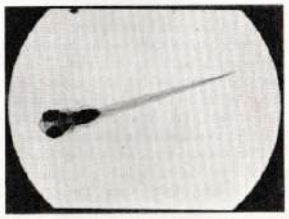
water as has been used for spawning, and is held at the same temperature. Two days later, five days after spawning, the first eggs hatch at a temperature of 79°F., and eventually there are about 500 fry in 1½ quarts of water. One day after hatching, feeding is begun. At first they get a commercial fry food, and 12 hours later the first brine shrimp nauplii are fed.

The young remain 12 to 14 days in the "raising filter." During this time they should be fed three times daily: commercial fry food in the morning, brine shrimp nauplii at noon, and in the evening chopped *Tubifex* worms, fine-grained dry foods, and brine shrimp nauplii.

Four or five days after hatching the first change of water is undertaken. We push a hose into the outlet of the filter and in this manner draw off two-thirds of the water without endangering a single young fish. The water is replaced with clean tap water, naturally of the same temperature. As we have stated before, our Basel tap water has a hardness of 6 to 8 DH. One day later the water is again changed in the same manner, so that in six days after hatching the fry are swimming in almost pure tap water. This sudden change from peat-filtered water to pure tap water seems somewhat radical, but the



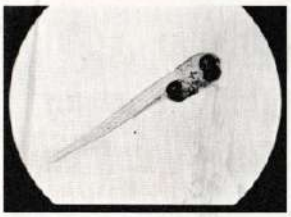
A young Congo Tetra shortly after hatching. This fish hatched 6 days after the spawning. Between its eyes and yolk-sac there is a balancing organ.



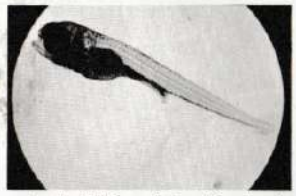
A young Congo Tetra, photographed about 6 hours after hatching.







This Congo Tetra, 6 days after the spawning, has already had his first nourishment (brine shrimp nauplii). One can see distinctly that the swim bladder is filled with air.



A Congo Tetra 8 days after spawning.

fact is that no fish has ever been hurt by it. We are of the opinion that the youngsters should be accustomed as soon as possible to tap water, as this is the water most hobbyists give them later on.

Twelve to fourteen days after hatching the youngsters are transferred to an all-glass aquarium. They grow quite well if fed properly, and when six weeks old they are about ¾ of an inch long; after three months the "flags" on the tails of the males make it possible to distinguish them.

Except for the preparation of the treated water, spawning of the Congo Tetra presents no difficulty, unless one allows wind and weather to interfere with what many hobbyists no longer deem necessary: the collecting of varied live foods.

We are of the opinion that if many spawnings result in failures or small batches of eggs, a high mortality rate, etc., in spite of obeying all the rules laid down by the literature on the subject, they can be avoided by proper feeding. This surely holds good for many fish species of which it is still said that their breeding can be accomplished only with the help of chemical mixtures, vitamin baths, hormone preparations and the addition of trace elements.

# Remembering the Easy Way

BY JERRY CURRIER AND MARTY SMITH

One of the most satisfying experiences of this hobby of ours comes when our fish spawn for us. Nothing can give a sense of accomplishment like that you get from successfully conditioning, spawning, and raising the young of a hard-to-breed fish.

The successful spawning of such a fish happens not by chance. It happens after a lot of careful planning, proper feeding, and hours spent trying to satisfy the persnickety little beggars with the right conditions.

Most of us are amateur biologists, and we all have to be part ichthyologist, chemist, botanist, dietician, hydrologist, physicist, and, above all, we have to be practicing philosophers! In other words, all of us are scientists and can offer a great deal to the general body of scientific knowledge provided we approach experiments with our fish properly.

One of the standard procedures used in any scientific research is the keeping of **accurate** records. OK, with all of that in mind, stop and think. How many times have you read an article that tells you all sorts of things about spawning a new or previously unspawned fish? Pretty often, right? Now, have you been left guessing? Of course it told you that the latest model of *"Apistassizi corylatus snozzerei"* got together with another *"Apistassizi,"* and they managed to get some eggs spread all over the place. But what did it actually tell you about the spawn? Did it have statements like ". . . the parents must be well conditioned if a successful spawn is to be achieved," or ". . . the water was slightly acid and rather soft . . .?"

Great! Now what does "well conditioned," "slightly acid," or "rather soft" really mean? Does an *"Apistassizi corylatus snozzerei"* eat brine shrimp, earthworms, or liver and onions to become "well conditioned?" Is "slightly acid" pH 6.9 or pH 5.0? Is "rather soft" a DH of 10 or of 2? Vague? Sure it is.

But wait a minute! If **you** were suddenly taken with the creative urge and decided to sit down and enlighten the world on one of your successful attempts at spawning a pair of fish how would you do? Could you recall all of the exact (that's the gimmick, EXACT) conditions?

Think so, eh? OK, try to answer these questions:

1. What was the exact pH of the water?
2. What was the exact DH (hardness) of the water?
3. What was the temperature of the water?
4. What were the foods used for conditioning, and how were they fed?











5. What time of day were the fish put in the spawning tank, and what time of day did they spawn?
6. What kind of light was on the fish when they spawned?
7. For how long did they spawn?
8. Were they separated before being placed in the spawning tank?
9. What kind of spawning medium did you use?
10. Was your water softened artificially?
11. Was the temperature raised to stimulate a spawning?
12. Did the fish show any unusual characteristics (color, movement, etc.) before or during spawning?

If you scored 100%, forget it! This article isn't for you. But if you're like most of us, read on. This won't improve your memory, but it'll help you reinforce it.

Remembering all of these things is easy. All you have to do is keep a set of **complete** records that are accurate and simple.

"Hold on," you say? You haven't got time for all that paper work?

Alright, so it takes you 2 months to condition the parents, a week and a half to get the water "just right," and 4 months to raise the little fellas

NAME OF FISH:_____ TANK NO.:____

| | TIME | DATE | |
|---|---|---|---|
| Placed in Tank ----- | | - | Temp.____ |
| Spawned---------- | | - | pH:____ |
| Eggs Hatched ------ | | - | DH:____ |
| Free Swimming ----- | | - | |

Fed Fry ----------
(Type & Quantity of Food)

Other Info:_____

(Such as spawning medium, tank location, unusual activities etc.)

The proper information on an index card will help you remember.

to adulthood. So you've shot half a year. Think you can afford maybe 15 minutes to insure you can do it again?

OK, so you still don't want to get bogged down in a lot of paper. ("Let the Government keep the paper business booming!") No sweat! You can keep accurate records that are easily referenced with a minimum of paper. Some 3½ × 5 inch index cards and a looseleaf notebook is all it takes. (Of course it helps to have a pen or pencil handy to make entries with.)

Here's how it's done: first, you might find it helpful to number your breeding tanks. That way you know which fish were in which tanks if tank location turns out to be a factor in spawning (due to light, passing traffic, etc.). Numbering is easily and neatly done with a plastic labelmaker. If you don't have one, use a piece of masking tape or the new cellophane tapes that can be written on, and write the numbers. (We mark our numbers twice on each tank, once on the hood for easy reference, once on the underside of the tank itself to help in matching hood to tank.) But, numbering your tanks isn't absolutely necessary, and you can skip it altogether if you're lazy. That's why we told you about it first.





The next thing is to number your index cards to correspond to your tank numbers. (If you decided not to number your tanks, just write down the name of the fish you're spawning.) The cards are easily filed in an appropriate box, in numerical or alphabetical order (whichever you're best at, numbers or alphabet).

If you hate thumbing through a box with the attendant problems of hangnails and all that, you may want to make up a peg board for the cards. A peg board is the easiest to use by comparison, but does require a little more effort to begin with. You can get peg board at most building supply firms. It isn't too expensive (costs about 75¢ for a 2 ft. × 4 ft. sheet) and can be easily cut with a hand saw. Be sure to get some peg board hooks when you purchase the board; you'll need them to hang your cards on. Cut the board to meet your needs. A good way to judge the size you'll want is to figure that each 3½ × 5 inch card takes about 6 holes in length by 4 holes in width on the board. (Be sure you leave some extra space for that unexpected spawning or that new tank you've been planning on getting.) After you've gotten the board cut to the proper size you can hang it in the fish room. You may want to paint it, especially if the "better half" insists on esthetics!

Now you can number the card locations on the board so that they correspond with your tanks. By punching a hole in the top of the index cards, they can be hung on the hooks you remembered to get when you bought the board. (You didn't remember? See, that just goes to prove the need for all of this!) If you want to get real classy, buy some spring-loaded clips at the five-&-dime and hang the cards on the hooks with the clips.

Whether you use the peg board or settle for a file box, the next thing to decide is what information you need to keep. Here is a sample of the important information you will probably find necessary to keep.

1. Name of fish.
2. Water conditions. (pH, DH, temperature, etc.)
3. Times. (When were the fish placed in the spawning tank. What time did they spawn, etc.)
4. What type of spawning mediums did you use? (Artificial, natural, bare tank, etc.)

You may also want to record the location of the tank, what foods the parents were conditioned on, how long it took the eggs to hatch, how long before the fry were free-swimming, growth rates, and anything unusual about the spawning act or the fry.

Even if the spawning attempt is not a success you should keep the cards. Why? Well, a lot of times the reasons for not achieving your aims can be





deduced from that information, and you can do something about correcting the problem.

You might find that a shorthand code can save a lot of time. For instance, these are some of the codes we use:

*NS*—*N*o *S*pawn. (The male betta was too busy looking pretty.)

*ENF*—*E*ggs *N*ot *F*ertile. (Papa barb was lazy or bored.)

*DNAC*—*D*ied, *N*o *A*pparent *C*ause. (The fry saw the headlines in the morning papers.)

*TOSS*—*T*hrew *O*ut *S*mall *S*pawn. (Six zebras hatched out.)

*FD*—*F*emale *D*ied. (The male betta got tired of nagging women.)

*MD*—*M*ale *D*ied. (Maybe he was just too old for that young chick.)

So, all this sounds ominous, like hard work, eh? Well, if you're 100% successful with all your spawning attempts . . . forget it! (But, let us know how you do it. You've **got** to have connections up **There**!)

"I still haven't found out what the looseleaf note book was for," you say? Well, don't be so impatient, we're getting there. If you only attempt a spawning one or two times you can do without the looseleaf. (So, you already rushed out and bought one. Save it! We may write an article for "looseleaf owners, *only*" some day!)

As we said before, you **can** do without it. Just file your completed cards in alphabetical order, using the names of the fish. But if you really have the fish-spawning "bug," and you do a lot of it, the looseleaf will make reference much faster. The thing to do is to assign a page for each fish you are working with. Keep the notebook in alphabetical order. Use the common name if you like, such as: bronze catfish, Egyptian mouthbreeder, guppy, mollie, zebra, etc. If there is no such name, use the scientific name, such as *Apistogramma agassizi*, *Hyphessobrycon ulreyi*, etc.

Now as you take your cards down, you can transcribe all of the information from the cards to the appropriate sheet in the looseleaf. Thus, you can refer to all of the information on any particular fish at a glance. (You can also use the back side of the card for another spawning effort and save a little money.) You might want to get a set of those "stick-on" index tabs to use on the pages. This makes reference easier and adds a little class to the whole thing.

There you have it. A month, a year, or 10 years from now you can look back and see exactly how you accomplished a spawning with any fish. And when you decide to sit down and write the "Great American Fish Story" you won't have to make vague guesses. Oh, by the way, did you ever get those "*Apistasisi corylatus snozzera*" to spawn again?

A Phractocephalus hemiliopterus in a very large aquarium in Dr. Axelrod's office at TFH. Photo by Dr. Herbert R. Axelrod.

**Our new colorful and interesting pet.**

# The Redtailed Catfish

BY WILLIAM VORDERWINKLER

You can't say it's not colorful—chocolate brown body with a creamy yellow stripe that runs along the sides as far as the tail and on the other end comes all around the mouth. As the name indicates, the tail itself is red—not a flaming red, but red. Young specimens have a yellow edge on the dorsal fin, which may disappear when the fish grows. Ours (in Dr. Axelrod's office) dominates the huge tank there and has taken possession of one end, keeping a small school of good-sized Discus on the other. No violence has been observed so far, and it looks as if these fellows are only interested in whatever they can swallow. As the mouth is quite large and the fish gets big, this can take in a lot of territory.

*Phractocephalus hemiliopterus* (this is a name which I always seem to have trouble remembering) occurs in most of the British Guiana streams and lakes and also throughout northern Brazil. When collecting in the River





Napi in the southwestern part of British Guiana, the author recalls seeing the Indian boys sitting on a boulder and shooting arrows into the water at them. They seldom missed, and I was glad that they were not unfriendly toward our little party. Ever try to shoot at or spear something in the water? You have to allow for light refraction, because every time you don't you miss your mark completely. We drew our nets several times and besides these Redtails we caught some large *Callichthys callichthys*, from which the natives make a soup, and quite a few *Acanthadoras spinosissimus*. The "small stuff" consisted almost completely of silvery Tetras which were either entirely devoid of color or at most had a dark spot at the tail base, so we gave the Indians a field day by pulling our nets for them and getting them a huge catch.

Some of the Brazilian Indians will not touch the Redtailed Catfish, much less eat them. Their flesh is of a deep pink color and although it is delicious, they seem to consider these fish as a reincarnation of some of their ancestors and refuse to have anything to do with them. One runs into some fantastic taboos among these simple people, and every common form of animal life has some kind of folk legend connected with it.

*Phractocephalus hemiliopterus* grows to about 4 feet in length in some streams. Those we caught in the Napi were no more than about 2 feet long. Ours in the office is about a foot long. It will be interesting to see how big he gets and how quickly the process occurs. Small specimens about 4 or 5











Our Redtailed Catfish became tame enough to eat out of our hands within a few days after he arrived. Large specimens of up to about 4 feet in length are caught in their native waters and are good for eating. Photo by Dr. Herbert R. Axelrod.

inches long are very attractive and come in quite frequently. They are more nocturnal than diurnal in habits, but do not object to feeding in the daytime. A number of retreats where they can find darkness are necessary to the fish's comfort. Feeding them *Tubifex* worms would be highly satisfactory to the Catfish, but might prove to be a considerable financial drain on the owner, unless he has access to an inexhaustible supply. Earthworms are also relished; lacking these, strips of lean beef or fish will do. Small living fishes also make a good food, but I do not know if they would condescend to eat such foods as boiled oatmeal and other vegetarian fare. In their natural waters where I have observed them there is seldom any amount of plant growth, and it seems to me that they are strictly carnivores.

To date none of the public aquariums, who would be the only ones likely to have a tank big enough for the purpose, has reported spawning them. About the biggest captive specimen I have seen to date was a monster in the Cleveland Aquarium which was over 2 feet in length.

*Continued from Page 7*

contain a material called guanin, hence they are called *guanophores*. (Guanophores are also referred to as iridocytes.) The pigments in these chromatophores all differ from one another chemically, but guanin is particularly different from the others in that it is a form of waste product which occurs as a crystalline deposit which prismatically reflects light. This reflected light may alter the color produced by any of the other chromatophores!

A veritable kaleidoscope awaits the curious breeder who has access to a microscope through which he can observe these interesting cells. Red and black cells in particular may be seen in near random profusion. In fish with many guanophores, guanin crystals may be observed as sparkling flashes, obscuring or enhancing pigments so that a vista of glittering color greets the eye. As these are observed more closely, they may seem to be concentrated into areas which, magically, become patterns when viewed without optical aid.

Research indicates that chromatophores occur in several layers of the skin. These layers are designated (moving inward) as superficial, intermediate, and deep zones. To understand the significance of this in betta color production, it will help to keep in mind that transparent materials transmit light, while opaque materials do not. This makes relative transparency an important factor in the production of a color. For instance, an opaque material (in this case a pigment) will show whether it is in a skin layer above or below a more transparent one. On the other hand, a transparent material will not show if it is in a layer below a more opaque one. In order of decreasing transparency (or increasing opaqueness) the true pigment cells rank yellow, red, and black. Iridocytes may be somewhat opaque if they contain very large numbers of guanin crystals. In order of depth in the skin, red (erythrophores) and yellow (xanthophores) are deepest, black (melanophores) throughout, and guanophores generally are closest to the surface.

## ANALYSIS OF KNOWN BETTA COLORS

Using this knowledge of the elements involved in the production of color, it becomes possible to consider the contribution of each to the color pattern of wild type bettas. It is then possible to consider what alterations would be necessary to produce the more colorful domesticated types.

The primary "brown" color of a wild betta could be expected if a moderate amount of red and black cells were arranged so that they were concentrated in areas where visible patterns occur and were less dense, allowing yellow and background color to show through in other areas. Greenish-bluish spots and streaks would result from concentrated localizations of iridocytes, and red patterns would be visible when not obscured by others. Using this type as a reference, let us consider some of the better known "mutant," domesticated varieties. While these have not all been fully investigated, enough good work has been done to enable us to make some reasonable suppositions.

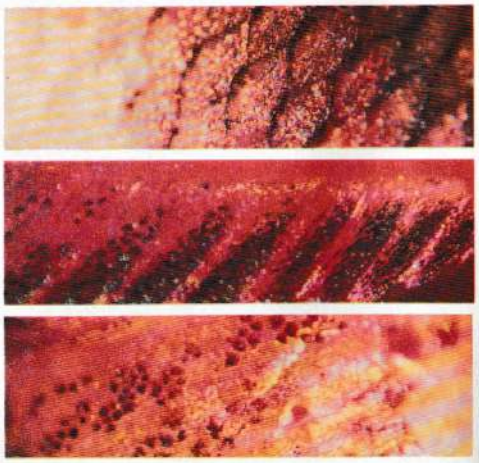




**Variations involving the reduction of melanophores:** At least three different variations are known which involve limitation of dark pigment in bettas. One of these is albino, a condition recognizable because of lack of pigmentation in the eyes as well as on other parts of the fish. Few albino bettas have been reported. One found its way into the hands of a prominent hobbyist who, fortunately, was able to photograph it. It proved to be sterile, or at least it did not breed. No successful breeding of albino bettas has been reported.

A second variation severely limits dark pigmentation, but the fish have pigmented eyes and often pigmented patches on the body. The body generally appears pink or yellow. This mutant is called "Cambodia" and was probably one of the best known types until quite recently. The possession of dark red fins and both red and yellow on the body indicates that this variation primarily involved reduction in the amount of dark pigment.

Three microphotographs — Top: Scale pattern from light variation such as might be used for background in good red bettas. Center: Reddish fins showing particularly red areas, dark pigment cells, and reflectant flashes of guanin crystals. Bottom: The sparse population of melanophores in a light-bodied fish. Photo by Gene A. Lucas.







Two rarely seen bettas. The white betta (above) is particularly rare. Photo by Gene A. Lucas. Almost-black bettas of the quality of the one below are hardly ever seen. Photo by Edward Schmidt.

A third variation also involves the reduction of dark pigment but is not so extreme. It has been called "Bright" by the biologist who described it because it was discovered during the investigation of the genetics of red and produced a specific variation in types of red. The last two variations mentioned here have been found to be genetically "recessive" to the normal amount of dark pigmentation.

**A variation involving the increase of melanophores:** A strain of bettas called "Black" has been recognized for some time. It is not well known, but it appears to be the result of an extensively increased density and distribution of dark pigment cells. The best blacks would be expected to occur in fish having few iridocytes, since they might alter the color effect.

**Variations involving erythrophores:** Red bettas are highly coveted because they are very striking and are more difficult to produce. Good reds result only when there are at least three favorable factors. Two of these factors involve the limitation of pigments which obscure red, that is, dark pigments and large populations of iridocytes. The third requirement is a considerable increase in the density and distribution of the erythrophores causing a notable enhancement of the visible red color. Still another problem is the fact that female hormones seem to have a partially inhibitory effect as evidenced by female Cambodias which develop little or no red on their bodies while males are often very red. Red females occur, however, so they are probably of the "Bright" type mentioned earlier. The latter, however, still do not approach the brilliancy of red males.

**Variations in distribution, density, and configuration of guanin particles in iridocytes:** Two genes involving these cells have been investigated. One of these involves the presence or absence of large numbers of iridocytes. An extreme scarcity of iridocytes appears to be recessive genetically. The extent of increase appears to be quite variable and is probably under the influence of several genes. When iridocytes are present they produce variable reflected colors ranging from green through bright, or "Cornflower," blue to dull, or "Gunmetal," blue. All of these are variable, but to the trained eye they are easily recognized. In genetic terminology, these show partial, or incomplete, dominance. This is when two pure breeding types are crossed and an intermediate form results. In this case, green and dull blue are pure breeding types and the intermediates are bright blue. An additional factor is that the intermediate forms do not breed true, when incomplete dominance is operating, and in the case of the bright blue bettas this has been found to be true.

**Special color combinations:** In light of what has been discussed, it should be possible to account for the many unusual colors that have been reported. For example, limitation of all the various "masking" pigments would allow yellow or the background color to show. This would produce









"Yellow" bettas. Add a light layer of dark cells and the combination would produce "Browns," a quite different brown, incidentally, than the wild type brown. Fins of such fish may be colorless or transparent. And, as might be expected, such fish have been dubbed "Cellophane" bettas. Purples and lavenders are the result of medium to thin layers of the various blues overlying a dense population of erythrophores, the red showing through the blues and creating the blended color. Mint greens, sky blues, other pastel shades, and whites occur when the colors produced by iridocytes are located on fish with the light colored Cambodia as a background. Similarly, the intensity of these colors varies considerably on dark fish, depending upon the "darkness" of the background pigmentation. Other genes, which have not been worked out, control the distribution of the pigment cells. A fish may have a green or blue body, for example, with bright red fins. This combination requires heavy pigmentation on the body and lack of interfering pigmentation, allowing erythrophores to show, on the fins. Other variations have red fins with pigmented bands of blue or green at the extremities of the fins.

## CONCLUSION

An understanding of the factors covered in this article will be useful to the breeder who wishes to select breeding stock which is most favorable for production of desired fish. Maintenance of good red stocks, for example, can best be accomplished by avoiding crosses with fish having dark bodies or highly colored bodies since large numbers of dark pigment cells or iridocytes will mask red in the offspring.

Helpfully, there are some true-breeding stocks, allowing the breeder to predict what his matings will produce in many cases. Cambodias breed true, as do greens and dull blues, though the latter two may be over dark or Cambodia backgrounds. Bright reds should breed true, providing the proper females can be identified. Greens mated to bright blues should result in approximately equal numbers of these two forms. The same is expected from matings of dull blue with bright blue, that is, approximately equal numbers of dull and bright blue. Greens crossed to dull blues should produce all bright blues, the intermediate form. Generally speaking, yellows and reds should never be mated to dark or highly colored (with iridocytes) fish. Blacks could be mated to any except the fish possessing many iridocytes.

While the greatest problems in breeding beautiful bettas are not selection of colors, but rather the more elementary ones of spawning, rearing and handling fry, feeding, housing and handling adults, disease control and similar factors, it is hoped that familiarity with basic genetic and developmental features concerned with the production of color types will be useful to the serious breeder.

In the face of photos like this one showing harlequins laying their eggs, the author insists that they are livebearers. Photo by R. Zukal.

# Harlequin Rasboras as Livebearers!

BY ONG KAY YONG

Under rational thinking and observation, harlequin rasboras, *Rasbora heteromorpha*, are livebearers, but more about that later. Being small, in their native waters, harlequins are erratic swimmers and live in separate schools. They dislike mixing with other species of fishes and prefer shallow, fast flowing streams with sandy bottoms. They will choose the more inaccessible places to live in. Their favorite spots are where nipa-palms are to be found. Being very small and fragile, there is a strong tendency for them to run upstream to spawning grounds. The value of this habit is obvious; it places the baby fishes in an appropriate nursery ground, in narrow waters and where they have fewer enemies to contend with.

BREEDING

I was myself a strong believer of the legend that harlequins are egglayers. Even the many aquarists in Singapore are skeptical of the discovery that they are livebearers. Many hobbyists and tropical fish dealers tend to be on the safe side and will not discuss it. Many have been led up the garden path, and the egglayer myth has been circulated among us with no attempt to get at









the real truth. Many can produce photographic evidence purporting to be authentic with the results that all are deluded further.*

To be successful in breeding harlequins, two ways are open to you. You can either choose a fully matured pair from your tank (in my case, around Singapore, from a stream) or catch as many fry as possible and raise them (this is not possible for many) in your tank. The latter way is valuable in that these fish will become acclimatized to your water.

When ready to breed, the female harlequin will swim from one leaf to another, as if looking for a suitable place to lay eggs. She will not necessarily favor a cryptocoryne plant, as has been often reported. In fact she may totally ignore cryptocorynes and play about on any other plant. She will then go through the act much like spawning on top of a leaf or under it. The male will be near by to help her and will come to her side immediately as if he is fertilizing her eggs. Both fish will carry out quivering movements for a few seconds. After this, they will swim away to look for food or chase one another around the tank. At other moments, the male will hover over the back of the female harlequin and tickle her with his ventral fins. The act makes her quiver for a second. This is repeated over and over again for a few minutes. At other times, the male harlequin will keep nudging at her or will drive her into hiding. He will then keep watch until she comes out again to keep him company. These procedures are carried out repeatedly for about a week.

In actual mating, the male will approach the female from behind and on the right side of her for copulation. The act is carried out in the same manner as with guppies with the exception that the male makes an arc of 90 to 120 degrees on his side. All this while the female harlequin will keep very still. This is repeated for a few minutes until fertilization is completed. The action usually takes place at night. A mating I witnessed was observed on a night when I suddenly switched on the lights at 11 o'clock.

During the gestation period, which is generally one month, the male harlequin becomes bolder and guards the female very jealously. He will face any intrusion bravely and will even attack your hand if you put it into the tank. About a month later, baby harlequins are found at the bottom of the tank and hiding among the rocks. No attempt should be made to net them out, but, rather, the parents should be removed.

*Note: Our staff here at TFH was quite shocked at Mr. Ong's contention that harlequin rasboras are livebearers. Mr. Ong informed us that he could not provide any photographic evidence because the rasbora fry are too small to photograph at birth. Most hobbyists have seen evidence that harlequins are egglayers, photographic evidence supplied by respected aquarists (see cover story of this issue) and written reports from aquarist-scientists. Many of us here have actually seen *R. heteromorpha* spawning, and we have seen the eggs. We feel neither deluded nor that we have been "led down the garden path." How to explain Mr. Ong's views? We don't really know, but we do know that he is a talented and accomplished aquarist, and we feel that as such he has the right to have his views aired.

# MAIL CALL

By William Vorderwinkler

If you have an aquarium question that you would like answered, send it to MAIL CALL. Each month the most interesting questions received and their answers will be published in this column. Letters containing questions cannot be acknowledged or answered personally. Address all questions to: MAIL CALL, T.F.H. Publications, Inc., 245 Cornelison Avenue, Jersey City, N. J. 07302.

**Sharks**

**Q.** 1. I understand that there are about 50 varieties of sharks. Is this true? If so where could I find some information about them? I would at least like the various names of each of them.

2. At this time I have about four varieties: black shark, redtailed black shark, bala shark, and silver shark. I am very interested in trying to breed them, but understand it is next to impossible.

3. Are sharks true sharks or a breed of carp or catfish?

**Bob Hightower, Los Alamitos, Calif.**

**A.** *1. I just knew it would come up some day! Yes, there are about 50 varieties of sharks, but those are marine fishes, and most of them attain respectable sizes, certainly bigger than anything you could keep in your home aquarium.*

*2. The four species you name are not true sharks. They spawn very rarely in captivity.*

*3. The aquarium fishes that are sold under the popular name "sharks" are members of the family Cyprinidae, the*







*catfish. The underslung mouth and the rather large triangular dorsal fin give them a tiny sharklike appearance, hence, I suppose, their name.*

**Crisper drawers**

**Q.** This is not a question but something I have recently discovered. It is that crisper drawers from an old refrigerator serve excellently as breeding tanks for bettas, containers for aging water, raising fry, and treating sick fishes. Not only are they less likely to break than a metal and glass tank, but they are very easy to clean and are inexpensive.

**Bill Jones, Lawton, Okla.**

**A.** *Yes, and there are doubtless many of them going begging in junkyards. Here is a good use for them: if you go out and get a catch of live food, they can be put in the crisper drawer with clean water and examined for unwanted fish enemies, which show up very plainly against the white porcelain bottom. Planis also can be examined in this way.*

**Common and scientific names**

**Q.** 1. After finding several answers, I would like to know what tank is suitable for raising bettas? In your Libby Betta article, it said from 2 to 10 gallons, but in your publication BEAUTIFUL BETTAS, it states 10.

2. Although I consider myself an informed hobbyist, I don't know all the scientific names. Could you please, when writing about a fish, give both the common and scientific name?

You have a fine magazine. Keep up the good work.

**Jonny Edlow, Baltimore, Md.**

**A.** *1. Here's the way it is: if you use a small tank, it will require more attention. A small tank is more likely to tend toward*





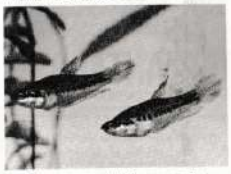


*foulness when you feed heavily with infusoria cultures and the like. A larger tank will hold many more of these animalcules, and the water will remain fresher.*

*2. This has come up often before, but it bears occasional repeating: A fish has only one officially correct scientific name, which is the same the world over in all languages. A common name may vary in the different countries where the fish is known and kept, and using it could lead to much confusion among our foreign readers. We try always to use both here.*

**Pygmy gourami**

**Q.** In the December 1965 issue you have the pygmy gourami. I would like



Pygmy gourami, Ctenops pumilus.

to know if you have more information on these fish, as I would like to breed them.

**George Koutny, Cicero, Ill.**

**A.** Ctenops pumilus *is a little fish which likes to be kept at about 80° F. They spawn like bettas do. They build a small bubblenest which is sometimes hidden under a leaf. Eggs hatch in about 30 hours, and it is best to let the male take*

*full charge of the brood. Once the fry start growing, they are quite easy to raise.*

**Whirling angels**

Q. 1. Recently I purchased a group of baby angelfish. When I had set them up in a tank, I noticed that one of them kept going in a circle. For the next few days I observed him. Through all this time only once did I see him stop circling and swim straight. There are no marks on his body or any signs of a disease. He eats and acts normally except for the fact that he is continually circling. I would like to know if there is any disease which causes a fish to circle, or do I just have an odd fish?

2. How many angels can I raise to breeding size in a 15-gallon tank?

**Joseph Pane, Jr., New York City, N.Y.**

A. *1. This sounds like the result of some sort of brain damage, perhaps from banging against a rock or glass side. This often upsets the sense of balance and causes a fish to swim in circles.*

*2. About 4 or, at most, 6.*

**Bad smell**

Q. I am 15 and as long as I can remember we have had either tropicals or some other kind of freshwater fishes. I have done some breeding of guppies and bettas, and I love fishes and just can't be without them. In March I set up a new 15-gallon aquarium. Being a new one, I bought everything new to go with it. Just this week, my mother has started complaining that it smells, and when I got close to the water I found out what she meant. Everyone in my family agrees that it smells terrible. You can only smell it when you get close to the water (about 5 or 6 inches). I have new gravel and a new under-





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gravel filter with charcoal cartridges on it. I only have a few fish in it: two small angelfish, two neon tetras, two catfish, two gouramis, three of my breeder female bettas, and four young guppies. I don't have a reflector, just the light. Our cat just loves the aquarium, and she sometimes tries to take the plants out when no one is home. I thought it might be the cat, but to tell you the truth I never have had that problem in my breeding tanks, and once in a while she gets into one of them.

**Alan Clayton, Woodburn, Ind.**

A. *Such odors are generally caused by decay of some sort. I'm afraid you'll have to tear down your tank and set it up again, sniffing as you do so. Maybe you can spot whatever's "rotten in Denmark" in this way. Lots of luck!*

**Cloudy Water**

Q. I have a 10-gallon aquarium with 22 fish in it. I have a problem. I just cleaned my tank out about 3 weeks ago, and it is already cloudy. I also noticed some sort of dirt or scum on the plants. Do you think this stuff would be doing it? Could it be the gravel? I feed my fish all they can clean up in 3 minutes. What could be doing this? I hope you will publish this in TFH.

**Leonard Olszewski, Chicago, Ill.**

A. *22 fish in a 10-gallon tank? No wonder you have trouble with cloudy water. Get another 10-gallon tank and set it up. Then divide the fish between the two, and don't ever kid yourself that 22 average-size fishes are not too many for a 10-gallon tank!*



















**Water chemistry**

Q. 1. The hardness of the water in my tanks using ocean gravel is lower than the tap water with which they were originally filled. I attribute this to the lime in the gravel. Naturally this keeps the pH on the alkaline side. Is there any way I can lower the pH and keep it from rising again?

2. In another publication, rainwater is suggested in the production of peaty water. Is this because of its low degree of hardness? Rainwater is hard to get in the city. Could you suggest an alternative? If it is boiled tapwater, will the peat remove the permanent hardness, as boiling removes only the temporary hardness? I'm interested in very soft peaty water for breeding.

3. Will charcoal filtration alter the makeup or characteristics of peaty water?

4. Should mild aeration be used in breeding tanks?

5. Is there an easy way of testing gravel for lime? I'm interested in lime-free gravel for use with acid water.

6. Where can I obtain young adult *Aphyosemion* species for breeding? They seem to be scarce around Chicago.

7. Is methylene blue still the most reliable method for curing "ich"? One book advocates a 5% solution. All I can find is a 1% solution. Is this of sufficient strength?

**Obed B. Oglesby III,**
**Chicago, Ill.**

*A. 1. Adding sodium biphosphate to the water will give you an acid reaction once more, but if your gravel is loaded with lime it will soon creep back to alkaline. I suggest you use a neutral aquarium gravel, or if you are going to use the tank for breeding and looks are not important, don't use gravel at all.*

*2. Rainwater is an inexpensive way to provide water which is reasonably soft. An expensive way to do this is to use distilled water. If you are going to use soft, peaty water for breeding, make sure of the peat you are using. Local peat moss will sometimes give an alkaline instead of an acid reaction.*

*3. Very little.*

*4. It's a very good thing, because it keeps the water circulating and provides even heat throughout the tank.*

*5. You could take a glass container, a drinking glass if necessary, and put in a generous amount of gravel to be tested. Then fill it with distilled water. Let it stand for a couple of days, and then test the pH.*

*6. Dealers seem to shy away from selling some of the* Aphyosemion *species, because they have to pay a high price for them, and if they lose some, there is little or no profit on the books. One of our advertisers, Aquarium Stock Co., tells many of these fishes through the mails.*

*7. The effectiveness of methylene blue, to my mind, is highly overrated. Many times a case is treated with this and the temperature raised at the same time. The fishes get over the attack rather from the raise of temperature than the use of methylene blue, but the methylene blue gets the credit. Get an ich remedy that contains malachite green, which is much more effective.*







**Jewel cichlids**

**Q.** I have become very much interested in jewel cichlids. I was wondering if you could answer these questions:

1. Is a 20-gallon tank suitable for maintaining and breeding them?

Jewel cichlid laying eggs.

2. What foods would you recommend for their fry?

3. When can the fry be removed (or the parents)?

4. What plants would be suitable for the tank?

5. Could snails and a catfish be kept safely with a pair?

**Mark Lambin,**
**La Grange Park, Ill.**

*A. 1. Yes, they can be bred in 20 gallons, but it must be remembered that a large brood must be given more room as they grow up.*

*2. The best food without a doubt is newly hatched baby brine shrimp. As the fry get bigger, they can be fed chopped tubifex worms and adult brine shrimp, either live or frozen.*

*3. The parents have completed their duties as soon as the youngsters are able to swim about and hunt their own food. There is no point in keeping in the parents any longer than this, unless you want to gamble that the fry will not be eaten.*







*Removing the parents is much simpler than fishing out the babies.*

*4. Keep the plants away from the immediate vicinity of the spawning site, because they might be uprooted. For the rest of the tank I would recommend* Sagittaria, *which is fairly tough, or the various* Cryptocoryne *species.*

*5. Why keep snails? They clean up some uneaten food, it is true, but they also contribute heavily to the wastes in the tank. They also have an insatiable appetite for fish eggs. As for keeping a catfish in a breeding tank with jewel cichlids, there is no point to this, and the catfish could easily be damaged and even killed by the cichlids.*

A cryptocoryne.

**Catfishes**

**Q.** In a book I have that tells you how to breed catfishes it says that they lay eggs on an object in the aquarium or on one of the glass sides, and in another book it says that they build a bubblenest. Which is right?

**Ronnie Formiglia,**
**Philadelphia, Pa.**

*A. Probably both. There are many, many catfish species all over the world. There are some that attach their eggs to some solid object, others that build bubblenests, and I can think of one from our own Mississippi River that hatches its eggs in its mouth. There is one in Africa that swims belly-up three-quarters of the time, and one in Thailand that gets to be about 7 feet long. There is a nasty little customer in South America that forces its way into an animal's or human's urethra, where nothing but a very bloody operation will get it out. So Ronnie, if you want to know about the habits of catfish, be sure you know what catfish you mean!*



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**Baby coloring**

**Q.** About a month and a half ago, my red wag swordtail had quite a few young. About five or six of them are all red, and the rest have normal red wag coloring. I was wondering if there was something wrong or is this normal?

**Linda Meyer,**
**Salt Lake City, Utah**

*A. It is not abnormal for red wag swordtails to revert to their original red swordtail colors; discard these babies or keep them where they cannot get at the virgin red wag females and fertilize them, if you do not want such "throw-backs."*


**From far away**

**Q.** I have read a lot about you and your famous guppies, and as I'm deeply in the breeding of your strain of guppy, I will be very grateful if you would give me some general hints on breeding, especially notes on mating and selection. Also, please tell me the method of feeding to ensure the breeding of giant guppies like yours. In addition, would you kindly tell me how to obtain the book ALL ABOUT GUPPIES which was written by you and Dr. Leon Whitney. One last thing, Singapore does not have an aquarium society, and my friend and I are interested in forming a club. Before we carry out this project, however, we would like your opinion regarding it. Tropical fish keeping is a fast-growing hobby in Singapore.

**Seah Kim Swee,**
**Singapore**

**A.** *Glad to hear from you from about halfway around the world, and your interest in breeding first-class guppies. The easiest way is to start with well established stock from a well known breeder. But actually this does not mean anything if you do not provide your fish with good conditions such as sanitary water. Also, the best foods will not be of any help if you neglect the first law of fish-keeping, cleanliness. I myself do not do selective breeding, but you can always read up on it, for instance in* ALL ABOUT GUPPIES. *To obtain this book, write to TFH Publications, 245 Cornelison Ave., Jersey City 2, N.J., U.S.A. Forming a club is a very fine idea. To get interested hobbyists to join, you can always advertise in your local newspaper. To make things*











*easier for you, you could write for the constitution of a club and allied information. Closer to you than the U.S.A. is the Hawaiian Guppy Society. Their secretary is Thomas Inn, 428 Kearlani Street, Kailua, Hawaii 96734. Mr. Inn will be glad to assist you.*

**Move to larger quarters?**

**Q.** What can I do with about 150 baby guppies—plain type? They are taking up all my tank space. I own two 10-gallon tanks.

**Margaret Roach,**
**Douglaston, N.Y.**

**A.** *Do you know that a single pair of guppies, allowing all of the progeny to reproduce, will result in more than a million in a year's time? It is like the story of a maharajah in India who wanted to reward his grand vizier for teaching him how to play chess. "What would you like?" asked the maharajah. "My king," the grand vizier said, "just place a grain of wheat on the first square of a chess board, 2 on the second, 4 on the third, then 8, then 16, 32, 64, and so on." "You do not ask for much, my faithful servant!" the maharajah said. To make a long story short, the grand vizier ended up with 18,446,744,073,709,551,615 grains. As a bushel of wheat contains about 5 million grains, this would have been the world's production for about 2,000 years. This, in a small way, is what happens with guppies.*

*Most guppy breeders just discard the surplus and keep only a few promising ones, depending on how much tank space they have. They may take the discards to a petshop, or feed them to larger fish. There is one other alternative, but many people do not have the heart to do it: really hot water will do away in a split second with any fish you want to discard.*

**Who is daddy?**

**Q.** 1. Can a mated female guppy which has given birth to young once have babies resulting from a second mating by a male of a different strain in the next batch? Which will be the father of the second batch, the first male or the second male?

2. Are microworms as good as baby brine shrimp? Have you ever used them?

3. Why do you use gravel in your tanks? Doesn't this limit the amount of food you can feed?

**Paul K. Evans,**
**White Plains, N.Y.**

**A.** *1. If a different male is introduced not later than 4 days after a female has dropped a litter of young, the sperm of the second male could take over in some of the ova for the very next birth. As a result, the babies at the next dropping will be partly from the second male; it could also happen, however, that this litter might be from the first male and the following litter be primarily from the second male.*

*2. Whatever food these worms are fed the fish will get. It stands to reason that the food value of microworms is completely different from that of brine shrimp. Some breeders swear to their nourishing value, and others reject them. I never use microworms.*

*3. It just so happens that I like a planted tank, and for this you need gravel. If you do not feed too much at one time, there is no danger that food will collect in the gravel.*













## Salts From The Seven Seas

By Alfred A. Schultz

**Q.** I would like to convert some freshwater mollies into saltwater fish. Can this be done? If so, how? And can they be kept with other saltwater fishes?

**Steve Kling,**
**Bunker Hill, Ind.**

**A.** *Yes, mollies can be converted to salt water. They are generally brackish water fishes to begin with. The method that I have used is to put about 2 cups of synthetic sea salts into a 5-gallon tank, add the mollies, and then let the water evaporate. Keep checking it with a hydrometer. When the water has evaporated to a point where the reading is 1.025, it would be safe to add the fishes to your marine tank. Yes, they get along with peaceful saltwater species.*

**Q.** My father and I have been raising tropical fish and seahorses for about 8 years. I have found it is best not to use charcoal in the filter, only glass wool. You can weigh down the filter with glass marbles. Also, put plenty of brine shrimp in the tank, so they can eat as it passes by. The shrimp will live in the salt water for a long time. Also, the hydrometer should range from 1.023 to 1.027, and never outside of this range. Be sure to check every week, because the water gets stronger as it

evaporates. Does all this meet with your approval?

**Howard Graham, Collingdale, Penna.**

**A.** *You have covered a lot of the fundamentals of marine fish-keeping, and it is not a bad idea to review some of them. Yes, many kinds of charcoal are better left out. Glass marbles, of course, are fine for weighing down an inside box filter. Your advice to put plenty of brine shrimp in the tank, however, should never be overdone; always have enough in there so that you can see a good number of them swimming about, but never so many that they will compete with your seahorses for oxygen or foul the water by dying and decomposing on the bottom. Your hydrometer range holds good, and also your advice to check frequently and keep the water within this range.*

**Q.** I have been reading your column for nearly a year and a half now. I think it offers a really wonderful treatment of problems concerning the marine aquarium. From the column, I have become very much interested in marine life and would like to add a saltwater aquarium to my present freshwater collection. I would be grateful if you could give me some fundamentals for starting a marine aquarium or references where I could find them. I plan to start with a 5-gallon tank with a stainless steel frame containing 2 starfish, 2 hermit crabs, 2 pipefish, 1 red decorator crab, and some marine rumbleweed. I will be grateful for any suggestions.

**Robert Burns, Cincinnati, Ohio**

**A.** *Before you begin making any mistakes I suggest you get a copy of* SALT-WATER AQUARIUM FISH *by Axelrod and Vorderwinkler. A 5-gallon aquarium is much too small for the fellows you plan on getting, and there are very few marine plants which will grow in the aquarium. Never figure on getting a small tank and crowding it. Marine fishes are much more susceptible to the problems of crowding than are freshwater species.*





# YOUR FISHES' HEALTH

BY MIKE REED

## Some Enemies

You are not taking care of your fishes properly if you are not taking special care against introducing enemies into your aquaria. Such enemies are most commonly introduced into aquaria as "hitchhikers" on aquarium plants or in with live foods. Most reliable petshops sell plants that have been treated against such enemies or have been grown in greenhouses where such enemies are not present. Live foods purchased in petshops are usually checked over for hidden enemies by both the commercial collector and the owner of the shop. However, no matter how carefully things are checked, there is a chance that some objectionable animals will find their way into your tanks. Two rules to follow to minimize the risk of getting them are: to never collect your own plants, and if you must collect your own live foods, to examine your catch *carefully* before dumping it into your tank.

I will cover four enemies here, the most commonly found and easiest to spot. The four include the water tiger (also known as the dytiscus beetle), the dragonfly larva, the hydra and the leech.

*The water tiger*, or dytiscus beetle, is dangerous to all but the largest aquarium fishes in both its adult and larval forms. The adult

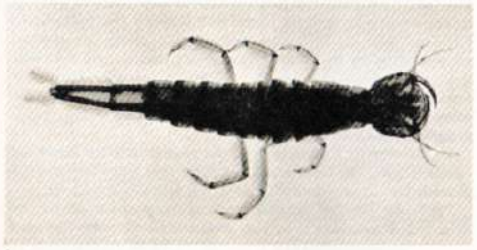
Two water tigers feed on a fish they have captured. Photo by Knaack.





is quite large and is very easy to spot and remove from live foods. Fully grown specimens are large enough to attack and kill fishes the size of large swordtails. They clamp on to their victims with their powerful jaws and suck them dry of their life juices. The water tiger larva kills fishes in much the same way as does the adult form. The difference is that it is not as large or as active in its hunt for prey. Of course its looks are different too, being elongated rather than beetle-shaped. Both the larva and the beetle can be removed from the aquarium with a net.

Water tiger larvae bear some resemblance to dragonfly larvae. Top—water tiger larva. Photo by G. J. M. Timmerman. Bottom—dragonfly larva. Photo by Laurence E. Perkins.







*The dragonfly* larva is not as vicious as the water tiger but is far better known to aquarists. It is quite probable that many aquarists have misidentified water tiger larvae as dragonfly larvae, for the two look much alike to the untrained eye. It really doesn't matter if you can't tell the difference; just don't let either of these fellows into your tanks. Dragonfly larvae kill in much the same way as do water tiger larvae, but they have smaller jaws and are fairly well confined to the bottom where they must wait for prey to come within their reach. Dragon fly larvae can be removed from the aquarium with a net.

*The hydra* is dangerous only to fry that are ¼ inch or less long. Hydra are so small that most aquarists who have them in their tanks are not even aware of them. They can contract to such small sizes that they are virtually invisible among daphnia, upon which they often feed. This means that you can get them in live foods from even the best of petshops. Certain fishes, such as blue gouramis, will eat hydra if they are hungry enough. When hydra are ready to feed they stretch out long tentacles with which they can give their prey a paralyzing sting after which they consume them. Hydra move only very slowly and are most commonly found attached to the aquarium glass, rocks, plants, or gravel. Two friends of mine cleaned infestations of hydra out of their breeding tanks by putting blue and pearl gouramis into the tanks and adding no food for 10 days. Between the sixth and the eighth day these fishes began feeding on the hydra. To avoid infestation of breeding tanks if you are conditioning your breeders with live food, condition them in a tank or tanks separate from the one in which the fry will hatch out and spend their first days.

*The leech* has been accused by many of attacking fishes. Personally, I do not think this is likely, but, since it is possible, and since leeches are quite unpleasant to have around, they should be eliminated if they get into your aquaria. They move about by either swimming or by walking by expanding and contracting their bodies. When contracted they are quite small but not impossible to see. When expanded the most common ones look like dark-colored garden worms with sharp heads and tails. To get rid of one, wait until it begins to swim about the aquarium. (It will resemble a coolie loach until you take a closer look.) Then use a fish net to scoop it out. You'll have to be fast, persistent, or both to catch one of these fellows.

Unless they are in spawning condition, Rasbora heteromorpha are not always easy to sex. With this pair the male (upper fish) has a triangle which is much more clearly marked below than that of the female.

# Spawning *Rasbora heteromorpha*

BY R. ZUKAL
Brno, Czechoslovakia
Photos by the Author

In my estimation, it is a waste of time to describe this lovely fish to present-day aquarists. Everyone has seen these beauties from Thailand, the Malay Archipelago, and eastern Sumatra. Imports date back to 1906, and for many years the species was considered a "problem fish." Nobody seemed to be able to spawn them. Not until shortly before World War II did a few gifted aquarists succeed. Numerous articles have been written about these gorgeous little fish. Soft acid water, a temperature of 82°F. and broad-leaved *Cryptocoryne* plant species have been recommended for their spawning. Here in Czechoslovakia, aquarium hobbyists say that rasboras and cryptocorynes go together "like ham and eggs." I myself am of the opinion that fish which have been kept in my aquaria have accustomed themselves to normal tap water and that it can be used. My tap water is fairly soft, however, and I don't know how things would work out if it were not. Here in Brno, the tap water varies from 8 to 14 DH. For spawning, I use an all-glass tank of about 5 gallons capacity. The water temperature is about 78°F., perhaps a little higher.



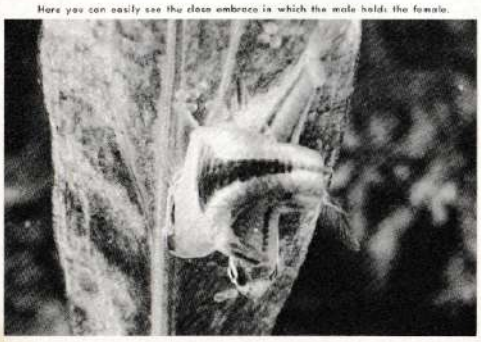


Eggs are clearly visible in this photo.

occasional one that rubs against plant leaves, sometimes even turning upside down under a leaf as she does so.)

The male is introduced into the tank in the evening to allow him to become accustomed to it. The following morning it is the female's turn to be put in

Here you can easily see the close embrace in which the male holds the female.



When the spawning is over, the precious eggs are left clinging to the leaf.

the tank. As soon as the male becomes aware of his mate he swims over to her side and spreads his fins almost to the bursting point. Side by side they swim about the tank in this manner. After a short time the male tries to "ride" atop the female. This position is characteristic of *Rasbora heteromorpha* shortly before spawning. Now and then the male swims up to a cryptocoryne leaf and tries to coax his mate there. If she is not yet willing, the male pokes her gently. At last the female swims up experimentally to the leaf. The male follows closely.

As with other fishes there are false matings at first, possibly to try out the spawning site. The female swims up to the cryptocoryne leaf (which is not cleaned off as carefully as would be the case with cichlids) and presses her belly against it while she waits for the male to swim up. When he does approach, she turns slightly, and he moves in close and embraces her with his body, turning over completely as he does so. During this embrace a few eggs are pressed from her body. These are more or less sticky and adhere to the leaf. Eggs that fall to the bottom are very likely to be eaten eagerly by the parents. Each contact results in only a few eggs, but the process is repeated frequently, and a good pair may lay a total of as many as 200 eggs! The fish lay eggs both atop and under the leaf. The eggs are easily seen; they are about 1 mm in diameter and of a light yellow color. If the water and the bottom are clean, even the eggs that fall to the bottom and are not eaten hatch out. After spawning it is best to remove the parents at once and, if possible, to place the tank in a dark or shaded spot. In 24 to 26 hours incubation is complete. The fry are about 4 mm long.