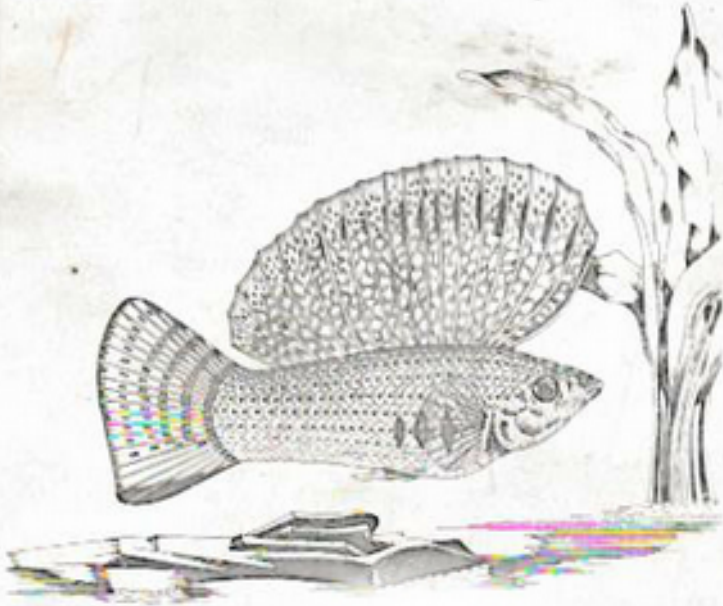


LIVEBEARERS

BULLETIN OF THE AMERICAN LIVEBEARER ASSOCIATION



Guppy Coloration

by Dr. Eugene Larr

(Reprinted from the October, 1974, issue of GUPPY NEWSLETTER, the following was recorded at the February, 1974, meeting of the San Pacific Guppy Association and transcribed by Don Holtz of the Southern California Guppy Association. It originally appeared in the GUPPY CARETAKER of June, 1973, a publication of the SCA. Apparently the first remarks were aimed. It appears that Dr. Larr was speaking about the experience of acquiring a new strain of guppies.)

...you raise that particular fish or its fry, you notice that the color either changed or got paler. This is especially true in case of the yellow. You will find some of the half-black yellow parents, an orange as it were, from which the tails (some of them) look almost butter yellow. Then as you raise them yourself in your tank, you know that they become fainter and fainter and fainter until finally it is yellow occasionally but, it is now a yellowish-white. So the question looks like "are you missing something in the water?"

This prompted a lot of experiments you will remember one time I mentioned, while speaking up here, that Vitamin A (retinol) added to the water seems to help a guppy produce color.

We carried this to further extremes with some beautiful work which was done by a friend of mine at the University of California. Using radioactive phosphorus as a tracer, he started a culture with some of the vitamin compounds where we could put radioactive tracer in the molecule itself, put the new vitamins in the water, and after several days take the fish out and study them radioactively and see if they had absorbed that vitamin. We were surprised they had not. It immediately prompted the question, "Why didn't they?"

Well, the first assumption here is that ordinary guppies do not drink water - even though they live in water - they don't drink it. It's true they get water when they eat their food, but this is a very small amount of water because they have in their throat a little section that will grab a bit of food and squish the water away from it before they swallow. The reason is obvious. Because of the water balance problem in a guppy - and you know what that's called after you get a guppy that's all puffed up with scales sticking out. He cannot drink that much water simply because he cannot urinate that much water back out. So he does not take it in. This means, then, any molecule that is too large to diffuse through the cell wall of a guppy cannot enter the guppy unless he swallows it.

We went one step further. If you treat a guppy with a mild solution of phosphoric acid, it will destroy the mucous membrane all over the fish. It is a very difficult and very delicate

operation because if you get it on its gills you will kill him immediately. But, if you simply stripped him of his mucous membrane, we noticed, again using the radioactive tracers, that he could begin to absorb a small percent of the material we put in the water.

But obviously the barriers are not only the cell wall but the mucous membrane on the guppy itself. This is where we get, and it's sure all of you are aware, all kinds of diseases. If a guppy injures himself, if he scrapes that mucous membrane off, then the underlying set of cells are wide open to infection or are wide open to the absorbing of something you want the guppy to absorb.

Well, so we then started after this problem of what makes a guppy color. We immediately started adding all kinds of things to the water - ordinary things - not chemical coloring agents, not dyes, not things like paprika, not things like beet juice, not things like animal eyes - but those things that are required in the various molecules that give a guppy color. One of the most interesting to play with is, of course, melanin; and one of the very tricky things in the formation of melanin is manganese. This gives us something to play with. What could we feed a washed out half-black guppy that would make his melanin very black so he would then be the dark half-black that we normally see or that we would like to normally see?

Well, we found all kinds of variations and results in those fish that did not show an increase in the intensity of black color due to the presence of manganese. We started taking sections to see how thick the mucous membrane layer was and, sure enough, that was the key. Those guppies that have this mucous layer absorbed these molecules more readily than those that have thick ones. It's undoubtedly a genetic trait - the thickness of the mucous membrane, but it is also a trait that is due to environment.

One of the things that Dr. Hillier found out very quickly was that a guppy who was raised in water that is changed half every day from tap water doubles the size of his mucous layer because of the chlorine in the water. He swallows it to protect himself. Because, when water is changed half each day with distilled water totally free of everything, the mucous membrane layer stays the same thickness.

Now this surely brought out another interesting point. What happens when we replace water in a guppy tank with water directly from the tap? We know, of course, you'll be getting all kinds of crazy things but among them you're getting chlorine. So this is going to affect the guppy in some way. It's going to, first of all, apparently increase the thickness of this layer and thereby make him more resistant to many, many things. This is probably one of the reasons why many guppies raised this way have very few diseases. But it also plugs up the door through which we want to feed this guppy something. So then we started thinking - okay, if the organic metallic compounds are too big for the guppy to take in

through his system, and he is not going to drink enough water to make it worthwhile, let us go to simple metallic compounds whose molecules are small. We got some very good results.

I have a little list here for those of you who would like to try it. It's a very interesting little series but, here again, we found variations. Some varieties colored nicely - other varieties, maybe a similar strain, did not. We started to investigate what was the difference, believe it or not - environment is the change that has to be looked at carefully.

In those tanks where plants are growing, where the water is changed a minimum amount, the coloring enhances in the greatest. Why? Again using radioactive tracers, we found the obvious solution. If we really stop to think about it, I think one of us would come up with it. In the old-fashioned balanced aquarium, remember way back when we talked about that, you had plants and snails and fish and the whole bit. Also, in that kind of a system, are all of the microorganisms - ammonia, potassium, sulfide and so forth. Parasitism can take these metallic elements out of the water very fast, if you know how a parasitism works. He's a liver-shaped animal. He has an opening which is like a mouth and he has what is called a vacuole. He simply sucks water into this vacuole and closes it off, and if something is alive in there he eats that; but he will also absorb all of the elements that are in that drop of water. So, he absorbs them and grows and eats his? The guppy! So we deliberately feed the parasitism this element in a separate aquarium and feed them to guppies in distilled water. They colored beautifully. Where we just simply raised the guppy because it distilled water with ordinary foods, they were much paler. So you see, we have a real complex cycle going here.

While I wouldn't like to have to admit that to get the best out of a guppy colorless we're going to have to have proper balanced aquariums with plants and snails and everything else, this old thing of what the guppy is eating between the times that you are feeding him - namely the microorganisms that are living in his environment - is extremely important.

This element was arrived at literally by hit and miss, because some of these things are poisonous. I'm sure you will appreciate the following:

- 2 grams of manganese sulfate
- 1 gram of nickel sulfate
- 1.5 grams of potassium bitartrate
- 1.1 grams of copper sulfate

Dissolve in a quart of water; three drops of this liquid is placed in ten gallons every two weeks and so on. If you have plants in the tank and therefore more microorganisms swarming around, three drops in ten gallons every ten days. Now when you change water - let's assume for a moment you do not have plants - when you change water, keep track of it, and to maintain this kind of a balance you

* LIVER-SHAPED editor's note: Parasitism is not liver-shaped. Perhaps the speaker said "liver-shaped."

will have to know how much you take out. I want to warn you about this. There is one of these elements that some is good and you might think lots is better - NO WAY. Six drops in ten gallons can be fatal, and CAN be fatal quickly. Very likely the biggest problem is the potassium bitartrate. It's a very toxic substance, unfortunately. It is a source of potassium and chromium that the guppy can easily use to make all the rest of the colors that he plays with. So as you take, let's say five gallons out of a tank, don't add half of the dosage back unless you're going to do this cleaning only every two weeks. You're going to have to arrive at a balance and you'll have to do it by experimentation. Incidentally, greens colored the fastest. It was amazing how intense they got. This simply is that you are now giving the guppy some of those metals that he might not be getting in the food. This is because a lot of our fish foods will list all of these metals but - what form are they in? This is a problem. Sulfates are easy to absorb. They can handle it fine. As I say, potassium bitartrate is very easily absorbed and is deadly poison to a fish. It will make you all water-colored if you get it on you. I would not suggest you add it to your coffee. I don't know what that will do to you. You know that copper sulfate is poison to guppies and you will notice that that is the least amount of material you're adding.

Unfortunately, if you go to buy these things, they come at the supply house, you end up with bottles the size of which you'll use maybe as much as you can get on the tip of a small knife. So, if you're interested in trying this, I would suggest you pool your resources and not spend a great deal of money for four bottles of stuff you're not going to use in your lifetime. So judge accordingly. But also keep in mind that it is the in between best, these microorganisms, that are extremely important to anything that you want to get inside of a guppy.

We tried some experiments that are not quite complete. We tried some experiments, however, in which this material was added to the salt water used in raising baby brine shrimp. The baby brine shrimp are eating things. How much would they absorb? If the baby brine shrimp are raised in a large container that is aerated and they are actively eating - baby brine shrimp, you know, live for several days on their little egg sacs. Once that is gone, they start eating and they eat microorganisms. Your books will tell you to feed them brewer's yeast and this kind of thing. Great! Yes, they will even grow. But, they will also get rid of almost all of the metallic elements that you need to have inside them.

I don't know any easy way around it other than simply adding this to the water and trying to cut down on the percent of chlorine in the water that you are adding to your tanks, because the chlorine added to the tanks kills the microorganisms. In one way, of course, that's good because this gives you some control over your fishes' health. I mean, really, if you stop and think - if you change water in a guppy's tank quite often with water that has chlorine in it, you are killing off microorganisms and you are almost growing that

guppy in a sterile condition. The chlorine that is there is acting as a killer for anything else in the water and of course the guppy itself if it is strong enough. So, if you want to do this and do this as an experiment, I would suggest you only use aged water or boiled water to get rid of the chlorine.

Four ordinary water has a lot of these things. For instance, we did not add calcium here because I doubt if there is a drop of water in California that is not full of calcium. We didn't add magnesium because there is probably not a drop of water in California that is not full of magnesium. The same goes for sodium, potassium, as well as other kinds of things. We did enhance potassium with potassium bitartrate because potassium bitartrate is a nice molecule for a fish to handle. But exactly how these things are used by a fish is way too technical to go into. But, I'm sure you can imagine if you were making a particular molecule that is actual tetraodon (Ken's notes tape garbled these last two words) which is one of the blue colors - he has to have this structure in that molecule. Well, he can get it there once it is inside the guppy and that's how you have to do it.

I'm very curious - most of the people I've been talking to about the alcohol blocks that came out about a year ago got the same kind of results we were getting when we were adding African violet food. Some people had good results. Some people decided they could tell no difference at all. I think - here we have this problem of how thick the mucous membrane is on the guppy. So, remember, anything you add to the tank that you want the guppy to pick up, you're going to almost have to get it down his throat somehow because he is well protected from anything coming in through his skin. His mucous membrane stops at the cell walls of the epithelial layer.

So the easiest way, of course, is to put him in a tank where there is some algae. Put him in a tank where there are some microorganisms so that they can gobble these things up so that he can gobble up the microorganisms. I'm quite sure, from the results we got from outdoor tanks, that this is exactly what's going on. There are enough microorganisms in the tank outside, tanks exposed to all kinds of stuff - dirt blowing in, droppings from who knows what flying over, so they are getting all of those peculiar organisms. Microorganisms are eating them, guppies are eating the microorganisms, i.e. you have a bright-colored guppy because he was grown outside.

So remember, those guppies, those that we have here today, are growing at home in sterile conditions as far as chemicals are concerned. On the vitamin side of this thing, as I mentioned earlier, you simply have to rely that the vitamins he needs are in his foods. Most of the vitamins are too unstable when they are added into the water. They start to oxidize, altering form, and the guppy can't use them even if he would happen to swallow a

worthful of it. The microorganisms, of course, break the vitamins down. They start breaking it into something they can use. Now the guppy can use these fragments if he gets enough of them of course. But in these matters that we're talking about, we're talking about in the guppy molecule itself very, very fractional parts per million. I mean we're not talking like he's got to have a thousandth of that, we're talking a millionth of that is what makes the difference. So, as I say, don't exceed this or you will be in trouble. You can kill them very fast.

I hope, as we go along, some of you will try different experiments with the water conditions that you've got. For instance, one of the gentlemen in Colorado that was doing some work along this same line - I asked him to try some of these to see if he could get duplicate results under an entirely different set of water conditions. He did. He found that he got the best results, now I'm not sure if we're dealing here with a psychological thing or not, but he felt he got the best results if, in addition to these, he had a rusty nail in the aquarium. Well, certainly iron is required in the guppy's diet, but, here again, water is coming into your aquarium through iron pipes like and and, if you run a spectrograph on your water, you've got iron in it whether it is rusty looking or not. But I suspect, since he is rather an emotional type, he felt he had to have a rusty nail in there to make sure there was some truly iron in the aquarium. So whether or not that will add to your guppy's color I don't know. I personally doubt it, because I think there is enough iron already there. But certainly these other ones and especially chlorine, it's an amazing material and is absolutely necessary.

So I'll leave a copy of this with someone here so you can try it if you want to. I will assure you that your black guppies will never look blacker, your blues or greens will never look bluer or greener.

You can go the other route. Take the guppy that has been growing in your water that you use all the time. Put him in a small aquarium where you're changing the water, a small bowl - let's say two gallons - where you're changing the water every day with aerated distilled water and, if you will watch carefully under the same lighting conditions, as time goes he will get paler, and paler, and paler because you are leaching him out just as if you were flushing out a wash rag. Then, after you get him down to where he is no pain and you're not even sure what he was when you started, if you will add a few drops of this. In about ten days he will be right back where he started from. Especially if there are a lot of microorganisms in the water. If there are just a few, it will take longer. The more of those that there are, the better.

For those of you who might like to raise perforations, which, incidentally, guppies love, it is not a difficult thing to do. You

can take separate tanks and simply give them an eyedropper full of, let us say, scraped-up paramecium every day. But if you have as many tanks as Dale (Dale Hartness) has, I can't imagine Dale running around with an eyedropper feeding. I don't know how many tanks now, with scraped-up paramecium. But, it is something to consider.

Here again, you have one of these same things, of course all of these colors are genetically controlled. The genes say I'm going to make this fish blue; but, if the building blocks to make the blue pigmentation are not there, even though the genes say I'm going to make it blue, he cannot possibly make it blue. It's just simply that. The genes say I will do it if you will give me the building blocks to do it with. If they are not there, he can't build them at all.

It would be very interesting to see some of our parakeets that were treated with this material to see where they would go. How many of our parakeets, the soft, beautiful pale colors (hence the name pastel), how many of those are due to environmental conditions having a lack of building blocks to make pigment and how many of these are actually dictated by genetics. It would be interesting, and on that subject we have absolutely no guesses at all. But I know on those that we tested, which were red, blue, green and half-black, the difference is startling. As always, you always do these kinds of tests by splitting up groups of brothers so that you know who's who, so you're dealing with the same kind of things. The results all the way down the line were very, very fine.

If you want to play this direction, if you wonder whether or not your fish is getting the right vitamins, check your foods. It's not to be in the food or he will not get it. The vitamins molecule is too big unless he swallows it. The steroids, especially those particular ones, have very small molecules and he can get those but he will get them better if he eats them via another animal. So give it a try and, if you have washed out supplies, I think you will be very surprised at the results. Thank you very much.

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Parachanna mboia 20 (Joanne Norton)
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Parachanna mboia 16 (Joanne Norton)

Ameca splendens

of the Family Cichlidae from Mexico

by Dick VanIant

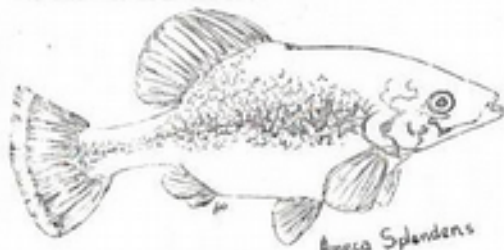
(Reprinted, with revisions by the author, from FISH TALKS, Greater Iowa Aquarist Association, January, 1975.)

Ameca splendens, that's the name of the newest livebearer, and, man, what a fish! It's about ten to three inches long and it looks like a midwestern brook trout. The male has a yellow fringe on the very end of his tail. I was able to get 10 from a friend and I must admit I knew nothing about them. At this writing, I still know very little. They are a fast-moving fish and the female has a lot of bright spots on her body that make the silver background just seem to glisten.

The first brood I had was only 11 fry, and I thought that from the size of the fry that she must have had them very tightly packed in her body because they were about three-quarters of an inch long at birth. You can imagine my surprise when I saw the size of those juveniles. I asked my friend, Harry Oiler, what I should feed the new fry and he answered, "baby alligators." When I saw the size of the fry I know why he said that! You can imagine my amazement when the second female had 25 babies! The size of the fry suggested that the female should have been the size of a large swordtail to have that many babies.

I might mention at this time that the first female I took out right away and put her back with the male/ide next morning. She is no longer with us, but the second one I put in a tank by herself and she and the fry are doing well. They do not carry sperm over like mollies, swordtails and guppies.

The Mexican government restricts export of them so they are a little hard to come by, but nevertheless a very beautiful fish—they should make a good show fish.



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(Encrypt, on *Ameca splendens*, from a letter by James E. MacGowan, reprinted from FISH FANTASIES, Columbus, Ohio, March, 1976.)

But now on to the "bad guy" department, that is, of course, your peripatetic Journalist Ian Froom, who in the December FISH FANTASIES apparently is attempting to dress himself of his pen name, "Dirty Ian." Ian really isn't a wholly rotten sort, and I've spent some enjoyable evenings trying to talk some sense to him. It was bad enough when his poor taste (apparently located in conjunction with those cheeks most distant to his cerebral cortex) caused him to erroneously assess his own stocks of *Alphapetichromis* as more colorful than my own. Such hereby I could normally ignore considering the source! However, when he makes one of my favorite fish - the magnificent butterfly goodeid, *Ameca splendens* - and attributes erroneous observations to myself concerning their "ferocity," then some rebuttal must be forthcoming.

I have never to anyone said that the butterfly goodeid is ferocious--nor have I ever housed them at home with swordtails! It would seem that Ian in his deluge may be becoming characterized of the blotter syndrome so characteristic of woman folk-- the ability to soak everything up and get it all backwards!

The butterfly goodeids do not exhibit any belligerency to any fishes that I have ever seen them housed with. I do not even bother to isolate gravid females from the stock tank since adults which are well fed do not select their own juveniles. All goodeids have formidable dentition, so do not expect starving goodeids of any species to manifest good behavior. But, please, do not deprive yourself of the great pleasure of owning these fish because of a statement I did not make!! In conclusion, I'd like only to say that the most common cause of death in goodeids, and I'm sure the so-called "plague" to which Ian attributes his goodeid losses, is old water. Goodeids simply cannot long tolerate water of lowered pH with elevated levels of nitrogenous wastes and bacterial pollution.

Mix and Match

by Charley Criss

(Reprinted from TROPICAL TROPICS, Indianapolis Aquarist Society, November, 1976.)

A couple of months ago, I was fortunate enough to be able to spend a little time with Mr. Paul Letelski. Letelski is justly famous regarding fish both professionally and in the hobby.

Anyway, as an aside after seeing my fish room, Paul suggested

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I might like to combine some of my goldfish and *Jullidochromis*. He said that they were both about the same in terms of aggressiveness, etc. He said the julies would hang around in the bottom ten percent of the tank and the goldfish could have the rest of the tank. I, of course, allocated *Jannina pleuro* as they spend a large portion of their life pretending they want to grow up to be piranhas. *J. pleuro* have a track record of being very nasty and are most willing to take on larger and often thought of as rough customers.

My first effort was to combine *Acanthopoma splendens* with *Jullidochromis* *quillens* in a 70 gallon tank and it worked out just as Paul Loebelle had said. The fish got along with each other well and suddenly I noticed twenty gallons ahead and my 70 gallon tank looked better than I ever thought it could and was much more interesting to watch the actions and interactions.

I was surprised to see the big fish get along so well with each other. I was very pleased to see baby *A. splendens* show up and hang around with the julies. I hope to see what happens when the julies spawn. Since the pair had spawned about a dozen times, I assume sooner or later they will.

I later got what I assume to be a pair of *Jullidochromis* *quillens* in a 40 gallon tank with *Acanthopoma splendens*. Same as with the *A. splendens* and *J. pleuro*.

It appears, to my way of thinking, that this combination has no adverse effects on the fish and, in fact, benefits them. The fish are in a larger tank, are more active and alert, and the fish get the added benefit of getting more attention from me and are treated better.

For years we have seen the advantages of a tank of different species of rift lake cichlids being housed in a large tank. The fish not only add variety and make the tank more pleasing to look at, the reproduction is not at all adversely affected. I realize fish from Lake Tanganyika and Malawi don't normally hang around together but they seem to do well in my tank. For years there seemed to be some fish that normally slept, but, with the exception of angels, cichlids weren't slept with non-cichlids.

I will grant you that mixing *Cichlasoma* *ocellatum* and *ocellatum* won't work out but perhaps some other odd-ball combinations will work out for you.

From James W. Atis Here is the very brief sketch of the great Cuban naturalist, Felipe Poey, taken from David Starr Jordan's two-volume volume upon "Guide to the Study of Fishes." Poey was an excellent ichthyologist, but he also was an ornithologist,

malacologist, mammalogist, etc. I think it is appropriate that the readers of *Hydrobiologia* become acquainted with him.

"The fish fauna of Cuba has been the lifelong study of Dr. Felipe Poey y Aloy (1799-1891), a pupil of DeClerk, for a half century or more the honored professor of zoology in the University of Havana. Of his many useful papers, the most extensive are his "Memorias sobre la Historia Natural de la Isla de Cuba," followed by a "Repositorio" and an "Iconoclasico" in which the fishes are elaborately catalogued. Poey devoted himself solely to the fish fauna of his native island, in which region he was justly recognized as a ripe scholar and a broadminded gentleman. A favorite expression of his was "Cuba naturalista, je no cito por separado lo mio cosmopolita."

* * * * *

Dr. Atis also brought attention to the March, 1977, issue of *Hydrobiologia*, which contained an article, "Felipe Poey of Cuba and his 'Memorias'" by E. S. Jacobsen (American Museum of Natural History). Poey's very early account of livebearing fishes is discussed in the following excerpt from that article:

"In his essay on the small freshwater fish of Cuba (date 1841-1855 inserted by Dr. Atis), he writes thus somewhat (in 179, 17): 'If we consider the small size of these fishes, we might be inclined to look upon them with contempt. But if we realize that they live in the lakes, creeks, and ditches of our fields and gardens -- which they adorn and enliven with their presence at the same time as, by a decree of Providence, they are purifying these waters by eating the slime and digesting the minute bits of matter -- we must look upon them as useful little fellow creatures and companions who are as pleasing as they are innocent. Whoever contemplates nature will not disdain these tiny fish in their games, their love affairs, their little wars, their gentle evolutions, their flashing and rapid flight. At times they come together in numerous clusters, at times they swim about one by one just above the bottom and into which they plunge at the slightest sign of danger and hide in the pulled water. Sometimes they come to the surface to capture the flies and ants which other stragglers and other gases have precipitated into the liquid element. Or else they swallow the seeds blown by the wind and dragged along by the current. While the fascinated onlooker follows the thousand twistings and turnings of the fish, he is also delighted by the green, golden, and purplish reflections given off by the glittering scales. Happy indeed is the man who above his crystal fountain with them, and in their company forgets the burdens of life.'

"There is charm even in Poey's instructions to fish breeders: 'All the species of small freshwater fish are viviparous. You can, dear reader, if you like, breed them in a transparent bowl in your own home and see them bring forth the fruits of their work. You

will see the recently emerged young move around immediately with ease. You will make note of the day of their arrival, and every night you will record their growth in millimeters. You will soon note that the males are considerably retarded in their growth as compared with the females. You will see how day by day the abdominal area of the female becomes more obese. You will write down the first day that they give birth. How many children [sic] were born? Are you sure that the mother hasn't already eaten some? It is safer to remove the young to another glass bowl. A month later you will see the mother give birth for a second time. If at first she produced 30 young, now she delivers 50. And she does this virtuously, because if you listened to my advice, you will not have introduced a male into the container during the last transfer. There is another delivery the following month and you will make a note of how long these continue. If you don't size of the mother, you will finally count 200 young in one delivery. Now we should like to find out if the females who make those deliveries are as virtuous as the mothers; or if they, like Séamus's apidae, remain fertilized for also generations. This is not likely, but you might perform the experiment anyway. And to be certain, be sure to isolate a female from the moment of her birth." (Egg.)

TRADING COLUMN

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NOTE: *Aequidens splendens*, 6 unsexed fry, \$15.00
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NOTE: *Heterandria formosa* (need females only)
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NOTE: *Thalassoma panamense* *reticulatum* *gracile*
Brachygnathus rhomboides

TRADING COLUMN, CONT.

John Kamen, 9770 Glenelder Ave., Vienna, Va. 22180.

NOTE: Back issues of aquarist magazines
 1971: any before 1972, Aug.-Nov. 1972, Feb.-Dec. 1973,
 Jan.-Dec. 1974, Jan.-Dec. 1975, Nov. 1976
 Freshwater and Marine Aquarist: Feb., 1970
 any other old aquarist magazines or books

NOTE: 1976, April-Dec. 1976, 75¢ + 15¢ postage each, or trade for above

This is for you to think about using for A.M. It makes interesting reading and has to be one of the first records of livebearers exhibited in the United States. **MSD 200062P.**

From *The Aquarist*, October, 1972:

THE AQUARIUM EXHIBIT

by John Treadwell Nichols

The annual exhibit of the New York Aquarium Society took place in the American Museum of Natural History, New York, October 6th to 13th, inclusive. It constituted what is doubtless the finest collection of living fresh-water fishes which has ever been on public view in America.

The different breeds of goldfish formed a comparatively small part of the collection, yet some fine goldfish were shown and much admired by the visitors. The fan tails and grotesque telescope eyes of some of them, a monument to the breeder's art, never lose their interest, familiar as they become. To devotees of the goldfish it may have caused regret that the space allotted to these was limited by other forms, many of which are less adapted to aquarium culture, but most of us were glad to see the new things. Some of these less familiar fishes doubtless find favor chiefly because they are new; others are veritable living jewels whose popularity must increase with familiarity. The paradise fish with spiky, streaming fins have now become so plentiful in aquaria as to scarce merit mention. The beautiful Indian fishes of the genus *Tetraodon* with iridescent yellow, red, and blue colors, and long threadlike ventral fins which they wave so gracefully, call up visions of the mysterious, luxuriant tropical waters of that faraway land. The many species of iridescent silver and pearl fishings compel our admiration as they float in the still water of the aquarium. But no more attractive fish comes from the continent of Asia than the trim, active, boldly-marked *Rasbora*. Some beautiful specimens of *Rasbora melanostomus* were very attractive, but this species will scarcely find as much favor as the smaller, more brightly-colored *parva*, while *Rasbora daniconius* is a veritable living gem.

The fighting fish *Betta* were among the most interesting shown. These fishes are kept for fighting by the Siamese, pitted against one another like cock-fights. They build a nest, a mass of floating bubbles under which the eggs are laid and zealously guarded until hatching by the male fish. Such a nest was started during the exhibition.

One of the tanks contained a pair of mouth breeders, *Aplocheilichthys multicolor*, which carry the eggs in the mouth, and there were two allied species seldom seen in aquaria, but the African specimens which attracted the most attention were of the curious and beautiful butterfly fish, *Pantodon*. Several of this rare and interesting fish were exhibited, and it was a treat to the ocellists who visited the exhibit to see living specimens of it. They were generally lying inactive near the surface of the water and did not show off well. The species is more of a curiosity than one especially adapted to aquarium culture.

There were many small fish of the family *Poeciliidae* shown from Southern America, which bear their young alive instead of laying eggs, none other so beautiful as *Heteropoma boltoni*. Some splendid males of this species, their elongated serrated tails flashing iridescent colors, attracted much admiration. Specially spotted *Gambusia pinnatifida* was one of the most beautiful of the live-bearers, and a splendid male *Gambusia boltoni*, almost jet black with gleaming white eye, was much admired. The males of most of these species are brighter and often quite different from the females.

Several species of *Misgonyx*, not distantly allied to the live-bearers, were interesting, but *Misgonyx* fishes stayed too near the surface and the others were too sluggish to be aquarium fish of the first rank. Some very beautiful *Pomphlyx chrysoptera* from the southern United States were perhaps too large and clumsy to find general favor. The species of the Indian genus *Halbottius* showed to better advantage in a small aquarium. A number of species were shown.

On one table *Aplocheilichthys pinnatifida*, *pinnatifida*, *chrysoptera* and *pinnatifida* occupied adjacent tanks, beautiful all of them, but less beautiful than a tank of *guppies* across the aisle.

Numerous species of characins, small fresh-water fishes from southern America resembling our sunfishes, were very interesting. These fish are hardy, but less attractive than some of the more delicate kinds. On the other hand, the genus *Tetramodon* from the same regions are as beautiful and graceful as they are rare and interesting. They are quite unlike any fish from northern regions, resembling somewhat both shiners and catfish, with superficial resemblance in form and in the slender adipose fin in front of the tail on the back to the salmon. *Tetramodon* specimens, marked with red, and *pinnatifida*, with a black longitudinal stripe, were very attractive. An armored catfish (*Callichthys*), of which there were two or three specimens shown, had special interest for the naturalist, and two gobies (*Gobius*) were interesting because so seldom seen in aquaria.

A single specimen of *Phoxinellus* was shown. Its interesting black marking, activity and beauty make it a very attractive aquarium fish.

In a large tank at the end of the exhibition room was an African lungfish, an eel-like form with two pairs of feelers like fins. The snakes show they live dry up at certain times of year, and it then becomes dormant in the sand, dried out and breathes air. The specimen was shipped to the American Museum of Natural History, dry, in a lump of hard mud. When it arrived the mud was carefully softened and broken, and the fish readily took up aquatic life again in the tank and at once developed an appetite for fish worms.

The exhibition, being arranged especially for the tropical fishes which made up so large a part of it, did not contain many of the colder-water forms from Europe. It is only necessary to mention that the bitterling was on view. It was disappointing to some that more of our native fishes were not shown, but they had for consolation a splendid tank of red-bellied dace and some lively specimens of humped sunfish.

A special feature was made of young fishes, and a great assortment shown. The rapidity of growth of some of these raised this season, especially where they had been kept in outside tanks, was remarkable.

One striking thing about the exhibition was the variety of people it appealed to. It was of course of particular interest to the naturalist and to persons interested in aquaria, while the fishes, and their water-plant surroundings, made a strong appeal to all lovers of beauty and there were always children in the room admiring the pretty colors, interested by the whistlers of the striped Indian catfish, getting an insight into an unknown life below the surface of their ponds and streams, their imaginations stirred by seeing the sizzling perch and hearing of its exploits out of water.

The largest daily attendance at the exhibition was on Sunday, October 5, when 1317 persons visited it.

To the editor: I am writing to you concerning a great problem I seem to be having. The problem is that whenever I write to some members of your society concerning the exchange and purchase of fish I have very little success in getting replies and if I do get replies they nearly always say that they will not send any because of the cost even though I am willing to pay.

I would be very grateful if you could put me in contact with some members of your society who would consider sending some fish to me.

With white worms another problem has always been airtight which sooner or later permeates a culture. With polyfoam sheets, airtightness is less of a problem than with dirt. Keeping a glass cover on the culture also helps. It not only keeps moisture in, it keeps flying and crawling invaders out of your culture. However, if the cover fits snugly, you should use a wooden box for your culture, not some impervious material like plastic or glass. If a culture cannot breathe it is apt to "sour." Until the number of worms is built up from your starter portion, remember not to put in too much food, for this too can invite trouble.

If you heed the above warnings, Joe's system should soon supply you with plenty of white worms. Have at it!

