Growth Inhibiting Substance

by BOB SPARKS

Everyone who has raised tropical fish has noticed that the greater the number of fish in a closed system, the smaller each of them will be, all other things equal. Have you wondered why this is so? Did you notice that changing water helps improve growth rate?

In the early days of the aquarium hobby, many hobbyists felt that the older the aquarium water might be, the more valuable it was in substaining aquatic life. Today most hobbyists and scientists endorse frequent water changes as beneficial in a closed-system set-up such as the aquarium.

What happens if you put a particular fish in a 10-gallon aquarium and circulate water from a 20 or 30-gallon tank through this aquarium? Experiments show that the fish will grow at the same rate as if it were placed in a 30 or 40-gallon tank. The larger the quanity of water, within limits, the faster the fish will grow, even if it is confined to a small area, as long as the total quantity of circulating water is larger. Put two fish of the same species through the same experiment and discover that the growth rate is less than for a single fish of that species. "Crowding" is a problem than with growth rate decreasing with an increase in population. This is not surprising since all that has been done by adding more fish is to reduce the ratio of the volume of water per individual fish.

What would you expect if you put one fish each of two species together in a 10-gallon tank? Do they each grow at a slower rate than if they had individual 10-gallon tanks? Well, it has been determined that the two fish will grow at the same rate in either case. But place the two in a larger tank and their growth rates increase over that in the 10-gallon aquarium, again if all else remains unchanged.

Now we have a paradox. But we have not contradicted our statement that fish grow larger in larger volumes of water. It is just that fish of the same species grow larger in larger volumes of water, or to say it another way, the effect of the ratio of volume of water per fish is not interspecific. Within limits, and I make this statement with limited information available, many more fish can successfully be kept in an aquarium if several species are present than if only a single species is maintained.

There is a reason for this growth retardation. The reason is the presence of a material called Growth Inhibiting Substance, which is an organic waste excreted by the fish themselves. So far, this material has not been isolated in quantities large enough to determine its composition. However, it does accumulate in the water and the normal filtration methods, including carbon and ozone treatments, do not remove it. In smaller volumes of water the concentration of the GIS increases more rapidly than in larger volumes and has a greater effect on growth rate. Experience also shows that the substance is different for each individual species and that the GIS from one species has no retarding effect on the growth rate of another species.

It appears that the effect of GIS is not totally irreversible. That is, once the growth rate has been retarded by GIS, changes of water, or placing the fish in larger aquaria, will increase the growth rate again. However, the growth rate may never reach the level attained if the fish have never been stunted by the effects of concentrations of GIS.

There is currently quite a lot of activity occuring across the country, especially I think in the Midwest, to isolate and identify GIS. As we learn more of what it is, we should be able to better control its effect on our fish.

For purposes of this report, it is not necessary to know what the GIS is. It is only important to know that it is present and that its presence is the main reason for small fish in small aquaria. It should also give some inklings that something can be done to off-set its presence, even in small containers.

Changing the water, either partially or totally, will give the same effects as moving fish to a larger aquarium if changes are made large enough and frequently enough. And it is additionally surmised that the more frequently the water is changed, the less will be the effect of the GIS. Take the experience of the Trout Hatchery at Edray. The Trout are reared to good size in small areas, but a constant change of water is used as a stream of water runs into and out of the ponds or troughs continously.

There is little doubt at present in the aquarium hobby that water changes are beneficial. The one big question now is how much and how often should I change the water? You might expect the "how much" and "how often" to be different for each species. I will reserve comment on this aspect for the present.

I like to make whole water changes for all my fish as often as weekly or bi-weekly, and daily for most fry. I get acceptable results using this procedure, which currently is quite time consuming for the 70-75 tanks I use. You might like to vary the quantity and frequency of your water changes, but it is important to make these changes. I am a firm believer that the closer you are able to come to a constant change of water, the better your results will be in growing large, healthy fish.

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