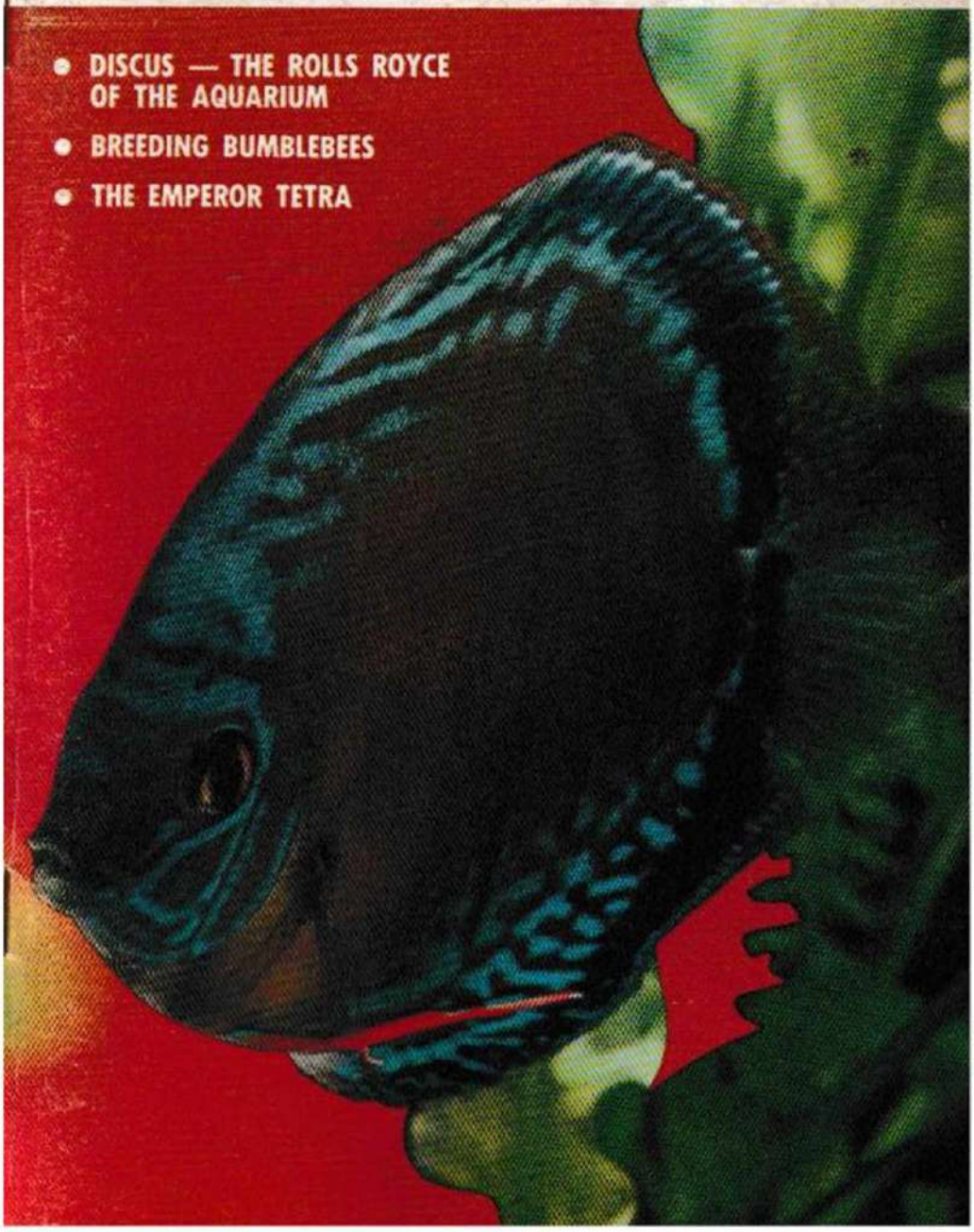
JULY, 1969
VOL. II NO. 9

THE AQUARIUM

British Isles 4/2 DOMESTIC 50¢

- DISCUS — THE ROLLS ROYCE OF THE AQUARIUM
- BREEDING BUMBLEBEES
- THE EMPEROR TETRA



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THE AQUARIUM

founded in 1932 by Dr. William T. Innes

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cover

Andrey Roth used a motorized Nikon F with Kodachrome Film to capture this beautiful blue discus. (Additional credits appear on page 69.)

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Discus-The Rolls Royce Of The Aquarium

by
BRAZ WALKER

AMONG ALMOST ALL SUSTAINED or prolonged endeavors of mankind, there are names which to those involved in a particular pursuit denote quality and station. "Flashes in the pan" may, upon occasion, momentarily steal the limelight from them, but their exaltation within their respective fields seems somehow to persist. As the name Rolls Royce is to the automobile lover and Leica is to the photographer, so is the discus fish *Symphysodon* and variations thereof to the aquarium hobbyist.

Possessing many of the traits of their cichlid relatives, the discus species also have an elusive delicacy about them and, as with other royalty, they can be quite temperamental concerning conditions and surroundings. This is aside from their beauty of form, stature and coloration—perhaps a part of the fascination for to keep discus successfully requires a degree of skill and patience more than for ordinary fishes and to consistently breed them and raise their young is proof of any aquarist's pudding. *continued on page 44*

BREEDING BUMBLEBEES

by J. TRUSSO

My first enthusiasm for bumblebee gobies *(Brachygobius xanthozonus)* was dampened by the reports that I had heard and read about them. They demand live food (I'm told they will occasionally accept frozen food), exacting water conditions, and they are fin-nippers best kept to themselves. Despite these problems, I decided to try them.

A four-gallon, all-glass, aquarium filled with local water (80 ppm hardness) with one inch of gravel as bottom covering was my starting set-up. Pieces of slate were arranged to provide "caves" and retreats, and water sprite *(ceratopteris thalictroides)* was planted fairly thickly. Since they like brackish water, one teaspoonful of kosher salt was added for each gallon. An outside filter was connected and a 40-watt incandescent light was suspended about eight inches from the aquarium surface. After this environment was established, I went to purchase the fish.

Because of their food requirements, bees are nearly always starved when sold. They are one of the most abused fish in the dealers' tanks. In the several years I've been a hobbyist, it has been my experience that few dealers properly inform their customers about bees' requirements. However, I found four healthy, but hungry, bees and took them to their new home.

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JAVA MOSS

By WILLIAM A. TOMEY

DURING THE PAST FEW YEARS, three kinds of mosses, mostly rapidly growing plants, have found their way to aquarists. These mosses fall into two groups: the leafmosses and the livermosses. From the former we obtain *Vesicularia dubyana* (the most important of them all), known popularly as "Java moss", and the stumpcover moss, *Amblistegium riparium*. From the latter group we have only the livermoss, *Marchantia polymorpha*, a very slowly growing dwarf plant.

The leafmosses grow best on rocks or the wood in the aquarium, underwater as well as above water in moist surroundings. They are, in fact, one of the most easily kept aquarium plants. Our concern here will be with the Java moss, *Vesicularia dubyana*.

The origin of the Java moss is Java, Ambon, the Sunda Islands and other islands of the Indonesian archipelago and the Philippines. It was only about 35 years ago that this small aquatic moss was discovered in the Zoological Institute of the University of Vienna, among a collection of plants sent from the Botanical Garden in Bogor, Java. For many years, all attempts to identify the plant scientifically, failed. It was only in October 1957 that E. B. Bartram of the Academy of Natural Sciences in Philadelphia succeeded in determining the species, although a few months prior to this Dr. J. Poelt of the Cryptogramic Herbarium in Munich, Germany, had recognized the genus. A. Stejskal, the Austrian who discovered the moss at the Institute in Vienna, propagated it by means of the leafy branches of the shoots and distributed it under the name of Java moss.

So much for history. In the aquarium, the moss grows well under lighting conditions ranging from shaded to bright. As the moss grows on wood, rocks, cork, etc., there is no problem with the selection of the substrate in which to grow the plant. It can withstand temperatures of from 50 to 86°F. The plant itself consists of branched stems from 1 to 6 centimeters (roughly ¼ to 2½ inches) in length, on which can be found very tiny leaves. Since this produces a very dense appearance, Java moss can be used to hide imperfections in the aquascape, e.g., as a rimming plant around the edge of a flowerpot to conceal the leafless portion of the stems of another plant. With a piece of thin nylon fishing line, for example, we

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*A common emperor tetra, **Nematobrycon palmeri.** Mr. Bookbinder's black strain produced fish with all blue-black bodies, highlighted with blue and green highlights.*

THE EMPEROR TETRA

By MICHAEL BOOKBINDER

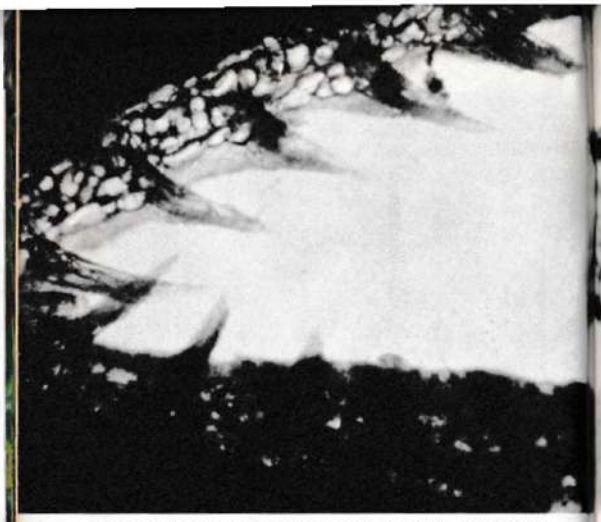
ABOUT THREE YEARS AGO, I started working with the beautiful emperor tetra. It was very difficult to purchase breeders at that time, so I had to buy immature fish. Several months later, I found several pairs of adult fish from two different sources and was on my way. I did not attempt to breed them at first, but spent another two months conditioning the fish. By this time, the original young emperors were approaching breeding size. It was at this time that I noticed that one of the mature females was colored differently from the other fish. She lacked the distinct stripe that the others had, and instead was covered with iridescent green blotches over a darker-colored body.

I paid little attention to this female at first. She was set up to spawn the same as the others with normally colored males. As the months went by I noticed that in several of the spawns there were one or two very dark fry. All of these almost-black fish were saved until several dozen were accumulated. Then came the long wait (about seven months) for

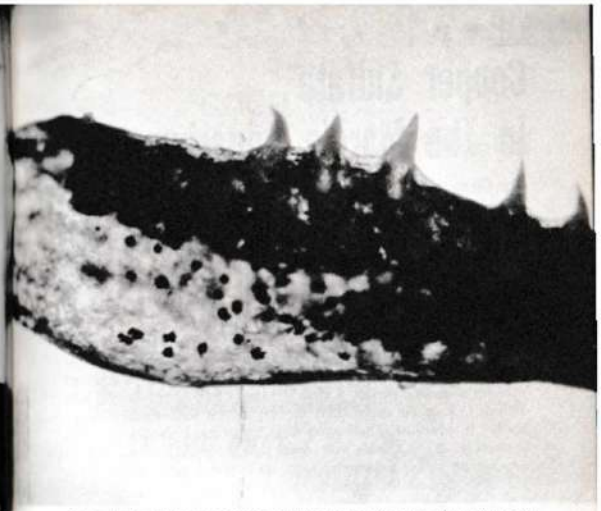
The female emperor tetra lays her eggs in plant thickets such as Java moss. (Story on page 9)

them to mature. All of this time, the strangely colored dark female was still producing a few black offspring in every spawn. The first blacks finally neared breeding size. Their colors were beautiful—shimmering blue and green highlights on blue black bodies. They retained the brilliant green eye of the original emperor tetra, however.

When these black emperor tetras were of breeding size, the darkest were selected for spawning. One tank was set up for the original female to be bred to several of her sons. The other tank was used for brother-to-sister matings of the first generation of blacks. In both cases, the young looked exactly like their parents. Now, after four generations, the strain



A closeup of the throat region of the emperor tetra, showing that characins do have sharp teeth!



The underjaw of the emperor tetra, showing the needle-sharp, dagger-like teeth.

breeds almost one hundred per cent true. There is, however, still room for improvement. In one spawn a fish appeared with a solid black tail. It turned out to be a female, and now is being bred back to one of her brothers. In another spawn there was a fish with an unusually long anal fin, and the young from this fish are being watched closely.

About a year ago a fish called the "rainbow tetra", another *Nematobrycon* species, was imported into this country. They lacked the color of the species that I had been working with, *Nematobrycon palmeri.* The big difference between the two species was that the male of the rainbow tetra had a red eye. I crossed both the regular and the black emperor tetra with the new fish. Fry resulted from these breedings but at this time I do not know if they will be fertile since they are hybrids. The young are colored more like *Nematobrycon palmeri.* No blacks appeared in the first cross, but they look like that they will be larger than either of the parents. If the hybrid young prove to be fertile, they will be inbred

and I hope that there will eventually be some red-eyed black emperor tetras.

I have found the emperor tetra to be a very hardy and disease resistant fish. They are fed mostly live food but will take dry food readily. The most important factor in conditioning fish for breeding is a varied diet; tubifex worms, adult brine shrimp, daphnia, etc. The young are able to feed on newly-hatched brine shrimp, which makes them extremely easy to raise. The percentage of fry lost is practically zero.

Aged tap water is used for spawning. According to the local water department, the water has a hardness of 21 ppm and the pH is about neutral. Several pairs of fish are placed in a 20-gallon tank and are left overnight. Spanish moss is used as a spawning media. The best temperature for the emperor tetra is about 75 degrees, raised to 80 degrees for spawning. If given plenty of room and frequent feedings they grow very fast, and will be full-grown at seven months of age.●

Copper Sulfate In The Marine Aquarium

By GLENN Y. TAKESHITA

IN THE PAST TEN YEARS OR SO, the marine fish hobby has had a tremendous growth in the continental U.S. and even here in Hawaii. With this tremendous growth has come the many problems associated with the keeping of marine tropicals in aquariums or a closed, recirculated system. A great part of these problems have been with disease and the use of copper sulfate, and it is about this compound that I would like to expound on in this article.

From reading many of the previous articles that deal with copper sulfate in the marine aquarium, hobbyists are often misled to think that it is quite an easy task to keep the free copper concentration at a desired level for a desired period of time. Contrary to this belief, it is very difficult to keep the copper ions in solution in a marine tank. Why is this so? It is because in salt water there are so many negative ions that combine easily and quickly with copper ions to form precipitated copper compounds. In this precipitated form, the copper is no longer active to kill off the undesirable organisms that are causing the disease problem. This is why many hobbyists using copper sulfate for disease treatment in the marine tank have been unsuccessful in treating the marine tropicals. In most of these cases, the concentration of the free active copper ions was too low to control or kill the organisms causing the disease.

Do the precipitated copper compounds cause any harm in the marine tank if they are not removed? My answer to this question is "yes".

For example, in a marine tank that has bottom feeding scavengers, it is a fact that they take in enough copper in the precipitated form while feeding to cause them to die. In this case, it is a direct copper toxicity problem. Also, in very poorly maintained marine aquaria, if the pH of the water drops down low enough to be slightly on the acid side, some of the precipitated copper will go back into solution which in turn may cause a problem. Therefore, I believe that when a marine tank is treated with copper, a great percentage of the precipitated copper should be siphoned out when it has settled out on the sand layer. If this siphoning procedure is followed everytime you use a copper treatment, the chances for the precipitated copper to cause you a problem is greatly reduced.

The next topic of discussion is a very interesting one: What is the recommended copper treatment dosage in a marine aquarium? This is a very "loaded" question from the standpoint of a scientist. For actually there is *no* one copper concentration that will be effective in controlling

all disease causing organisms. Also, each individual specimen even within the same species has its own tolerance level for copper. The right concentration of copper for treatment will depend on the specimen itself, the species and the organism causing the disease.

There are other very important variables that will limit or enhance the toxic properties of copper. These are as follows: (1) temperature of the water, (2) hardness of the water, (3) turbidity of the water, (4) carbon dioxide concentration of the water, (5) presence and concentration of the following elements, radicals, and compounds: (*a*) magnesium, (*b*) phosphates, (*c*) chlorine, (*d*) zinc, (*e*) cadmium, (*f*) mercury, (*g*) pentachlorophenate, (*h*) sodium nitrite and sodium nitrate, and (*i*) cyanide. In other words, the toxicity of copper to aquatic organisms varies significantly not only with the species, but also with the physical and chemical characteristics of the water. For example, in salt water, hard water will reduce the toxicity of copper by the precipitation of copper carbonate and other insoluble compounds. Further, copper and chlorine, copper and zinc, copper and cadmium, copper and mercury, copper and pentachlorophenate together act synergistically to increase the toxicity of each acting alone. On the other hand, sodium nitrite and sodium nitrate have been reported to decrease the toxicity of copper sulfate to fish. Also, copper has shown evidence of decreasing the toxicity of cyanide.

Most authorities who have written about copper sulfate treatment of the marine aquarium have recommended concentrations that I believe are on the high side. For example, Dempster in his monumental paper recommends a treatment dosage of 0·5 ppm Cu for at least 10 days exposure. He has also gone as high as 0·8 ppm Cu for a short exposure time to treat some very strong specie of marine fishes. Braker of Shedd Aquarium has recommended a 0·15 ppm Cu concentration for at least 10 days exposure time. Most of the others recommend an approximate concentration of 0·5 ppm Cu for an exposure time of 7 to 10 days. On the other hand, McKee and Wolf's recommendation in their text *Water Quality Criteria* set the threshold concentration of copper at 0·05 ppm for sea water. This is a much more realistic and safe concentration for a long exposure time for most marine fishes.

Although the recommended treatment dosages have been high, the reason why wholesale catastrophe has not occurred is because in most marine aquarium setups, the copper demand is very high. Therefore, in most cases after this demand is met, the concentration of the free copper ions is quite low, eliminating the possibility of a mass fish-kill. So in actuality, if you added one drop of a copper sulfate stock solution per gallon of aquarium water, which should have given you an end concentration of 0·5 ppm Cu (calculated), you might be actually getting only 0·1 ppm Cu (actual) for a very short time which is available for disease

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Societies at Work

By
HELEN SIMKATIS

MANY HOBBYISTS BECOME as involved in aquatic gardening as they do in fishkeeping, and our mail indicates that problems concerning plants arise almost as frequently as those relating to fish. Hank Bouma, a new member of the Calgary Aquarium Society, begins what promises to be a series of articles devoted to the culture of aquarium plants entitled *Are Your Plants Growing?* in the February issue of *The Calquarium*, published by the Calgary Aquarium Society. He commences by telling us something about plant types. The real water plant differs from the swamp plant (the latter, incidentally makes up a large portion of what we generally consider aquarium plants) in that it depends upon the water to hold it up and out of water it is limp. The swamp plant has structure sturdy enough to permit it to keep its shape out of water and normally has a well developed root system. Swamp plants grow slower than real water plants and do not require as much light. The author tells us that we can determine ourselves whether or not the amount of light our plants are receiving is too much or too little. Growths of algae on the plants indicate the light we are using is too strong and perhaps we are leaving the tubes on for too long a period each day. He explains how to lessen the amount of light the tubes give off by pasting strips of paper on them. Too much daylight can be filtered out by placing sheets of green cellophane on the side glass. He advises buying several species. Fast growing plants are best for beginners as they use the available nutrients faster than the slower growing swamp plants do. In the second segment of this series appearing in the March issue of *The Calquarium*, he lists some of the fast growing plants as *Hygrophila*, temple plant, and *Vallisneria* (Italian variety). Planting procedure is gone into, bottom media discussed, and plant combinations considered. One interesting point in this section is that a single species with a number of plants of another species does not do well. The species in the majority seems to retard the growth and well-being of the single plant of a different species. All in all, there is a great deal of fresh information here on plants that is derived from 27 years of experimentation conducted by the author. Certainly this will make good reprint material for editors of other bulletins to pick up and although the substance of the articles could be organized to better advantage, such criticism becomes carping when the wealth of information offered is fully appreciated. *The Calquarium* is an attractively laid out bulletin containing many original articles as well as reprints. Write to the Calgary Aquarium Society, P. O. Box 8118, Postal Station D, Calgary 2, Alberta, Canada for information regarding the society and its publication.

Aqua Jewels, published by the Aquarium Society of Broward County, and ardently edited by Doris Vilda, can be praised for providing a forum for all opinionated hobbyists, following the lead of the ADVERSARIA column in *THE AQUARIUM*. A number of hobbyists have responded to the *Dear Editor* section of this Bulletin, braving the possibility that their pet peeves and theories may take a shellacking to the extent that they may have to forego them. The forum also provides the less intrepid reader an opportunity to hear the pros and cons of any controversy and quietly form his own conclusions. To date tubifex, snails, growth of fry are some of the matters considered, and in the March issue we see a new topic rearing its precarious head, i.e., the value of the subsand filter, posed by Joe Carroll. Besides offering a forum where opinion and thoughts on the hobby can be aired, *Aqua Jewels* provides its share of stimulating articles by hobbyists from all over the country. In this issue W. L. Whitern F. Z. S. gives some constructive criticism directed at the "in-groups" who run aquarium societies in a piece he has entitled *Is the Fault with the Executive*. Specifically, the "fault" with which he is concerned is the "fluctuating memberships and the number of aquarium societies . . ." The bulletins he receives from all over the world reflect that the publishing societies from time to time are alarmed by the "lack of attendance at monthly meetings, failure to acquire new members and a general decline of interest by some of the older members." He then proceeds to isolate the causes for such failures experienced by societies and his probings lead him to executives who allow meeting time to be utilized for ironing out internal difficulties of the society rather than using such valuable time for the study of fish, discussion of problems, and through programs designed to hold the interest of the membership and to stimulate them into venturing into new areas of the many-faceted hobby of fishkeeping. He feels that bulletins are not used as efficiently as they might be in that new projects or proposals could be aired in their pages, alerting the membership in advance of what plans and objectives the executive body are considering, and giving the members an opportunity to express their views concerning them by way of letters to be read and considered at the next executive or board meeting. Decisions can then be announced in the bulletin and as a result, membership meeting time can be saved for programs devoted to the hobby itself. This is a thoughtful piece and should be read by every elected executive for the general improvement of society meetings as a whole. George Pinter has some wise words to say *On Overcrowding* in this issue directed for the most part at the beginner in the hobby. Many experienced aquarists, however, will read this and find himself relating to the predicament of the over-extended fancier. *Aqua Jewels* is a far-reaching bulletin and reflects an active and involved association. Write to the Aquarium Society of Broward County, P. O. Box 115, Fort Lauderdale, Florida 33302 for information regarding corresponding membership, etc.

There is an excellent reference piece on *Native Fish of Colorado* (a composite, Editor Ella Pitman tells us, developed from articles written in the past by Blaine Browne, Carol Honnold and Jim Christy) in the February issue of the *Colorado Aquarist*, published by the Colorado Aquarium Society. The Colorado hobbyist has a wide selection of species to choose from, according to this well-organized piece, should he or she be inspired to set up a tank devoted to native fishes. Available are two species of killifishes, dace are found in the cold, clear streams, and further south, *Gambusia* can be collected in the Arkansas River drainage. Darters, catfishes, and many species of sunfishes are present throughout the state, and in the high mountain streams the sculpin is found. For good measure, we are told, even an occasional eel shows up in the Arkansas River. Attention is given to the appearance and disposition of the various species and we are warned that the stickleback should not be included in a community situation. Maintenance and requirements of these natives are discussed and certainly the novice is alerted to where the differences lie in dealing with them and their tropical counterparts. Hobbyists who hanker to "go native" do not have to live in Colorado. Every area

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VIEWS AND REVIEWS

If ever there was reason for those who truly love wild animals to wholeheartedly support legislation such as the Endangered Species Act now pending in Congress (H. R. 6138-Representative John D. Dingell, 16th District, Michigan: The bill would empower the Secretary of the Interior to prohibit importation or sale or any animal, or portion thereof, that in the opinion of competent authority is in danger of becoming extinct, regardless of the country of origin of the animal.), the following account should be sufficient in and of itself.

In the Ruhr city of Bochum, West Germany, a restaurant owned by one Bernard Schuh currently offers such fare as roast puma or jaguar, and choice cuts from other big cats as well. The battle over Schuh's exotic menu is now raging in the letters columns of newspapers. Schuh, for example, has asked his lawyer to obtain an apology from the assistant director of the Frankfurt Zoo, who called the serving of puma and jaguar "barbaric" and "uncivilized".

"Nonsense", replies Schuh, who has won gold medals in West German cooking competition for his bear paw soup and turtle ragout. "People want to eat something special for their hard earned cash". Schuh, who said ". . . puma is tender and tastes something like veal, but jaguar has a somewhat wilder taste", contends the big cats are not in danger of extermination. In any case, Schuh argues that animal lovers should stick to their long-running fight with pelt dealers. He said he can serve 1000 to 1500 portions from five jaguars, and it takes five jaguars to make one fur coat. He considers the "tastes of gourmets" at least as important as women's demands for fur coats.

Schuh imports his bears, pumas and jaguars live. He refuses to divulge his sources of supply or say where they are slaughtered because he doesn't want animal protection forces to stage demonstrations. He has stated that he has no intention of changing a menu that features jaguar roast "Montezuma" with corn on the cob and banana rice for the equivalent of $4, and roast puma "Amazon art" for $3.25.

According to Schuh, business has increased up to 20% in his 50-seat restaurant in the few months he has been serving puma, jaguar and bear. "I have just bought 10 pumas and they are hanging in cold storage", he said.

Schuh, of course, is quite right. His restaurant demands are a drop in the bucket when compared with the senseless slaughter of rare wild animals for Milady's coats, handbags and shoes. Because these animals are not well enough protected in their native lands, which primarily are undeveloped countries, the argument that ". . . matters are best left in the hands of the source countries" is a cruel hoax indeed. Only the enactment of bills such as the Endangered Species Act mentioned previously, in all civilized countries, can bring these pathetic practices to a halt. As for Herr Schuh, we would like to see him hanging in cold storage right alongside of his pumas, if only for an hour or so.

Aquarists of course are familiar with the stupidity of several of our own bureaucratic State government agencies with regard to restrictive practices and legislation regarding aquarium fishes. It seems, however, that our aquatic cousins in Great Britain are no less plagued by a similar swarm of mental locusts. In Beckenham, Kent, under the Pet Animals Act of 1951, the Beckenham Town Council was empowered to grant licenses to pet shops and to specify special conditions to be observed in their operation. So far, so good. However, the borough's Chief Public Health Inspector, Mr. J. C. Kermode, asked the Council for authority to ban the sale of marine scorpion fishes (*Pterois*) because of the possible danger to customers of being stung by such animals. Mr. Kermode quoted information from the British Museum's Department of Zoology to the effect that a sting from the spines of a scorpion fish would undoubtedly give rise to great pain, adding that in his opinion, the effects on young children and very elderly people might well be more severe. He also brought up the question as to whether there might be other kinds of fishes that should be prohibited from sale also.

It is interesting to note that the main object of the original act was to ensure that pet shop animals were well-cared for in licensed premises. Arbitrarily, the Health Department maintains that the conditions of license could be extended to "protect the public" as well as safeguard the welfare of the animals. This is another case of "the camel in the tent"; the public thinks it is voting on one thing, presumably of merit, and finds later that it has been prostituted by those who feel that the world is not right until every facet of our lives is regulated and licensed.

The concern of the Public Health Department is, of course, ridiculous. Keeping marine fishes is a tricky business, and scorpion fishes are expensive. Buyers of such fishes are informed clearly of their danger and most assuredly are not sold to children. No pet shop owner in his right mind would ever sell a dangerous animal to a child if for no other reason than he would be liable to a costly lawsuit should the outcome prove tragic. The fact that no aquarist has ever been killed or permanently injured by a scorpion fish also seems to have been overlooked in this matter. With all the rats, roaches and other disease-carrying vermin running around urban areas throughout the world these days, it would seem that Mr. Kermode's concern with scorpion fishes is a farce and a clear indication that he is not doing his real and most important job.

Our "Fickle Finger of Fate" award this month goes to the Michigan Department of Natural Resources. On April 6, 1969, Jim Westra, whose specialty is caring for birds and animals with broken bones, went to jail for displaying

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THIS IS MY PROBLEM

by HELEN SIMKATIS

From: Becky Birely, Morrison, Illinois

I have a female swordtail that has from 20 to 27 little fish at a time. The babies are just fine for about a week and possibly two, and then they start dying. I have them in a double breeding trap and I would say it is large enough. I have tried a 5-gallon tank, but they have died in it, too.

Answer: We have selected this letter for this column because we have had many similar ones, and newcomers to the hobby very often have trouble raising what appear to be good, healthy fry such as those described in this letter. Probably the most common mistake made with the fry of livebearers is in the feeding. The first week is a critical one for baby fish. Feeding them from four to eight times a day in small amounts is important and novices are prone to care for babies the same way as they do adult specimens. Baby livebearers should be fed newly-hatched brine shrimp the first week in small quantities at a time but frequently throughout the day. At the end of the first week, the frequency of the feedings can be reduced somewhat but brine shrimp and a good grade of prepared food for baby fish should be offered at least three times a day. Minced washed canned shrimp can be added the third week and as the babies begin to take on size, their diet can be varied very much the way adult fishes are fed. By this time, the feedings can be offered twice a day and because the youngsters have had a good start in life, the critical period is over. Young livebearers do well in a well-established planted aquarium where algae has been allowed to accumulate on the rear glass. If the aquarium does not receive daylight, artificial light should be provided from 10 to 14 hours a day. Removing a fourth of the water by siphoning off the bottom of the tank about every 10 days is good maintenance. The water used to replace that which has been removed should be, of course, aged and brought up to the temperature of the water in the aquarium. One of the first things a novice aquarist should learn, if raising baby fish is one of the aspects of the hobby that is attractive to him or her, is how to hatch brine shrimp eggs. Newly-hatched brine shrimp is the most important food for newly-born livebearers.

From: Dr. Paul D. Tilley, Lenoir, North Carolina

While in Florida I picked up a moderate amount of assorted forms of coral. It is all of Florida origin I feel certain and is all white. Recently I was told by someone that it would "have to be treated" before being placed in a fresh water aquarium or I would have a graveyard of fish. Is this true? If it is true, how may I "treat" it to make it non-toxic to the fish?

Answer: We assume by "picked up", you mean you purchased various pieces of coral from stores in Florida. Such coral is usually bleached white by chemicals. Coral is very porous and coral that has been bleached in such a way would be dangerous to fishes in an aquarium. The coral should be boiled for a few hours and then put outside where the wind, sun, and rain will reach it. Do not place it where insecticide has been used. Placed on a sheet of vinyl in a secluded part of your garden would be ideal. After weathering for a few months, it should be safe to use in your aquarium. There are some other aspects to keeping coral in a fresh-water tank, however, that you should consider. The coral gradually breaks down in water and it will have a tendency to build up the alkalinity of your aquarium water unless you periodically siphon off a portion of the water and add aged fresh water. This is really no real problem, however, as this should be done every three weeks anyway. Another reason for not using coral in a fresh-water aquarium is that it is an unnatural furnishing for fresh-water fish and it does have sharp edges. Fishes swimming against it are apt to be scratched or cut. The coral could be used outside the aquarium back glass and if lighted would give an interesting backdrop or background to your aquarium.

From: Mrs. Carole Harvey, Oakland, California

If ever anyone needed the assistance of "Aquariums Anonymous", I do. Five years ago I broke the terrible spell that bound me and got rid of 17 or 18 large fish tanks and all imaginable accessories and gadgets that went with them (all springing, of course, from that harmless little 5-gallon tank my husband brought home one day). But now, heaven help me, I've just bought a 10-gallon fish tank. Modest enough, but those of us who have a past history of the problem can't allow ourselves that first tank. I do hope you can help.

Answer: We feel somewhat unqualified to answer this plea. Actually, your problem should be taken to someone who has "kicked the habit", and our reply will be akin to the halt leading the blind, or is it the blind leading the halt? At any rate, we do have one suggestion. Set up your 10-gallon tank to accommodate one fish that has lots of personality. One of any number of species of cichlids might fill the bill. Make a household pet of your subject and never allow him or her to marry.

From: Mike Blaskka, East Northport, New York

I have read that the Madagascar lace plant is the most difficult to grow. I must be pretty lucky. Approximately three weeks ago I purchased one of the plants. There were, at most, seven leaves, the largest being about two inches in length. There were also very few roots coming out of the carrot-shaped "bulb". I placed it in a 20-gallon community tank with approximately 30 fish. Now, after three weeks and two bi-weekly feedings of plant food, plus 12 hours of light daily, there are over 20 leaves, half of them over 4½ inches in length, and a much more developed root system. A surprising thing is that it is growing more quickly than my *Hygrophila*. How might I propagate it?

Answer: Two methods are given. One method is to plant seeds soon after they are harvested. With this method you would, of course, have to wait until your plant blooms but you do not risk losing your plant.

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ABOUT OUR AUTHORS

GLENN TAKESHITA

Glenn Takeshita, one of Hawaii's outstanding aquarists, is 33 years old, married, and has a 10-year-old daughter. His formal training in the biological, zoological and chemical sciences was obtained at the University of Hawaii and at Indiana University. Presently, Glenn is in Government work as a chemist with the Board of Water Supply of Honolulu. In particular, he specializes in quality control of water supplies.

He has been a hobbyist since he was 10 years old but it has only been during the past eight years that he has done some serious work in the development of fancy platys and swordtails. He has introduced many of these new strains to hobbyists through his articles published in a a number of aquarium magazines and club publications.

In 1965 he was the President of the Honolulu Aquarium Society; for the past five years he has been an active member of the American Killifish Association. Glenn's first love is to create new strains of fishes through selective breeding. His other hobbies include raising and breeding toy fox terriers, and culturing rare plants.

MICHAEL BOOKBINDER

Michael Bookbinder was born in New York City in 1938. He is a graduate of Adelphi University, with a major in Psychology, and is married. After graduation from Adelphi in 1961, Mike worked for a stock brokerage house but decided to devote his full time to the tropical fish business. Presently, he has his own fish hatchery in the Bronx, New York.

His hatchery now consists of about 400 tanks in which he turns out many killifishes and tetras. He has raised most of the common egglayers, such as angelfish, barbs, rasboras, etc., and has developed an award winning strain of bettas with which he has garnered many trophies. One of the areas in which Mike is experimenting is in the use of chemicals to increase growth and induce reproduction of fishes.

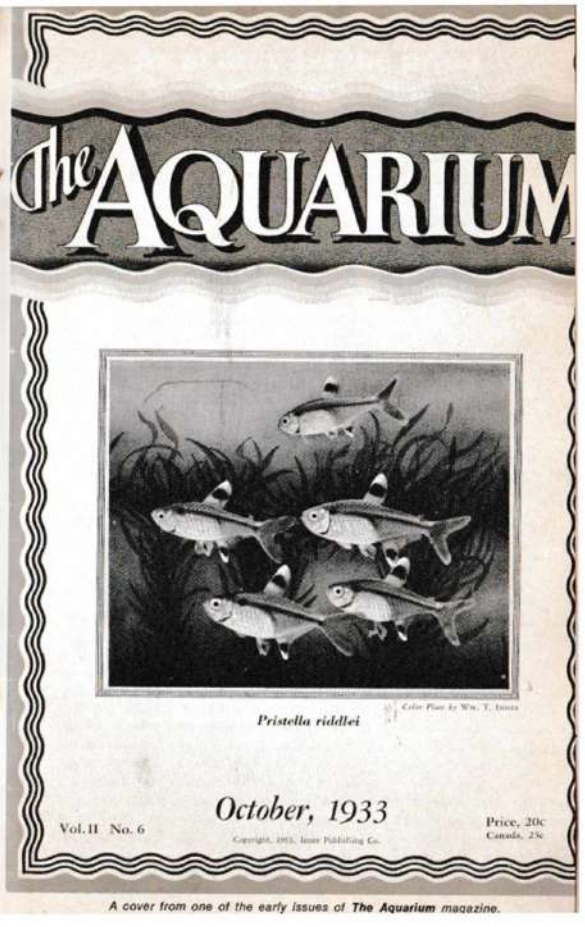
Mike's wife helped in the hatchery for a while but now teaches in the Sunnyside Progressive School in New York. Among their other interests are the raising and showing of dogs, and the Bookbinders are active members of a number of local and national dog organizations.●

A HISTORY OF THE AQUARIUM HOBBY IN AMERICA PART 20

by ALBERT J. KLEE

BEFORE REVIEWING THE OTHER commercial aquarium magazines that made their appearance in the decade of the 1930's, a few words are in order about two important staff members of the *Home Aquarium Bulletin*, viz., Henry Uhlig and Milton Schoenfeld. Uhlig was a professional illustrator and, among other things, designed the magazine's covers. In addition, he did a Ripley-like "Strange But True" column. The latter, however, unlike Ripley's, was strictly authentic. Schoenfeld was an instructor in biology at a New York University, an ardent devotee of aquarium fishes who did much experimental work with them. Joining the staff early in the magazine's history, he was soon its most important and most prolific contributor. Aside from his activities on the magazine, Schoenfeld manufactured a line of fish foods in his spare time under the trademark "Longlife". Other trademarks used in his Longlife line included "Micrograin", a powdered food intended as a substitute for infusoria. As aquarists well know, the Longlife brand has continued and is as familiar to the hobbyists of today as it was almost 40 years ago. We shall return to Milton Schoenfeld later in this series.

In May of 1932, one of the most important events in Hobby history occurred, for on this date appeared the first issue of *The Aquarium* magazine. One of the outstanding features of the new publication was its use of color plates of fishes on its covers, a feature that took the aquarium world by virtual storm. (Somewhat petulantly Walter L. Brind, in his advertisements for his own publications tried a weak counterattack to the use of color in hobby publications, e.g., "Color plates exaggerate so that you think live fish sold to you are poor or sick specimens. I prefer to let you be pleasantly surprised when you buy your fish and check them up with my own photos and illustrations. Black and white is all right!" This ploy, however, definitely did not work, although there certainly was some truth in Brind's statement.) Even without color plates, however, *The Aquarium* was a masterpiece. The printing was impeccable; the line illustrations and black & white photographs were superb. Added to this, the layout was dramatic and imaginative, and the balance and selection of material without



A cover from one of the early issues of **The Aquarium** *magazine.*

Milton Schoenfeld, one of the best-known aquarium writers of the decade of the 1930's. He was the most important contributor to the ***Home Aquarium Bulletin****, and the originator of the Longlife brand of fishfoods.*

peer. It may well be true that no aquarium magazine has ever surpassed these early issues of *The Aquarium*, or ever will. (In this day and age of shoddy workmanship, quality unfortunately takes a back seat.)

It was, of course, edited by William T. Innes, and published by him, his brother, Edward K. Innes, and the Innes Publishing Co. The brother has never really been given the credit due him in the aquarium hobby. Edward Innes was the "silent partner" who helped launch the venture and who contributed greatly to its publishing success. Regardless of the superiority of quality of any aquarium magazine, its financial future depends primarily upon its circulation. It was Edward K. Innes who negotiated the distribution of *The Aquarium* on the counters of the American News Company and its many subsidiaries, in June 1932. This was the first aquarium periodical ever handled in this manner, and in the process, *The Aquarium* exposed the hobby to thousands of people who hitherto knew nothing about it. The second issue of the magazine sold 5,500 copies, an almost unheard of figure for the times and type of magazine. One year after its appearance on the hobby scene, *The Aquarium* printed 15,000 copies! With increasing circulation, of course, came an increase in vital advertising accounts as well. The success of the magazine owed much, then, to Edward K. Innes.

The editorial staff of *The Aquarium*, in addition to William T. Innes, included George S. Myers, Allen S. Moody, and Professor John A. Timm. Myers, of course, brought scientific authority and accuracy to the magazine. His professional career as an outstanding ichthyologist and teacher of ichthyologists is well known. Myers provided valuable assistance in correctly identifying new (and old) aquarium fishes, an essential activity in this somewhat scientifically oriented hobby of ours. Timm, a distinguished educator and aquarist, provided an additional scientific touch to the magazine but he was nowhere near as important as the others. We do not

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BREEDING THE RAINBOWFISH

by PHILLIP S. FRANCO

THE AUSTRALIAN BLACK LINED RAINBOWFISH (*Melanotaenia maccullochi*) has been known since 1915 when it was found in the Northern part of Australia inhabiting fast-flowing streams. Oddly enough, it was very popular when first introduced in large quantities to the hobbyists in 1934, but since has fallen by the wayside, overshadowed by the many colorful new species of tetras and barbs. In the Australian rainbowfish we have a fish that is more ideal for the beginner than even the zebra danio when it comes to breeding and color. *M. maccullochi* is a very peaceful fish, being able to be kept in any community tank setup with no fear that you are introducing a bully into the tank.

The coloration of this beautiful fish is presented in red and black horizontal stripes, and orange-pink fins, all against a shimmering silver-to-yellow body which features rather large scales. The male has an outstandingly colorful feature, a brilliant yellow phosphorescent stripe which extends from the mouth to the double dorsal fin. Young males show this stripe as dull yellow when very young, but when mature and

courting the females (which they do even in the community tank), the phosphorescent stripe shows with such intensity that witnessing this alone makes keeping *M. macculloch*i worthwhile.

Rainbows are a school fish and show up to best advantage in numbers of six or more. With less than this number they become shy and temperamental, but small numbers of rainbows kept in a community tank with other school fish will find security swimming with them and will not scurry behind a rock or plant at the slightest disturbance.

When wishing to breed *M. macculloch*i, a well-conditioned pair should be selected. Sexing is no great problem when conditioned fish are used. Australian rainbows are easily brought to breeding condition by a good high-protein diet which includes live food such as adult brine shrimp. If life food is not available, the freeze-dried foods are excellent especially since they may be pressed to the glass side near the top of the tank where these fish prefer to swim and feed. The males' fins are reddish-orange; he has a pink hue in the body and is much slimmer than the female. The female, along with a very full appearance, has an over-all yellow tone which is carried into the fins in a very soft yellow-to-orange coloration.

As Australian rainbows are prolific, best results are obtained with at least a 20-gallon tank. Some people use refrigerator liners as a spawning tank. The only drawback to this size is to be able to supply the young with enough food in this large container (i.e., about 55 gallons in size). I successfully use a 20-gallon tank with dimensions of 30"×12"×12". This type of tank, which is sold as a "20-gallon long", is ideal since it gives as large a surface area as possible and yet does not sacrifice the depth which is needed to afford the fish enough spawning area. Aged water with a pH of 7·2 and a hardness of from 85 ppm to 170 ppm has been used with equal success. For an egg-catching medium, anything from live plants such as *Myriophyllum* or *Cabomba*, to nylon yarn or Spanish moss can be used. The important thing is to have enough to almost fill the tank, leaving enough room near the glass sides to allow the fish to move freely. Spanish moss is used more extensively now because it does not deteriorate in soft water or dimly lit tanks, can be easily sterilized by boiling in water, and also affords a dense yet flexible spawning media for all the egg-scattering fish.

There has been some confusion as to how much light should be admitted into the tank when spawning these fish, since their eggs are said to be light sensitive. My experience is that the fish prefer to spawn in a well-lit tank and loss of eggs, if any, due to light sensitivity is small.

Maintain the water temperature at 78°F. and the fish may be introduced at any time. Courtship will usually start as soon as the fish get accustomed to their surroundings, which can be the very same day. The male is a very persistent mate and will court the female almost constantly. His willingness to spawn is shown by his circling the female, spreading

*The Australian black lined rainbowfish (**Melanotaenia macculloch**i) is a very peaceful fish, and a colorful addition to any community aquarium.*

his fins, and displaying all his gorgeous colors. He almost stands on his head as he tries to coax the female into the Spanish moss. It is at this time that the male's yellow phosphorescent stripe seems to be glowing as if it were being turned on and off by a switch. Before too much effort on the male's part, the pair will swim into the spawning medium and with a side-to-side position, accompanied by a trembling of both fish, two or three eggs are scattered about. This procedure is continued at intervals throughout the day. The eggs hang from the moss by a small thread for seven to ten days before hatching. The Australian rainbow will spawn every day for as long as they are together, and heavily fed live foods or high protein dry food (which they like to snap up from the surface or as it falls). They seldom will take food from the bottom unless very hungry. The parent rainbow can be kept with the eggs with little fear that they will consume them, especially if the adults are kept fed. This does not mean they will not devour some eggs. It is rather difficult to ascertain how many eggs are deposited among the moss, but from the hundreds of young which can result after ten or twelve days of spawning, the loss due to the parents seems negligible.

To reduce loss due to fungus attacks on eggs during this long incubation period, I have successfully used a peat moss filter. This device has been used for years by German breeders and just in recent years have we in the United States accepted the many benefits of water filtered through peat moss. For those who have never used a peat filter, a brief explanation is needed. I use an inside filter box and peat moss which has

*A young pair of **Melanotaenia fluviatilis**, the largest of the Australian rainbowfish, will reach a length of about 5 inches.*

been boiled and washed is placed between layers of glass wool. Small stones or marbles are placed in the filter to give weight to the unit. As water passes through the filter it picks up tannic acid which acts as an astringent, killing a large number of bacteria present in the aquarium.

The first young may be seen anytime from the tenth day after the first eggs were observed. The young will go to the surface of the water in search of food. At this time one must decide whether to remove the parents or not. If one wishes to have a crop of young all approximately the same size, then remove the parents to stop spawning. But, if size is no matter, then the young can be left with the parents. The young are about the size of newly-swimming zebra babies. Some experts recommend infusoria as the first food, but feeding this can be troublesome in two ways: first, acquiring the necessary culture, which at times is smelly; and next, ascertaining the proper amount. I have found that the liquid fry food on the market today is the only answer to the feeding problems of newly-hatched egglayers. Feed baby brine shrimp along with this food. For the next week or so, newly hatched-babies can be seen daily and the liquid food should be fed through this period of about two weeks after seeing the first young. It would be wise to transfer the larger young to another tank to prevent cannibalism.

Growth is fairly rapid with high protein foods such as liver, flake food and brine shrimp. It is well to remember that Australian rainbows like well aerated water and the tank of young should have at least two airstones. Not only will this give the necessary aeration, but it will keep the food moving so the young have more opportunity to eat. Under proper conditions, adult size can be reached in four months.●

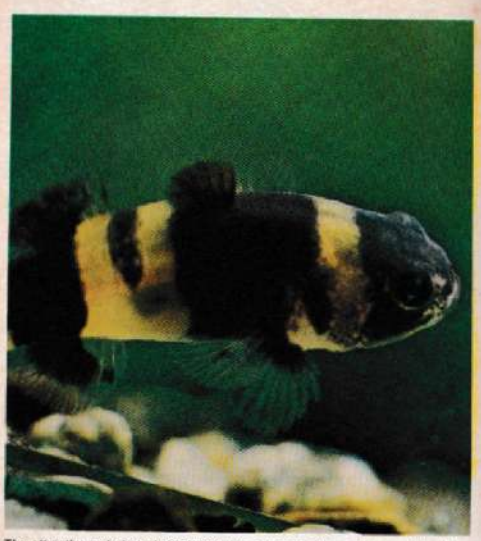
The bumblebee will often attach itself to the aquarium glass with the aid of a suction cup made of its ventral fins.

Trusso:continued from page 7

Their first meal was live adult brine shrimp which they happily ate. For the next few days, their appetites grew and they appeared more at ease. Since worms were recommended for other members of their family, I decided to try live tubifex. They were an unqualified hit. The fish tore into them viciously, and showed rivalry although there was enough food. I have since offered them many foods, including mosquito larvae. However, it soon became obvious that worms suited them best. Between feedings, they hunt down worms that escape into the gravel and pull them out. After two weeks, they had settled down and it seemed the best time to begin the next step in establishing a more comfortable environment.

Since 80 ppm is a bit soft for bees, I purchased a calcium insert (the kind used to keep turtle shells hard) and placed it in the tank. Hardness readings were taken every day and when it reached 280 ppm, the insert was removed. As the water grew harder, their colors (yellow especially) deepened and became less subject to their moods. Their appetites grew and their size definitely increased. By this time, the pH had stabilized around 6·5 and has since remained fairly constant.

By August, it seemed that two of the three remaining bees (one jumped out) were females. They had grown to about 1½ inches and the females had begun to round out. The females are butter-yellow, while



The attractive coloring of the bumblebee appears after a long period of becoming acclimated to its new environment. The females are not quite as colorful as the males.

the male is more orange-yellow with a bright yellow band beginning immediately behind the eye (though this is apparently subject to mood, etc.). The only other indication of sex is the male's torpedo shaped body as compared to the female's rounded body.

At the beginning of September the largest female, after two days of *constant swimming*, dropped her eggs in an apparent "false" spawning. During this time the other female had jumped out so an even tighter-fitting cover had to be found. I then purchased three young bees because I felt the two oldest were getting timid. The new fish eliminated this timidity, without causing much territorial squabbling. Soon the oldest female was filled with spawn and began swimming, night and day, up and down along the front glass.

***Brachygobius xanthozonus** shows a pattern of four broad bands separated by a brilliant white to gold color.*

In the early morning of the third day, the male coaxed her into his favorite "cave" and spawning began. Total time to complete the spawning was six hours, as opposed to five or six *days* as I had previously read. When the spawning was finished, the female was driven away and the male began his vigil of guarding and fanning the eggs. I estimated the eggs to number about 75; they were large considering the size of the fish. The three young fish showed interest in the eggs, and the male drove them away several times. I wanted the fry to survive so I decided to incubate them artificially, as I do with angelfish eggs.

A wide-mouth gallon jug was filled, half with aquarium water and half with aged tap water containing three drops of methylene blue as a fungicide. I removed the slate with its eggs and positioned it at an angle in the jug. An airstone was placed about two inches from this so that there was a gently but constant flow over the eggs.

The incubation took four to six days. After hatching, the free-swimming stage occurred 12 to 36 hours later. First foods offered them were liquid fry food, egg suspension, and infusoria. By the third day of free-swimming, it is fairly obvious which fry will survive. Those that have full bellies and swim in an even stable manner, do well. Those that are thin, swim unevenly, and have periods of "floating out of control", are usually dead within a day.

I began feedings of microworms during the second week. These

Bumblebees should be kept in an aquarium by themselves. A teaspoon of salt per gallon of water should be added plus plenty of hiding places.

were greedily eaten. Weaker fish seem unable to handle the worms, and under a microscope I observed worms literally wiggling through the digestive tract and emerging uninjured. Such fry die shortly after. The feeding schedule was now four heavy feedings per day, at 7 am, 12 am, 5 pm, and 11 pm.

At the end of the second week, all of the fry were transferred to a well established heavily planted tank. This particular tank was chosen because its water composition was similar and it had a large population of cyclops and other small organisms which I hoped the fry would feed on. As with the adults, the temperature is kept at 76 degrees and the tank is lighted 10–12 hours per day.

At three weeks, the fry develop the characteristic four black bands and spend more time on the bottom resting, as is typical with adults. There are only twenty fry left, but these are large and eat well. I think the problem of surviving the first two weeks is easily solved.

The solution for early fatalities is (I feel) a question of food. A very rich infusoria must be fed. The *xanthozonus* fry do not hunt their food; it must either swim or pass very near to them to be eaten. The problem is further complicated by the fact that the fry are extremely small. Therefore, a culture needs to be quite dense with all forms of infusorians. "Green" water might be a help. The fry, after three weeks, accept dry food and they eat it once a day. Their staple diet, however, is microworms.

Brachygobius xanthozonus

Brachygobius nanus

Brachygobius doriae

Brachygobius aggregatus

Brachygobius xanthozonus is a very colorful fish with interesting habits, and is worth the effort of keeping them. However, I hope that as the hobby grows we will change our approach to wild bees or perhaps develop a domestic stock. As it stands presently, we are being needlessly cruel and hobbyists are unfairly judging bumblebees out of ignorance. Next time you see that little black and yellow fish hopping about your dealer's tank, or maybe sticking upside down on the glass, give him a chance, it will BEE worth it. ●

EDITOR'S NOTE: Firstly, for Mr. Trusso's pun, ouch! Secondly, there is a great deal of confusion surrounding the scientific name of the bumblebee goby. Actually, there are some eight or so species, three or four of which have been seen in the hobby, i.e., *Brachygobius xanthozonus*, *B. doriae*, *B. nanus*, and *B. aggregatus*. The first two are quite similar in that there is a basic pattern of four broad bands separated by a brilliant white-to-gold color. Between the two, the one seen in the hobby is generally *B. xanthozonus*. *B. nanus* has more bands (five) than either *B. xanthozonus* or *B., doriae*, and they are much narrower. *B. aggregatus* presents a mottled appearance and should not be confused with any of the others we have mentioned. *B. aggregatus* and *B. nanus* do not have the brilliant white-to-gold coloration of the other two; they tend to ivory or buff.

Sterba states that *B. nanus* is a synonym for *B. doriae*. We do not agree. Dr. Robert F. Inger of the Chicago Natural History Museum has shown these to be distinct species. The illustrations referred to by Innes in his *Exotic Aquarium Fishes* and Axelrod *et al* in their *Exotic Tropical Fishes*, are really *Brachygobius nanus*. The accompanying sketches should help but readers should remember that many specimens of these fishes have broken bands, rather than solid, making identification that much more difficult. AJK.

These are the newly hatched fry at the spawning site.

Walker: *continued from page 5*

As far as the aquarium hobby was concerned in general, until a few years ago "discus" meant *Symphysodon discus.* Aquarists had noted certain differences from time to time in coloration and behavior, but this was usually chalked up to individual variation. Then came the day when names such as "red discus", "brown discus", "Peruvian green discus", and "blue discus" were heard, and an article in a major aquarium magazine pointed out that there were two different species. (See discussion at end of this article.) Of the two species and several varieties of discus, the most handsome perhaps and also least often encountered, is the blue form of *Symphysodon aequifasciata.* Spawnings are still quite rare, although the procedure and requirements for all discus are basically the same. Fortunately, THE AQUARIUM has been able to obtain an excellent photographic record of the spawning of this stately fish, and these photographs accompany this article.

Since successful discus-keeping seems to involve application of the same cautions and precautions for all types, a general discussion of the subject seems in order. Rather than think of the blue discus or any other in terms of delicacy and susceptibility, it might be more convenient and also more accurate to think in terms of a more limited range of conditions which will be tolerated. Obviously, they live and breed in nature, so these conditions fall within the range of tolerance. Considering that some aquarists are consistently able to successfully keep and breed discus, it stands to reason

Both fish take turns cleaning and fanning the brood and very often move them to a new location.

that they, too, are supplying the proper ingredients for health, happiness and fertility.

Most successful discus breeders agree that water is of primary importance. Reasonably soft, neutral to somewhat acid (7.0 – 6.5 pH) water seems to be in order, but MORE important than original water content and quality seems to be a need for regular, somewhat frequent partial changes of water. Discus have been successfully spawned and the young raised under a wide variety of water conditions, but almost without exception those who breed them consistently, routinely drain and replace portions of water from the discus aquarium.

This seems to accomplish at least two things. First, the influx of fresh water is a definite appetite stimulant to not only discus but a number of other fishes as well. Since feeding discus successfully over long periods of time is a major problem to the discus-keeper, this is extremely important. The second factor affected by water replacement is related to the first, i.e., the desirability to avoid chemical buildup in the water. This seems especially true of frozen brine shrimp and ground beef heart for although the water may remain crystal clear, after a period of time using these foods it will yellow somewhat and the appetites of the discus will noticeably dwindle. Frequent water changes seem to avoid this.

Filtration is also important. While it's always easy to get an argument on bird dogs, sports cars and filters, for the specialized needs of the

This blue discus spawned in an 80 gallon community aquarium located at the entrance to Crystal Aquarium Pet Shop in New York City. The water was hard and alkaline with a temperature of 75°.

discus-keeper a bit of extra consideration must be given to the role of the filter and the abilities and limitations of various types. Fast-flowing, high capacity outside filters have many advantages whether they are of the air-lift or power type. Solid waste and uneaten food is completely removed from the aquarium, and if the filter material is changed daily or even on alternate days, the water will retain its "fresh" quality for a maximum time. Discus of all types seem unusually susceptible to bacterial irritations and infections, and since the detritus or "mulm" which is allowed to collect is a source of nourishment for such microorganisms, this must be kept to an absolute minimum either through filtration and regular changes of filter material or frequent syphoning. Most discus do not appreciate excessive disturbances, so the former seems more desirable.

Some successful breeders recommend using aquaria which are devoid of sand, equipped only with a few large, potted plants such as sword plants or large *Cryptocoryne* species, plus a covering of water sprite or some other floating plant and perhaps a strip of slate or building tile for the purpose of egg deposition. For such a situation, outside filtration is a natural. In extreme hard-water areas where water softening seems advisable, rechargeable water softening pillows can be easily inserted and removed from outside filters. Peat filtration can be handled the same way by making a similar pillow with peat (coarse, not the finely ground peat moss commonly sold in garden shops in many areas) placed inside an old nylon stocking.

A beautiful blue discus in full breeding colors.

A blue discus jealously guarding its new fry.

Either procedure should be undertaken SLOWLY, and if your water is already around neutral (7.0 pH) and not unusually hard, it would probably be wise to leave it alone or at least gain some experience with other fishes before tampering with discus water.

Most aquarists would be somewhat less than satisfied to keep these majestic and expensive creatures under such barren circumstances. Planted and decorated aquaria certainly have a more appealing atmosphere, and a very popular part of the trend toward aestheticism and decorative quality is the undergravel or subsand filter. Properly employed, they are not only appealing to the aquascaper because of their invisibility, but also quite efficient. They are also capable of clearing water quite rapidly.

Improperly used, however, subsand filtration is dangerous; the ability of this type of filtration to completely disguise pollution is of special concern to the discus-keeper because of the sensitivity and susceptibility which they seem to have for anything but first quality hygienics. Subsand filtration requires careful feeding, especially with discus, and although the water may remain clear, the sand should be stirred periodically (especially under rocks and other objects) to be sure that pollution is not present.

Some breeders recommend a combination of outside and subsand filtration in a well planted aquarium. There are those who use undergravel filters in combination with a peat filled stocking placed under the gravel or sand. Just as with other "peat filtration", this allows tannic and humic acids to leach into the water in an attempt to simulate "natural" conditions.

Many times, plants and other decorative objects will not only enhance the natural beauty of discus, but may also tend to make them less shy. Shyness is perhaps not so much of an individual characteristic as an environmental result, and the reasons involved are not always clearly understood. An individual which is a vital, friendly and gluttonous creature in a bare aquarium in the basement or fish house may become a non-feeding nervous wreck when moved to a well planted larger show aquarium in the living room. This condition may be caused by a change in the amount or angle of light, increased traffic, and a therefore a change of location may well remedy the situation. The reverse can also be true, and seemingly well adjusted discus may not tolerate a move from a planted show tank to a bare breeding aquarium. The opinion has been expressed by some that over-planted aquaria with too much available cover, tend to induce shyness.

In the maintenance of blue discus or any other type feeding has always been a major problem, but since blue discus are less common and more seldom spawned than some others, there is less likelihood of the aquarist having the advantage of tank-raised fish. Aquarium-raised specimens have ordinarily been exposed to a wider variety of foods, have not suffered the shock of being rudely yanked from their Amazonian home with its unlimited space and natural food sources, and therefore generally are better adapted to aquarium living since this is all they have ever known. Fortunately, the necessary artificiality of aquarium feeding seems reasonably acceptable to those blue discus which are healthy when acquired, although some experimenting to find foods they will continually accept in quantities necessary to induce growth and reproduction may be necessary.

Notoriously finicky about food which they deem acceptable, discus seem to respond better to regular feedings several times a day, each of which falls just a bit short of satisfying their appetites. While certain types of live food are certainly desirable, others, notably tubificids, are seriously in doubt according to information recently published. Tubificids are very likely a major source of several discus ailments, although unfortunately early aquarium information recommended them strongly for discus. While "clean" daphnia is an excellent food for them, daphnia from contaminated sources have been also traced as carriers of discus maladies. Brine shrimp in areas where the adult form are available, mosquito larvae collected from other than a pond or other doubtful source (a rain barrel or watering trough would probably be "clean") or young red wiggler earthworms are probably the safest live foods which might be readily obtainable. The last-named can be raised easily in a large flower pot, or a styrofoam fish box filled with peat

other published rather recently, may be worthy of further investigation. One came from German discus breeders who spoke of the importance of vegetation in the diet of discus. While most of us who have kept discus of any kind can hardly imagine having them apparently relish lettuce as well as other greenery, the fact that this was experienced may be an indication of a deficiency in basic discus-feeding procedure.

A recent article in the British magazine, AQUARIST AND POND-KEEPER reported that supplementary vitamins in the diet markedly increased the appetites and vigor of two discus varieties. Unfortunately, administration of the supplement was not explained.

In summary, if somewhat out of context, I would like to quote Gene Wolfsheimer in part from an article found on page 406 in THE AQUARIUM, December 15, 1960 - January 15, 1961: "Brought into breeding condition with attention given to their food, water, temperature, etc., discus will spawn in cichlid style similar to angel fish. Normally, they should guard their eggs and when these hatch out, the fry should scoot over the sides of the parents and eat a slimy substance manufactured as their first food."

That's all there is to it!●

EDITOR'S NOTE: It is about time that the nonsense about "subspecies" of discus was dispelled. Writing in the June 1960 issue of TFH, Dr. Leonard P. Schultz of the United States National Museum reviewed the genus *Symphysodon* and, in our opinion, a more miserable analysis would be hard to find.

Schultz observed that in one specimen he examined, and in several literature references, the number of scales was from 44 to 48; other specimens, however, had a greater number of scales, 50 to 61. He concluded, therefore, that there are two species of discus. The older, *Symphysodon discus,* is most often referred to in the hobby as the "Heckel" discus, after its author. To the other species, Schultz gave the name *Symphysodon aequifasciata.* Up to this point, we are in complete agreement.

Unfortunately, Schultz then proceeded to subdivide *S. aequifasciata* into three subspecies. What is really amazing is that the subdivision was made on the basis of color and pattern only! Further, one of the "subspecies" was created on the basis of but a single specimen. All of this is patently ridiculous. Mayr (the prominent geneticist and authority on the subject) defines subspecies as " . . .geographically defined aggregates of local populations which differ taxonomically from other such subdivisions of a species". Note that a requirement is that these subgroups are distinguishable *geographically* and not as individual freaks or variants. Schultz's "subspecies" are not differentiable taxonomically. His own data show that, statistically, all have the same vertbrae counts, the same scale count, the

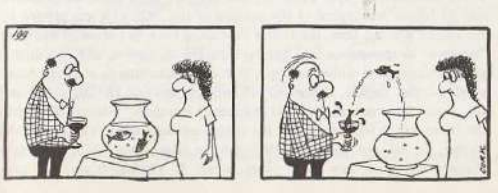
same pore counts, and the same fin ray counts. Of more immediate consequence, however, is that specimens of these three varieties are often brought up in the same net when caught in Brazil! Furthermore, there are graduations of color with a given varity found naturally that further makes the whole scheme silly. But regardless, the fact that his "subspecies" are not definable geographically, contravenes the very principle of a subspecies. Schultz's "subspecies" are nothing more than color varieties and, as such, have no standing under the International Rules of Zoological Nomenclature. Aquarists, therefore, are advised to ignore them, and consider that there are but two species, *S. discus* and *S. aequifasciata,* the latter with numerous color variations. *AJK*

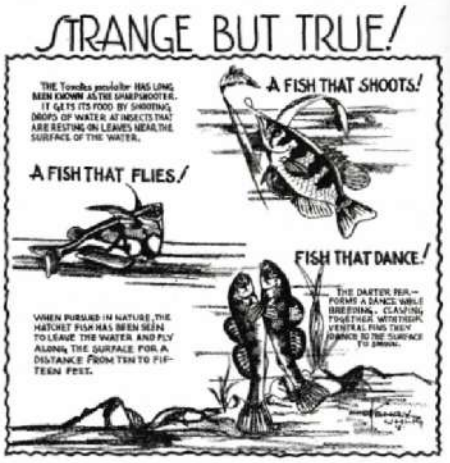
***Klee:* continued from page 32**

wish to give the impression that *The Aquarium* was a heavy, scientific publication - far from it, but it was authoritative.

Allen S. Moody is another of those individuals whose contributions have been overlooked by the aquarium hobby. Moody was, in effect, Innes' "leg man". It was Moody's job to check reports, material, etc., and to travel in search of new information. He could write well and contributed much material to the *The Aquarium.* Because often Moody was closest to the source material, and because Innes had the demanding task of managing the printing and the photography as well as writing editorials and some feature articles, much of the flavor of the *The Aquarium* was influenced by this young man, a fact not widely appreciated. It may shock some when I say that William Innes, in spite of misleading and hazy portraits of him as a "kindly old man", was as strongwilled as the next and not particularly conciliatory when it came to topics in the aquarium hobby. There was, in other words, no "second-in-command" at *The Aquarium* but Moody, in his own way, contributed a good deal of the "nitty-gritty" detail work that was necessary to its success.

The Aquarium was a bargain at 20c per copy, $2.00 for a year's subscription. It did not, however, signal the end to the appearance of new aquarium magazines on the market, In June of 1932, *Aquariana* made its debut, a periodical edited by Elbert A. Dulfer. What made this unique was





One of the "Strange But True" columns by Henry Uhlig, illustrator for the ***Home Aquarium Bulletin.***

the fact that it was the first such commercial venture on the West coast, the magazine being published in San Francisco. Individual copies were 15c, yearly subscriptions were $1.50. It, too, featured color plates on its covers, and its layout was typical of the printing of the 1930's (it was printed by the family printing firm, the Dulfer Publishing Co.). In a sense, it was more "modern" in appearance (and garish) than *The Aquarium*, and overall, one gets the impression while reading it that one is watching an old Fred Astair movie of that decade. *Aquariana* fell midway between *The Aquarium* and the *Home Aquarium Bulletin*. Its appearance was more "business-like" than the latter, but it fell far short of the critical and authoritative quality of the former. It did not last long, therefore. In September 1933, *Aquariana* changed hands, its new editor being Stuart B. Tinsley. It perished soon

No. 1 Aquariums—Deluxe Radio Finished

These Deluxe finished aquariums are the same as our No. 1 aquarium illustration. They differ in that they are finished more beautifully and they can be obtained in the same size at following prices:

No. 1-A	$1.00 ea.
No. 1-B	1.75 ea.
No. 1-C	2.00 ea.
No. 1-D	3.40 ea.
No. 1-E	5.00 ea.

No. 1

No. 1 Aquariums

These Aquariums are made from welded steel frames finished in deep green dunco. The legs are not included in accessories.

	Length	Width	Height	Capacity	Price
No. 1-A	9¼	5¼	6⅛	1¼ gal.	$0.80
No. 1-B	13	7	8	3¼ gal.	1.50
No. 1-C	14	9	10	5¼ gal.	2.75
No. 1-D	18¼	8¼	10½	6¾ gal.	3.20
No. 1-E	20	12	12	13 gal.	5.40

Fanciers Special Combination

Price Complete $15.00

Three removable tanks. Lower tank bulb edge glass build in. This gives you two tanks for baby fish, one for aquarist and one for live bearer. Over all height 42". Floor space 24 x 9 polychrome finished. Price complete $15.00. Total capacity 13 gallon.

DRUM SHAPED BOWLS

(Like Illustration)

One quart each	$0.15
Two quart each	0.20
One gal. each	0.50
Two gal. each	1.00

No. 5202 Breeder Tray

No.	Lgth.	Width	Depth	Price
5202	5 7-8	3 7-8	3 5-8	$1.00

Crystal Glass Only

Oval Fish Bowl

Clear Glass Oval Fish Bowl

2 gal. each $1.60

Aquarium Reflector

If turned on during the evening hours the light stimulates plant growth.

Single bulb	9½ inches long	Price $1.00
Two bulb	16 inches long	Price $1.50

These reflectors have universal hangers fitting any aquarium. They differ slightly from illustration. They are furnished complete with bulbs, hangers, and extension cords.

Metal Breeding Cages

Square Shape

	Length	Width	Depth	Price
Small	6	4	5	$1.00
Large	10	4	5	1.50

Oblong

	Length	Width	Depth	Price
Small	6	4¼	5	$0.75
Large	10	4¼	5	1.25

A page from the 1933 Beldt's Catalogue. Note the prices! A reflector could be bought for $1.00.

The first West coast aquarium magazine venture, ***Aquariana.*** *It lasted but a few years. The magazine had color plates on its covers.*

afterwards. The magazine was expensive to print, lacked a distinguished editorial staff, and suffered from being published on the West coast, away from the center of hobby activity in America. Another short-lived and similar West coast commercial venture was the *Fish Fancier* published in Los Angeles. It, too, is now just a memory.

A very fine aquarium publication was ***Aquarium News****, published by the Rochester (New York) Aquarium Society.*

The area of club-sponsored "slicks" was not dormant by any means. In January 1934, the Rochester (New York) Aquarium Society published *Aquarium News* a publication not unlike *Aquariana.* A monthly, except for July and August when it was not published, *Aquarium News* was edited by George H. Sly, Jr. Its price was 10c a copy, $1.00 a year. An interesting aside to this periodical was that its Advertising Manager (and frequent contributor) was Howard C. Damon, a nephew several times removed of William Emerson Damon, one of the pioneer aquarists of America and one of the five all-time-greats.

Aquarium News did not utilize illustrations, especially photographs, to

any great extent. It was, however, a very excellent publication and boasted writers of note such as Myron Gordon, and Gilbert P. Whitley of Australia. Even C. H. Peters contributed to it! It was almost as good a magazine as the *Home Aquarium Bulletin,* and it lasted a good time longer, passing from the scene in 1938. Like the San Francisco Aquarium Society's *Aquarium Journal* its pages were interesting and absorbing - pure nostalgia to the old-time aquarist. To the average hobbyist, it was a more useful publication than the *Aquarium Journal,* as the latter was dominated by professionals who did not have as great a commitment to the home aquarium. In any event, editors Sly, Damon and contributing editor Paul B. Tolle, carried the burden of publication for four years. A labor of love, it was a credit to them and to the Rochester Aquarium Society, but it had to end.

Although the *Home Aquarium Bulletin* maintained a loyal readership, the secondary depression of 1936 made severe financial demands upon the magazine. Furthermore, its editor, C. H. Peters, developed personal problems that ultimately resulted in his suicide. Faced with publishing the magazine alone, G. C. Hindenlang decided to solve his problem in a manner previously elected by five other pet hobby magazines. In 1936, the *Home Aquarium Bulletin* was absorbed into *All-Pets Magazine. All-Pets,* published by O. C. Lightner and edited by Stephen Tedor, was a consolidation of *Dogs and Kennel Science, Fur Farming and Trapping, Waterfowl Journal, The Pet Trade Journal,* and *The Pet Fancy* magazines. Hindenlang joined the staff and assumed the position of "Aquaria Editor", and the name of the magazine was changed to *All-Pets Magazine and Home Aquarium Bulletin.* Hindenlang edited a very fine aquarium department in the *Home Aquarium* Bulletin tradition. The fish section ran to about 21 pages, and that in a publication with a page size twice that of any aquarium magazine published. When Hindenlang retired some years later, the aquarium section lost its identity, finally ending a historic venture in commercial aquarium magazines. In its heyday, the *Home Aquarium Bulletin* was a fine, readable

Another club publication that "went commercial" was ***Home Aquarium News,*** *published by the Aquatic Life Society of Cleveland, Ohio. While not quite as good as either the* ***Home Aquarium Bulletin*** *or* ***Aquarium News,*** *it was a very fine periodical.*

magazine, in rapport with the grass roots of the aquarium hobby. Many were sad to see it go.

In 1936, the Aquatic Life Society of Cleveland began to issue a 1-page bulletin with an initial circulation of 20. By early 1937, this had, under the editorship of William J. Connelly, expanded into a 20-page publication

prepared via the spirit duplication (Ditto) process. Copies were sold for 10c each, and subscriptions were available for $1.00 a year. The demand for this publication was considerable, and some important advertisers were drawn to it. Accordingly, in April 1937, the magazine called *Home Aquarium News* went "commercial" and was professionally printed. *Home Aquarium News* resembled *Aquarium News* in appearance and in its sparse use of illustrations (the artwork was all line). It was a creditable project, not quite as effective perhaps as either *Aquarium News* or the *Home Aquarium Bulletin,* but as good or better than *Aquariana.* Like the others, it did not survive. As is usual in these cases, the load on a volunteer staff was too great.

The survivors at the end of the 1930's were *The Aquarium* (in an unimpregnable position), a somewhat ineffectual *Aquatic Life,* a limited interest club publication - the *Aquarium Journal,* and the *Home Aquarium Bulletin* which had lost its identity altogether. It had been a decade of aquarium magazine publishing that has never been equaled.

To be continued.

Takeshita: continued from page 16

treatment. It should be stressed that the hobbyist should be interested only in the "actual" copper concentration value and not the calculated value which is generally presented in the articles on copper sulfate.

The precipitation of copper in salt water is an almost instantaneous chemical reaction. Therefore, it is the keeping of the copper ion in solution that is the problem that confronts us. Many authorities have suggested complexing the copper with citric acid to form a copper-citrate complex ion which is supposed to be less active than the copper ion so that it remains in solution longer in salt water. This is not so for the copper-citrate complex ion will not remain as the complex ion in an alkaline environment as in salt water. Therefore, the complexing of the copper with the citric acid does not have any advantages over the free copper ion since we are working with an alkaline environment with a pH range of 8·1—8·3. If the pH range of the salt water was between 1—3, only then will the copper-citrate complex ion predominate. But at pH 8·1—8·3, the free copper ion predominates, therefore, the complexing of the copper with citric acid is not the answer in keeping the copper ion in solution longer. Other complexing agents could be tried that would work in an alkaline environment, but these agents should be first checked out as to their toxicity to fish.

Another very important area that has not been discussed adequately in the previous articles is how the copper ions affect the fishes and the organisms causing the disease. In respect to the fishes, the copper ions react as an irritant to the skin and gill membrane of the fish which in turn produces a copious amount of mucus to protect those tissues. If disease organisms are present on the tissues, the mucus which is produced

engulfs these organisms and when the mucus is sloughed off, the disease organisms are sloughed off also. This is how the copper treatment removes the detrimental organisms from the fish. These organisms are then killed by the free copper ions in the salt water. The mechanism by which the micro-organisms are killed is not understood too well, but researchers have found that it is either a coagulation of the bacterial colloids (in the case of bacteria) or an interference with some essential cellular metabolite or growth factor.

In the case where the fish dies from an overdose of copper, there are two possible reasons why death occurred. The first possibility is the direct ingestion of the copper ions through the gastro-intestinal and circulatory systems of the fish. Since the marine fish takes in great amounts of water through its mouth in order to offset the great loss of body water; if a high concentration of copper ions are present in the salt water that is taken in, a great percentage of these copper ions will enter the fish through its gastro-intestinal tract causing the death of the fish. The exact mode of action by which the fish is killed by a high concentration of copper in its body is not known. Most authorities know that the fish dies but most of them do not know the exact physiological mechanism that causes the death. A good example of this "direct" copper toxicity of marine fish was cited by Herald and Dempster when they reported the death of some marine fishes which had eaten live adult

brine shrimps that had a high concentration of copper stored within their bodies.

The second possible mechanism that explains how copper kills marine fishes is as follows. As was explained previously, the copper ions irritate the gill membranes to secrete mucus copiously. The higher the copper ion concentration, the greater the amount of mucus secreted. When too much mucus is secreted on the surface of the gill membrane, the oxygen exchange at the gill surface is greatly impeded. When this impediment of the oxygen exchange worsens, the fish dies. The death of the fish in this case is due to an oxygen deficiency caused by the mucus on the gill surface which was caused initially by the copper ions. Therefore, this second possible mechanism is an "indirect" type of copper toxicity.

I believe that most of the deaths of the marine fishes from copper toxicity are really a combination of the above two possibilities cited, but I personally feel that the second possibility causes more deaths than the first. Why I believe this is because if you were to treat marine tropicals with a high copper dosage, the first distress symptom you will see would be a respiratory one for the fishes will come to the water's surface with an increased respiration rate. If the distressed fishes are not removed from this water immediately, death soon follows. Heavy aeration of the water will not help the fish in this condition. Generally, death is the

end result if the fish is not removed from this water soon.

The final area is testing for copper in the marine aquarium. This very important step in the disease treatment of marine tropicals is generally overlooked. Only a very small percentage of the marine hobbyists ever monitor their systems during copper sulfate treatment. Actually every hobbyist using copper sulfate should have a copper testing kit. This is a "must" for without accurate monitoring of the system for copper, controlled copper treatment is impossible and a possibility of a fish kill is greatly increased.

Many copper test kits are on the market today. These kits retail for about $10–$15 each. But in buying a copper testing kit, the hobbyist must first be sure that it is designed to test for copper in salt water. Most kits are designed to test for copper in fresh water. These fresh water testing kits will not work well for salt water because of much interferences produced by the high concentration of many ions found in salt water. The methods that are generally used for copper in salt water are: (1) the Cuprethol (Modification) method, (2) the Bathocuproine method, and (3) the Cyanide (Modification) method.

What the hobbyist should look for in the kits are: (1) the ease of running the test, (2) the accuracy of the test, and (3) the copper concentration range that the test will cover. The recommended range would be between 0–1 ppm Cu.●

Societies: continued from page 20

in the United States has its share of interesting fish suitable for the home aquarium. When starting out on a collecting excursion, however, it is wise to find out which species are protected on a state or county level. The *Colorado Aquarist* is a well-established bulletin, very well produced, and information regarding it and the publishing society may be had by writing The Colorado Aquarium Society, 5444 Clay Street, Denver, Colorado 80221.

In the February issue of *Anchor* (published by the San Francisco Aquarium Society) there is an account of a spawning of *Monodactylus sebae* taken from *Drum & Croaker*, and authored by Arthur M. Hegedus and Arthur C. Johnson of the Columbus Zoological Gardens. A spawning of this elegant species is a happening in the aquarium world and *Anchor* has served its readers well to reprint this detailed account of it. In May 1967, eggs were discovered floating in filter boxes of a 70-gallon aquarium. Others were found in the aquarium proper. Three of the largest adult specimens in the tank measured from 6 to 6⅛ inches in length and from 7 to 7¾ inches in height. The eggs were approximately 1/32 in. in diameter, were white, and floated when newly laid. The fry hatched in about 24 hours and there were about 250 in number in the first hatching, representing about 10 percent of the eggs laid. The egg sac is carried on the back of the

fry and was absorbed in about 60 hours. So far, none has been brought through this critical stage which is, of course, reminiscent of salt-water fry of reef fishes that have been produced in a captive environment. Fosterfry, green algae, infusoria, newly-hatched brine shrimp, and plankton are some of the foods that were tried but none of these were successful. Details relating to water analysis, temperature, lighting, etc. are given in this article which make up the general conditions under which the parents spawned and the fry were maintained. Spawnings continued to occur but none of the fry survived beyond the egg sac stage and, in summary, the authors conclude that proper feeding when the egg sac is absorbed is the stumbling block they have encountered. As mentioned above, spawnings of salt-water tropicals have met with the same fate. Usually spawnings of brackish water fish which *Monodactylus sebae* may be considered, have been relatively successful in that the young will take newly hatched brine shrimp as a first food. Perhaps, when and if the writers of this piece discover a formula or food that is successful as a first food for *Monodactylus sebae* fry, they will be instrumental in providing a breakthrough for salt-water hobbyists in this particular area. Certainly their efforts will be watched and noted in aquarium literature. This issue of *Anchor* also carries two articles concerned with dyes

used as controls for fungal infestations. The first is entitled *Fungus and Dyes* and is a summary by Roger D. Burroughs of a study made by Richard L. Martin, reported in *The Progressive Fish-Culturist*, Vol. 30, No. 3, July 1938, as a *Comparison of Effects of Concentrations of Malachite Green and Acriflavine on Fungi Associated with Diseased Fish*. The highlights of the treaties might be briefed in the following way. Seventeen species of fishes (not listed in Mr. Burroughs' summary) tolerated a 10 to 30-second dip in a 67 parts per million solution of malachite green. Malachite green was found to control two of the most pathogenic fungi, *i.e., Saprolegnia parasitica* and *S. ferax*. Acriflavine is not as efficient a deterrent on these fungi but might be useful against other species of water molds. After exposure to malachite green of a 15 parts per million concentration for a period of 30 minutes, fish would probably be able to resist infection. We are warned, however, that fish exposed for longer periods in a lesser concentration of malachite green might expire because the dye is highly toxic. Albert J. Klee's article entitled *An Experiment in Dyes* compares methylene blue with acriflavine solution as an efficient deterrent of fungus forming on killifish eggs. In the tests the author ran which he describes in detail, acriflavine solution proved the more successful fungicide and he wonders if acriflavine might not

be used for cichlid and goby eggs, instead of the generally employed methylene blue. Both of these articles are reference pieces and considerable thought and work went into their preparation. In this issue, too, Braz Walker points up the alga-eating talent of characins of the *Prochilodus* genus. The hobbyist with a tank of relatively large fish who finds algal growths more than he can deal with will be happy to read Braz's comments of these lively, rather attractive fish. *Anchor* is published by the San Francisco Aquarium Society and is never disappointing in content. Write to *Anchor*, San Francisco Aquarium Society, California Academy of Sciences, Golden Gate Park, San Francisco, Calif. 94118 for information regarding both the society and its publication.●

Views & Reviews: continued from page 23

his patients. Westra is a naturalist and is known as "Mr. Jim". He has operated a pet shop in surburban Wyoming, Michigan, for 14 years. When children or grownups who know him spot a wounded animal, they think of him.

He has run afoul of the State Department of Natural Resources several times for taking wounded birds and other animals into his shop and caring for them. Orphaned birds that fall from trees or animals struck by cars or in other types of accidents have been brought to him by children, utility linemen who pick them up in storms, and others. The Department of Natural Resources holds that under State laws, he can not keep "captive" birds on exhibition at his pet shop. Westra however, doesn't sell them; further, he releases them to freedom after they are physically capable of taking off on their own. "You can get a license to shoot birds and animals but when you try to keep them alive you run into trouble," he said.

Westra has tossed in the sponge after spending $2800 on appeals in courts. The most recent case was a $100 fine, costs of $50 and a five-day jail sentence imposed last fall by a lower court and upheld recently by Circuit Court Judge John Letts. It involves taking in five baby racoons whose mother was killed in an auto accident. Four of the animals were released. He kept the fifth for treatment of injuries.

Judge Letts permitted Westra a stay of his jail term for a couple of weeks so Westra could complete speaking engagements to students in various schools that he had previously scheduled. "I'm out of money, but I won't give up treating wounded birds or animals. But from now on I will go underground and hide them from State inspectors, like Easter eggs, he said. Westra said he got a call from a man who spotted a squirrel that was injured and threatened by dogs in a bush. He said he told the caller to phone the Department of Natural Resources. "They were closed so I finally told him to bring it to me and I would take it to my jail cell and treat it", Westra said.

Our sympathies, of course, are to Mr. Westra but in a few years we may all be hiding things from State inspectors.●

CREDITS

PHOTOS:
G. Wolfsheimer, p. 34-35, 37; W. Tomey, p. 8, 10-13, 74-78; A. Roth, p. 4-7, 38-42, 44-48.

FISH:
BLUE DISCUS supplied by Crystal Aquarium Pet Shop, New York City, N.Y.; BUMBLEBEES supplied by Kazimir's Pets, Hackensack, N.J.; RAINBOWFISH supplied by Joe's Pet Shop, Ridgefield Park, N.J.

Problems: continued from page 25

The other method is to divide the rootstalk, or "bulb" as you call it. The cuts must be clean as uneven cleavage will encourage rot. Place the pieces of the rootstalk in a mixture of 5 parts coarse sand, 1 part loam, and 1 part softened peat moss. Each piece should be placed in a small flower pot, or plastic container filled with the above described mixture. The pots then should be placed on a bare aquarium floor, the aquarium filled with water of the same temperature, pH, etc. as that which your plant was thriving in. The aquarium should not contain fish because too much nutrient will cause the pieces of rootstalk to rot. Fertilizer in a small quantity may be added to the flower pot mixture, however, as this plant takes nutrients through its roots. This is one of the most frequently used methods for propagating this plant but you take the chance of losing your plant if the pieces of rootstalk begin to rot. It should make a very interesting project, however, and the possibility of success lessens the qualms of the risk involved.

From: Mr. & Mrs. Mark Johnson, San Diego, California

We have had four figure-eight puffers for about six months. We can't seem to get any information on them other than they have not spawned in captivity. Can you give us some information on them?

Answer: The figure-eight puffer is scientifically known as *Tetraodon palembangensis*. It comes from Thailand and Borneo, although there is a Sumatran version distinguished mainly by the presence of a black, pale bordered ocellus under the dorsal fin, another on the caudal peduncle and a black blotch on the shoulder. The fish has not been bred in captivity at the time of this writing. It grows to some eight or nine inches, and reports on its nature are somewhat confusing. Sterba states that it is quarrelsome both with its own kind and with other fishes, but R. E. Macdonald, the British aquarist, says that it is a rather shy fish. However, you would be in a better position to know this, at least with your own specimens!

From: Greg Costakis, Gary, Indiana

A few of my friends and I are trying to start an aquarium club at our school. I would like some information on what to discuss and what to do at the meetings.

Answer: When fish fanciers get together whether it is in a shop, a home, or a club meeting, they like to discuss their fish. Of course, you must organize your discussions so that every one present is involved and this is rather easy when the group is small. You might hold formal meetings where the minutes of the last meeting are read, etc., or you might have each member speak briefly about what he is keeping, what his problems are, etc. Small groups of fish fanciers usually meet at homes or in an empty class room, and as the interest grows, you will find that the program will evolve into a regular pattern. As the group grows, you will find it easier to follow a more formal procedure.

From: Danny Morem, Austin, Minnesota

I am very interested in the breeding of the algae-eater *Gyrinocheilus aymonieri*. Has anyone ever bred this fish in captivity? If so, how does one go about it and how can you determine sex?

Answer: This species, to our knowledge, has not spawned in captivity. The female is distinguished from the male by being somewhat larger and has fewer tubercles on her snout than he. The species requires good aeration and along with algae it will appreciate a good grade of dry food. If algae is not present in the aquarium, this species should be supplied with softened lettuce, chopped boiled spinach, or some other type green leafy vegetable. Youngsters behave very well in a community situation, but not the adults.

From: Peter Yasus, Flushing, New York.

When I feed my fish, some take pieces in their mouths, nibble them, spit them out, and then no other fish touch these pieces which float down to the gravel. What is wrong? Is there something wrong with the food I give them?

Answer: If your fish never actually eat the food you give them, we would guess there is something wrong with it. Very often fish will do this with some food but will choose to finish eating others. In that you do not say what you are feeding your fish, and do not tell us whether or not they do accept some of the food you give them, we can only assume that your fish are not eating and that you should certainly switch to a food that they will accept.

Question: I have a pair of three-spot gouramis in a 10-gallon tank with other varied tropicals. They are medium-sized. Every time I look at them, they are moving back and forth very oddly. Is this because of the other species of fish in the tank? Or is there something wrong with the water?

Answer: It is difficult to explain behavior of any particular specimen. However, fish rock back and forth sometimes when they are cold. The desired temperature for this species is from 78 to 80 degrees F. If your specimens are being harassed by a tankmate, this may cause them to stay together and perhaps to rock. On the other hand, if these fish, along with your other specimens, are not eating properly, as is suggested by your first question, it might be a good idea to check all of them for itch, and to inspect your tank generally for conditions calling for correction.●

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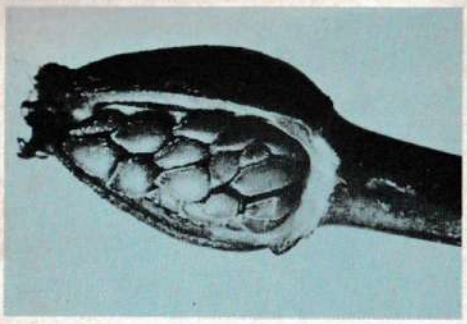


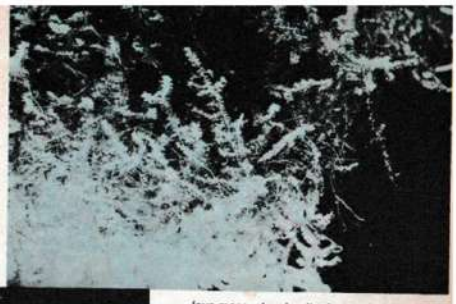
A sporehusk with a portion of its side cut away to show the spores.

can fasten a clump of the moss and suspend it wherever we like in the aquarium, where it will grow as well as on a rock. In color, the plant varies according to the light—dark green but lightening somewhat nearer the source of light. The shape of the leaves also varies according to the light, from fine to coarser shapes.

Propagating the Java moss can be as simple as taking a part of it and moving it to a new place where it will resume its growth without interruption. If the plant is cultivated in the aquarium for a long period of time, perhaps you will observe an entirely different kind of reproduction in which the moss produces a number of small thin reddish-colored stems, topped off by small husks which contain microscopically small spores. This is generative reproduction.

Examination of the Java moss under the microscope produces some interesting surprises. For example, if we take one of the stems of the plant and look at it closely, we find that the leaves are quite pointed (and small, of course), and that along the stem there are very fine red colored hairy roots called "rhizoids". The rhizoids provide the plant with nutrients when they are buried in the ground.

On the top of the Java moss plant we sometimes find bright rose or greenish-rose colored leaves, and developing at their bases we find very tiny female propagation organs known as Archegoniae. Between these brightly colored leaves are the male propagative organs, the Antheridia. These organs are somewhat bottle-shaped and are nestled in a wreath of cellular hairs called the paraphysen. Within, the male cells develop and



Java moss, showing its dense clusters and long tresses of foliage.

Magnification shows that the tiny leaves of the Java moss are pointed. Note also the hairs or rhizoids along the stem.

An emperor tetra, browsing among the tips of Java moss. The moss provides excellent refuge for both fry and for eggs.

The Archegonium is the female organ, and it develops at the base of brightly colored leaves at the top of the plant, such as these.

During cell division, the Archegonium ruptures to enable the zygote to grow and produce the sporehusk. This shows the Archegonium ruptured.

After cell division, a sporehusk is formed at the end of a long stem.

The sporehusk is capped by a cover, shown here tilted back.

The opening of the sporehusk is blocked by the peristoma, teeth-like structures. When the surrounding atmosphere becomes dry, the peristoma curl back and permit the spores to escape the husk.

upon the ripening of the antheridium and the presence of sufficient moisture (if the plant is growing out of the water), the spermatozoids burst out and are freed.

The Archegonium has a long neck filled with fluid. The spermatozoids are able to reach the neck opening, travel down the neck canal to the egg cell on the bottom and join to form a fertilized egg or zygote. The zygotes then go through the process of cell division within the Archegonium, forming an extended shape. The lower portion settles into the top of the mother plant but the upper part grows and ruptures the Archegomium.

From this ruptured part grows a thickened bud, the sporehusk, which perches on the end of the stem some two or three centimeters long.

Two male propagative organs, Antheridia, touching the end of a sporehusk. In this manner, fertilization takes place.

Sometimes a bit of the ruptured Archegonium remains fastened at the end of the sporehusk, serving as a sort of cap.

At the start the sporehusk is green but this changes in time to bright red, then brown. Although the cap falls off at this point, the husk is still closed by a somewhat conical, small cover. When circumstances are favorable, the cover loosens and a hole appears in the end of the husk. However, passageway is blocked by a wreath of spines called the peristoma, which fit together like interlocking fingers. The peristoma are very beautiful as they are a bright orange color.

The peristoma are sensitive to moisture and when the atmosphere becomes dryer, the teeth of the peristoma curl aside and the husk opens to free its spores. If, however, the atmosphere again becomes moist, the peristoma teeth curl back and once again close the opening. The spores, upon settling upon a substrate, form new moss plants, ultimately to repeat the cycle when it becomes a "mother" plant. All in all, the Java moss is an excellent aquarium plant, unusually attractive as it grows to dense clusters with long tresses of foliage. ●