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JULY, 1968

VOL. I NO. 9 SERIES II

AQUARIUM

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On The Cover

An exciting view of a *Tilapia Mossambica* graces the cover of this month's magazine. Our photographer, Andrey Roth, used a motorized Nikon F on Kodachrome film. (Additional credits appear on page 69.)

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BREEDING THE SMALLEST BARBS

by HERB MEYER

like a live coal as he displays his colors to full advantage by spreading his fins till they seem about to split, and the purplish-bronze flush over the checkerboard's black-and-silver sides is a sight not soon forgotten.

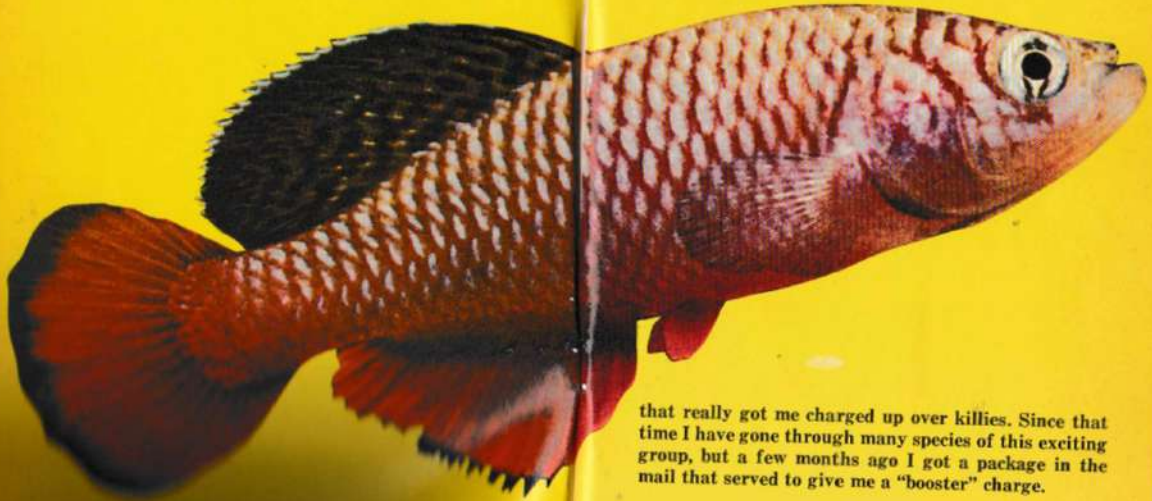
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A head view of *Barbus oligolepis* (regardless of other names proposed, this is still the correct one for aquarists to use). As an aquarium fish, it is even older than the cherry barb, having been imported in 1914.

THE NEW REDBELLIED NOTHOBRANCHIUS

by ROBERT J. GOLDSTEIN, PH.D.



I HAVE BEEN INTERESTED IN KILLIFISHES for a number of years, ever since I saw my first *Nothobranchius guentheri* (see *The Aquarium* Volume 35, number 9, 1966). Prior to that time I had, at various times, kept and bred the commercially common killies, e.g., the lyretail (*Aphyosemion australe*) and the "chaperi" (*Epiplatys dageti*), but it was the brilliant red tail of that marvelous *Nothobranchius guentheri*

that really got me charged up over killies. Since that time I have gone through many species of this exciting group, but a few months ago I got a package in the mail that served to give me a "booster" charge.

continued on page 42

TILAPIA MOSSAMBICA

By RICHARD C. HARRISON

THE SAN ANTONIO RIVER EXTENDS from San Antonio, Texas, to the Gulf of Mexico in conjunction with the Rio Medina system. It is fed in the main part by springs which rise in the northern and central parts of Bexar County. The most important of these springs empties into the system inside the compound of the San Antonio Zoo. Rainwater runoff and sewage effluent enter the river in and below the city of San Antonio. The water is hard and alkaline. Most important is the fact that the springwater rises at a constant temperature of seventy-three degrees Fahrenheit the year around. In the light of this situation, several attempts have been made to domesticate and propagate new species of fishes.

In 1960 several dozen immature *Tilapia mossambica* were set free inside the Zoo compound. While the water requirements of this fish are sufficiently different to cause initial doubts about their welfare, the fish adapted and flourished.

This fish, an African mouthbreeder, has been introduced into tropical waters in several parts of the world. In its own waters it often reaches a length of more than twelve inches and, in some areas, it is considered a valuable food fish. In an era when the spectre of starvation hangs over much of the world, new sources of nourishment arouse immediate interest.

continued on page 38



This is the "brood" end of the mouthbrooder (the female). In years past, "mouthbreeder" was the accepted term. Nowadays, "mouthbrooder" is preferred as being more descriptive of what actually occurs.



Cryptocoryne lingua is a standout among the other plants in the aquarium because of its peculiarly shaped leaves.

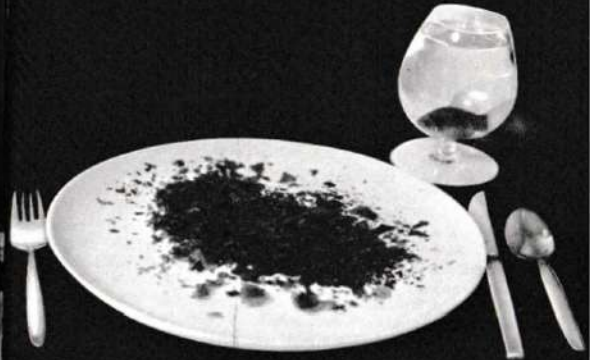
CRYPTOCORYNE LINGUA

By WILLIAM A. TOMEY

(Photographs by the author)

ALTHOUGH CRYPTOCORYNE LINGUA HAS HELD the interest of aquatic plant aficionados for several years now, not much success has been had in attempting to import them in quantity. Thus, the species still remains rather rare and tends to be cultivated only by the more experienced aquarist, particularly the kind who obtain their plants through personal contacts in foreign countries.

Cryptocoryne lingua is a member of the family Araceae, the species having been described in the year 1910 by the botanist, Engler. Its native habitat is Borneo (there is a possibility that it may also be found in Malaya). The leaves are broad, somewhat egg-shaped, and are carried on rather short stems. In color they are a moderately strong green. The midrib is thickened, with a fuzzy appearance, and the stems are characterized by the presence of a fleshy sheath. As a consequence, the plant (especially young specimens) often is mistaken for *Cryptocoryne* *continued on page 76*



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A-B-C OF FILTERS

by JERRY CURRIER AND MARTY SMITH

NOT TOO MANY YEARS AGO a common belief in fishkeeping circles centered around the so-called "balanced" aquarium. The theory was that a "balanced" aquarium could be set up in such a manner that the animal wastes given off by the fishes would be absorbed by the plants and turned into harmless by-products. This idea was based on the reasoning that if Nature could do it in a river or lake, man could duplicate it in an aquarium.

Although the idea of a "balanced" aquarium is attractive, it is almost impossible to attain. Such variables as overfeeding, the amount of light given an aquarium, the type of fishes and plants, and a myriad of other problems have caused this idea to fall by the wayside. The modern aquarist realizes that he is maintaining fishes in an unnatural environment and that he can, at best, only simulate Nature.

One of the most important considerations in proper aquarium management is often overlooked or ignored. Fishes are living organisms and, as such, they have certain functions common to all living creatures. They require food which supplies energy for growth and everyday activities. They give off wastes which are composed of unused or unusable discards of the food they consume. These wastes, if not removed, can accumulate to the point that they cause discomfort, and even death, to the fishes.

The problem of disposing of these wastes, many of which are also unusable to plants, must be faced. Regular changes of the water in the aquarium is one solution, but this method is time consuming and, in many cases, not healthful to the fishes. Because of this, various methods of filtering the water are now used.

Filtering simply means "to separate impurities from a fluid." The problem for the beginner, generally, is not whether to filter but how. There are many devices available to the aquarist today that will do the

job. The question is not "What is the best filter to use?" This is not an answer that can be given. The type of aquarium, the type of fishes, the amount of fish, the amount of light, the amount of food, and the amount of water must be considered. The filter must be properly placed and properly maintained. But for a 50-gallon

tank with an overcrowded population of large fishes, the filtering requirements are very different. Let's examine some of the more common filtering methods.

Probably the cheapest and most widely used filter is the "box" type. This consists of a container with a perforated lid and an air lift. The container is designed to hold a quantity of charcoal, topped off with glass wool. The airlift causes the movement of water through the filter. Before we go any further perhaps we should find out just what an "airlift" is.

Basically, an airlift consists of an inlet for pressurized air opening into a tube which has access to a liquid, in this case water. As air is forced through the tube it causes water to be pulled with it.* In most box type filters, the airlift is made up of a small tube, for air, which opens into the bottom of a larger tube. Air flows up the large tube in the form of bubbles and the water is drawn with it. (Some of the newer models use an air stone in a chamber at the bottom of the larger tube but the principle is still the same.)

Getting back to our discussion of filters, the next question that usually comes to mind is, "Why the glass wool and charcoal?" The answer is that this is the means by which we purify the water as it passes through the filter.

Glass wool, with its many overlapping filaments, is used to strain the larger sediment from the water and could be considered a "mechanical" filter. Charcoal, because of its capacity to absorb small particles, certain gases and various chemicals, is also used. Used together, these two products offer an effective solution to the basic needs of a filter. The one real drawback is that the filtering material must be changed rather frequently to maintain the filter's effectiveness.

Another type of filter that uses the glass wool-charcoal principle is the "outside" filter. This consists basically of a box into which the filtering materials are placed. Water is siphoned into the top of the box, then flows through the filter medium to be drawn off at the bottom and returned to the aquarium by means of an airlift. Recently, versions which use a motor-driven centrifugal pump to return the water have been introduced. While they will move a fantastic amount of water through the filter, they are only as effective as the cleanliness of the filtering medium. One advantage to be realized is that this type of filter requires no air pump, helping offset its higher cost. They have certain disadvantages, however, which are inherent in their design, the principal one being the need for frequent changing of the filter-medium (glass wool and charcoal) as the faster flow of water causes the filter to pick up more particles and clog sooner.

A simpler filter, in appearance and operation, is the so-called

* EDITOR'S NOTE: Airlifts work on the principle that a column of water and air is lighter than a column of water.

"undergravel" filter. If we took a cake pan, turned it up-side down, punched numerous holes in the bottom and installed an airlift in one corner which would pull water from under the pan, we'd have an under-gravel filter. Of course, a cake pan is metal (which could be toxic to fish) and is too deep. Today's undergravel filter looks like a very shallow plastic cake pan with slots or holes in the bottom and an airlift. Water is drawn down through the openings and expelled by the airlift. This filter is installed in the aquarium by placing it on the bottom of the empty tank and covering it with an inch or so of gravel. The filter completely disappears. All that shows are the airlift tube and its air supply tube.

The undergravel filter uses the principle of bacterial conversion of waste material to accomplish its purpose of cleaning the water. To put this more clearly, the water is pulled through the gravel, taking with it the impurities and sediment it contains. As the space between the bits of gravel are filled with these particles, bacteria, present in all water containing fish and plant life, multiply and feed on the waste material. By this process, the bacteria break down the waste to products that can be used by the plants, given off as gases or merely become harmless elements in the water.

The undergravel filter does not require regular changes of charcoal and glass wool but it DOES require occasional cleaning as a certain amount of "sludge" is pulled completely through the gravel, settling on the bottom under the filter. This can be removed partially by periodic siphoning through the airlift return stem. Merely turn off the air supply and place a plastic hose of proper diameter over the return and proceed to siphon. (An added benefit can be realized by those hobbyists who also raise house plants. The "sludge," heavy in nitrates and nitrites, is an excellent plant fertilizer.)

In theory, the undergravel filter should work forever without further cleaning. Don't you believe it! At least once a year, and more frequently if your aquarium is crowded or overfed, the entire thing should be "torn down," gravel thoroughly washed in running water, the filter plates scrubbed with an old toothbrush to clean out the holes, the airlift tubes cleaned and the rocks and decorations washed.

Even though the undergravel filter is said to never need cleaning, the water in the aquarium does! This type of filter does not remove the gases and acids that build up in the aquarium. Regular changes of 1/3 of the water in the aquarium will help but eventually you must clean everything as described above.

Some people claim that plants will not grow with the undergravel filter. This appears to be kind of sound varieties of plant life. However, *Elodea*, *Ceratophyllum*, *Limnoria*, *Hydrilla* plants and wisteria are particularly good. Most of the gravel is 4 inches deep or more. A 10-gallon tank will hold one pound of aquarium gravel for

each gallon of water. That is, if an aquarium holds 30 gallons of water, you should use 30 pounds of gravel.

Another thing that will inhibit plant growth is running the filters too fast. A slow flow of bubbles from the airlift is quite effective from the standpoint of filtration (i.e., a combination of filtration and aeration) and is also best for the plants.

Recently a new type of filter has become available to the aquarist. It uses ultra-fine filter material which is said to remove extremely tiny particles from the water. Although very useful for treating certain external diseases, such as fungus, ich (*Ichthyophthirius*), velvet (*Oodinium*) and the like, it is less effective against accumulated chemical and gaseous wastes. Also, the larger particles found in an aquarium, such as bits of dead leaves, etc., are not removed by this filter. Another drawback is the large amount of air required to operate this filter. There are "powered" models available but these are very expensive and usually not in the range of the average amateur's pocketbook. As mentioned previously, this filter is a very useful one for treating certain diseases and an added benefit can be realized by those aquarists interested in breeding the egg-layers. This type of filter will appreciably reduce the problem of fungus on the eggs.

As you can see, each type of filter has its advantages and disadvantages. No one yet has developed the "perfect" filter. Generally, these recommendations can be made:

1. For a small aquarium with few fishes the "inside box" filter, air powered and using charcoal and glass wool will usually suffice.
 2. For larger aquariums and aquariums that have a large fish population the "outside" filter using charcoal and glass wool, powered by air will give good results.
 3. For crowded or larger aquariums the motor driven "outside" charcoal and glass wool filters are better. (Note: All of these filters MUST be regularly cleaned to maintain their efficiency. The number of fishes, the size of fishes and the amount of food given, are all contributing factors to the time between filter medium cleanings. A basic rule would be to change the filter at least once every two weeks but variation in the factors listed above may necessitate more frequent changes.)
 4. The "undergravel" filter is most maintenance-free but may cause poor plant growth and is not effective in an over-crowded aquarium and still requires periodic cleaning.
 5. The new filters using fine porous filter material, are effective against certain diseases but are not ideal for removing the every day debris and impurities from the aquarium.
- In general, the filter you use depends on your specific needs. A little extra money will be required to find the filter that best suits your needs. In fact, the filter that you decide on, nothing can be done to improve the present filtration management. ●

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CORNERED BEEF AND CABBAGE



by ED SYMMES

WHY NOT? OF COURSE THERE ARE MANY foods that we normally feed to our fishes such as brine shrimp, beef heart, *Tubifex*, white worms, and prepared foods. But why stop there? Many foods can be fed to our finny charges which can break the monotony of their diet. Some of these are easy to obtain, economical, and highly nutritious.

The title foods were arrived at quite by accident. My *Metynnix* are kept in a tank arranged only with rocks and drift-roots. There are no plants to browse upon; they normally consume large quantities of lettuce. One day while searching for lettuce I spied a head of cabbage and hesitantly placed one small leaf in their tank and waited, and waited. Where was the rush to the feast? After more than an hour the leaf was still there. Was I doomed to years of supporting lettuce prices? As I started to remove the uneaten tidbit, the solution to the uneaten cabbage leaf was discovered. When the leaf was placed in the water, I had cupped it slightly to make it float. No wonder they weren't feeding! There wasn't

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an edge in sight for them to nibble. I turned the leaf over. The *Metynnix* quickly devoured it! After finding the "secret," I tried many other greens. The *Metynnix* loved them all, including celery, kale, and crabgrass.

This little episode illustrates one of the important requirements of fish keeping. *Keep an open mind.* There are many things that one hobbyist may find successful, but when another tries he is met with disaster. Often it takes little more than "turning over the leaf" to bring success.

I found later that my oranda goldfish also enjoy some greens, but only the softer ones. So much for the easy part. What about the corned beef?

I must admit that there was a little "honest cheating" here. I tried the corned beef on goldfish, guppies, swordtails, and even "Detroit Louie," our piranha, but to no avail. Remember, any food may be rejected just because it is different. The fish just don't know what to do with it. Careful supervision of any new food will reduce the possibility of a fouled tank. If you want to switch a stubborn fish to a new item, try adding a small amount at each feeding to the previously accepted fare. Increase the amount until fully accepted. Always remove any uneaten food in 30 minutes. I suggest leaving it longer than the standard five or ten minutes as the fish may need some time to get acquainted with it. Do not leave any food in the tank long enough to start decaying.

Did I just make up the title, or did someone finally eat the corned beef? I have a tank devoted to keeping native species. It was here that I found my willing and able recipients—two native catfish with ravenous appetites and sufficiently cavernous mouths to satiate themselves. With the *Metynnix* in one tank and the cats next door, I have fed corned beef and cabbage to my fish.

I have also found that some of the large cichlids will eat an amazing variety of foods. A big Oscar once refused to eat her usual portions of green shrimp and beef heart. I tried *Gambusia* (a small native minnow), but they tempted her not. One of the other foods offered was whole live earthworms. These put her back on schedule and perked up her gourmet interest. After that she ate variously prepared eggs, steak, shrimp (uncooked), and most other items we would use to tempt her. She never did like chicken.

I do not recommend feeding regular hamburger. There seems to be more fat than can be digested. The excrement is made of little pellets of beef fat which can easily foul the tank. Ground lean beef could be fat-free enough to eliminate this problem.

With these experiences in mind, I would like to suggest that we keep our aquatic eyes open for good ideas and seek new possibilities in fish foods to supplement the regular fare. Good luck and may your search find a new way to put a ripple in your tank! ●

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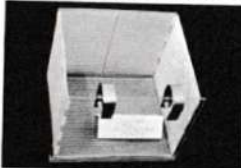
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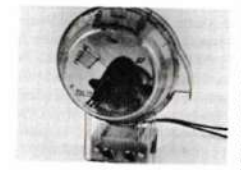
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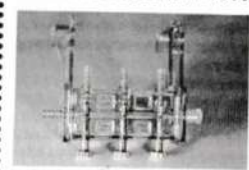
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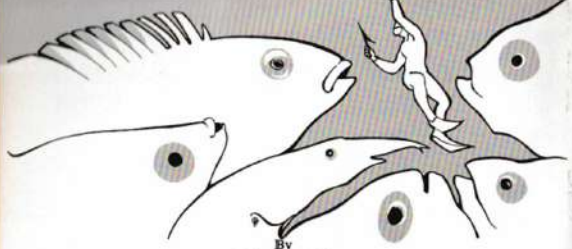


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Societies at Work



By Helen Simkatis

ONE OF THE OUTSTANDING SOCIETY BULLETINS is *Anchor*, published by the San Francisco Aquarium Society. The March issue is no exception to the grade of excellence established by the editorial staff when this publication was first conceived. The last in a series of articles devoted to *Electric Fishes* by Gene J. Gianladis of Saint Louis University and illustrated by Kappy Sprenger, tells us that the study of fishes given to sending off electric charges is far from completed. In finalizing his series, however, he points up the work of Donald Dewsbury of the University of Florida, and that of Braz Walker of Waco, Texas. Students with an interest in the behavioral approach to the study of electric fishes will want to earmark this and the preceding articles for reference. Don Tumminia of Austin, Texas, in his *So You're Moving* relates how he and his wife moved 150 fish 1,700 miles in their small automobile. Cardboard cartons (2) were used to hold the plastic bags. The bags, of course, were insulated, but even with this precaution, a goldfish named Samantha fell victim to the Arizona heat that climbed to 110 degrees F. The cartons were removed from the car at night when stops were made and the fish received aeration. Considering the distance and the number of fish involved, we believe the Tumminias did very well. Samantha was the only casualty other than the fry that were included with adult fish to serve as food for the journey. In *Memoirs of a Pioneer*, E. Calver Bayliss of the Swansea Aquarium Club of Toronto, Canada, takes a look back at fish shows held in the early '20's. Dealing with a public not familiar with the aquarium hobby in those days had its headaches and reading this account of a not too receptive audience reminded us of something we read recently that communication is the lifeline of civilization. Certainly we have come a long way since the '20's in the way of

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communication but even now our "lifeline" seems to break down occasionally. Even so, the uninitiated to our hobby are usually most responsive to tropical fish exhibits today which may serve as hopeful indication that the human race is coming of age. Jack Halloran compares the guppy of 1938 to that of 1968 in a positive way in his *Guppy Points to Ponder* and wonders what 1980 will bring in the way of size, shape, and color. We like his positive approach although he admits there are some defects in the "man-fashioned guppy." Albert J. Klee keeps us on the edge of his chair with his *Peruvian Adventure* in which he describes a hazardous landing of a B-25 on a makeshift air strip which he witnessed and experienced as a passenger in the nose cone of the plane. *A Peruvian Adventure* will be continued in coming issues of *Anchor* and if this segment is a representative sample of the story, we are in store for some more good armchair reading. *What's Happening At Steinhart?* by Louis Garibaldi is a monthly feature of *Anchor*, and this kind of progress report on the specimens held at Steinhart Aquarium offers a behind-the-scenes visit to one of the great public aquariums in the United States. Hobbyists cannot fail to recognize the similarity of problems facing the professional aquarist with their own. This report encompasses an obituary of a young manatee, an aquatic animal which to date has not done too well in captivity; a growth rate of a Queensland Grouper which a year ago measured a meager timid two inches in length and now sports from eight to ten pounds; and various changes made in a panel of tanks containing species especially well-known to aquarists. This particularly well-produced bulletin can be subscribed to for \$2.50 annually (foreign subscriptions are \$3.50 annually). Back issues of *Anchor* for March, April, June, July, August, September, October, November, and December of 1967 are available for 25 cents each. Exchange bulletins for the San Francisco Aquarium Society should be mailed to the society in care of Mrs. Kappy Sprenger, 139 Belhaven Drive, Los Gatos, California 95030. Information regarding the society or its bulletin should be addressed to San Francisco Aquarium Society, California Academy of Sciences, Golden Gate Park, San Francisco, California 94118.

Things diverting their attention to one species of fish are always necessary and we were happy to read *Guppy Roundtable*, published by the San Gabriel Valley Guppy Association (March 1968 issue) for the first time. Midge Hill, editor of the *Guppy Roundtable*, discusses "asexual reproduction" in her *Food for Thought*, appearing in this issue. Her article is based on an announcement by Professor James Bommer of Caltech that toads have been produced asexually. She briefly describes the method used by telling us that the nucleus of a cell from a toad's intestine was implanted in an egg from the

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same species after the nucleus of the egg had been removed. The egg developed into a toad identical to that from which the cell had been removed, i.e., the "parent" toad. Thus a genetic duplicate of the parent was produced in that its genes all came from a single individual. Asexual reproduction, Editor Hill explains, is made possible by the fact that every cell of every living thing contains all the genes necessary to reproduce a "genetic duplicate." A slip from a plant such as an African violet works on the same principle. She then points out the advantages such reproduction would have for the fancy guppy breeder. He could reproduce his best fish as many times as he wanted to, without the fear of "foreign genes" spoiling, or modifying the progeny of his "perfect" specimen. On the other hand, she warns, such reproduction might perpetuate certain undesirable characteristics should the specimen being produced carry them. The *Guppy Roundtable* is a lively bulletin reflecting a lively club and information regarding both can be had by writing Mrs. Midge Hill, Editor, 9903 Candia Drive, Whittier, California 90603.

The Oklahoma City Aquarium Society held its first business meeting in February and mailed out Volume I, Number 1 of its bulletin in March. Still un-named, this publication is neatly and tastefully produced and is certainly a credit to a society that has just gotten off the ground. *Let's Raise Some Black Tetras* by Bryce Tallor covers breeding procedure for this aquarium favorite very well and is a reference piece for those with such a spawning program in mind. Linda Gale's *My God! It's Mama!* will send any reader into gales (no pun intended) of laughter despite the fact it is a rather grim account of how the author brought a female *kribensis* through dog-bite. These are only samples of the material found in this bulletin which should be dignified with a name in months to come. It is seldom that a society publication comes of age in its first issue but this one has. Write to the Oklahoma City Aquarium Society, P.O. Box 19023, Oklahoma City, Oklahoma 73117 for information regarding the club and its publication, copies of which incidentally are 25 cents each.

In the March issue of *The Tropical Breeze* (published by The San Diego Tropical Fish Society), Guy Jordan in his column *Scanning the Periodicals* offers some cogent advice on the care and maintenance of editors of society bulletins. His remarks were prompted by the many excellent editors who have "dropped out" for lack of support and appreciation by the associations which they have served although he admits some have been lost for other reasons. There is little we can add to his observations because in a few words he has described the editor's lot but we should like to point out that the society that has an enthusiastic and dedicated editor should consider

itself blessed. Appreciation is best expressed by support in the way of articles, news items, and a helping hand with the mechanics of getting out a bulletin. Ginny Reed's poem entitled *On Being an Editor* is picked up in this issue and her wistful verses on an editor's plight tell the story most plaintively. There is a well-written article by Josephine White entitled *Why Not Give the Dwarf Gourami a Try* in this same number that will encourage some to work with this often neglected pretty little fish. The author favors a location near a window where the tank receives considerable light. She uses a bare 10-gallon aquarium containing floating plants and points out that because this species is not particularly fussy about pH or DH, it is a good beginner's fish. Herb Meyer's *Bloodworms, The Super Natural Food* will attract those hobbyists who like to venture out and collect their own live food for their wet pets. Write to the San Diego Tropical Fish Society, P.O. Box 4156, North Park Station, San Diego, California 92104 for information regarding the new society and its bulletin.

There is good coverage on the *Banana Plant* (*Nyphoides aquatic*) by Cliff Watson in the February issue of *Aquarium News*, published by The Aquarium Society of Eastern Connecticut. This interesting aquatic prefers a temperature in the 60 to 70 degree range, the author tells us, and requires a well-lighted location. It can be propagated by leaf-cuttings but a floating leaf should be used. The Aquarium Society of Eastern Connecticut meets at the Oswegatchie Firehouse, Route 1A, Waterford, Connecticut and information regarding it and its publication may be had by writing Charlotte Watson, Editor, 572 Meeting-house Lane, Ledyard, Conn. 06339.

Native fish buffs will find Edward L. Feiler's *On Minnesota Sunfishes* in the March issue of *Aqua News* (published by the Minnesota Aquarium Society) excellent coverage of these candidates for the home aquarium. Five sunfishes of Minnesota are given attention. These include *Lepomis macrochirus* (the bluegill), *L. humilis*, *L. gibbosus* (pumpkinseed sunfish), *L. cyanellus*, and *L. megalotis*. The species are described, information on their care is given, and methods for collecting these cichlid-like natives are discussed. This is notebook material for those especially interested in native fish. *Aqua News* is a well-prepared bulletin with an attractive new cover design of two stylized angels in dark green superimposed on light green. We regretted to read a letter of resignation by Dallas Knight who has served as Editor of *Aqua News* long enough to establish a reputation as a fine editor and writer of aquarium literature. Write to the Minnesota Aquarium Society, 601 35th Avenue, N. E., Minneapolis, Minnesota 55418 for information regarding the association and its publication.

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ABOUT OUR AUTHORS



GIMMIE LU COX

Miss Gimmie Lu Cox lives in the suburbs of Harrisburg, Pennsylvania. Her academic interests have been in the fields of science, psychology and education, and currently she holds degrees in Education (Master's and Science (Bachelor's)). To add to this, she is also a Registered Nurse and for the past eight years, has been so employed in the local public school system. Prior to public school nursing, she taught chemistry, microbiology, pediatrics, anatomy and physiology in schools of nursing.

Presently, Gimmie Lu has fifty aquaria in her basement. Although she occasionally spawns egg-layers, most of her tank space is used for the breeding of fancy guppies. Raising guppies gives her an opportunity to work in areas of aquatic science which provide her with interesting projects for research and study. She is especially interested in the challenges which exist in the areas of nutrition and genetics.

Gimmie Lu is an active member

of the Harrisburg Camera Club and the Susquehanna Aquarium Society. She is Program Chairman of the latter and has produced a slide program concerning its activities entitled: "A Society In Action—The Susquehanna Aquarium Society". This slide series was purchased by Aqua Engineers, who has made it available through its slide rental service.



EDWARD SYMMES

Ed Symmes became interested in fish at a very early age. Indeed, there was only one hobby that he enjoyed as much as watching nature, and that was sketching it. The latter interest ultimately led him to the University of Florida's School of Architecture and its Design Program from which he received a Bachelor of Design degree in 1962. Ed then moved his wife and two young daughters to Atlanta, Georgia, where he has been working in advertising.

In Atlanta, his early aquatic

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THIS IS MY PROBLEM

by HELEN SIMKATIS

From: Tommy King, Brownwood, Texas.

I have a well-planted 10-gallon tank in which I keep one common angel and one veiltailed angel. The temperature stays at approximately 78 to 80 degrees F. The fish are fed dried daphnia. This is all they will eat. I have tried color food on them but they will not eat it. The veiltailed angel keeps its color but the plain angel is almost always white. They are fed live baby guppies three times a week. Does the plain angel stay white because it's afraid of the veiltailed angel?

Answer: There may be a number of things that could keep your plain angel pale in color. If the two fish do not engage in combat, however, I do not believe the veiltailed angel is responsible for the paleness of the plain or common angel. A brightly lighted aquarium could cause the plain angel to remain pale, or your presence might. On the other hand, if the two fish eat regularly and show no signs of distress, they are probably getting along well in the environment you have supplied for them. Their diet is probably adequate, but I would suggest that you give them a feeding of newly hatched brine shrimp occasionally. Every serious hobbyist

should learn how to hatch brine shrimp eggs and keep some going. You will have to know how to do this if your angels turn out to be a pair and spawn. Very good directions for hatching brine shrimp eggs come with the container in which they are sold. I can't guarantee that feeding your plain angel brine shrimp will darken its color but at least you will know it is getting one of the most nutritious foods for fish.

From: Philip Levin, Brooklyn, New York.

Presently a 10-gallon tank of mine has become covered with worms. I have not been able to identify them so I am giving you a description of them. To move they contract their bodies. They are about one-eighth of an inch long. They appear white. I cannot see how these worms have gotten in the tank since I have not bought new fish or plants in a month. If they come from my plants, why are they not in my 5-gallon tank? The plants therein came from the same source. Are they harmful to fish? How can I get rid of them without harming my fish? What kind of worms are they?

Answer: From your description of

the worms that have appeared in your tank, I would guess they are the flat worms, planaria. They came into your aquarium by way of plants. It may be that only a few were on one of your plants and found conditions hospitable in your 10-gallon tank. Perhaps none hitchhiked on plants in your 5-gallon tank, or if some did, conditions there were not to their liking. Those that found their way into your 10-gallon tank were happy there, however, and as you have discovered, prospered. Some fish eat them but apparently they don't taste good enough to most fish for you to employ this method of eradication. They can be trapped by placing a small piece of raw meat on the floor of the aquarium over night. The worms gather on the meat and easily can be removed with the meat the next morning. Permanganate of potash can be used to disinfect plants before planting them in the aquarium. A one-eighth grain of the gillion solution can be used as a 5-minute bath for new plants. Incidentally, although Planaria are unsightly, they are harmless to fish, and in that they feed on waste materials in the aquarium, they will starve to death if the aquarium is kept reasonably clean.

From: Rick Jones, Mayfield, Kentucky.

Is it absolutely necessary to have a thermostat in your aquarium?

Answer: It is not absolutely necessary to have a thermostat or a thermostatically controlled heater in your aquarium but, of course, they are most helpful. An efficient thermostatically controlled heater obviates your having to check the temperature of your aquarium constantly. It also makes an allowance for the times when for some reason you turn the heat down in the room where the tank is kept, such as during the sleeping hours. Even with their use,

however, the temperature should be checked occasionally because these rather sophisticated instruments have been known to fail. Tropical fish require a constant temperature and drastic changes often cause fish to contract ich or other diseases. On the other hand, long before thermostatically controlled heaters were on the market, many aquarists were successful in keeping the temperature in the aquariums in the desired range. There is no doubt that the controlled heater is a useful aquarium tool but a conscientious hobbyist certainly can operate without one.

From: Carl C. Hartz, Jr., Norristown, Penna.

Recently my father-in-law purchased two *Abramites* headstanders for his 50-gallon tank. Almost immediately they began nipping the fins of other fish in the tank. Within 48 hours they had done considerable damage particularly to a number of varieties of angels. One black lace angel lost about 80 percent of its fins. Prior to the purchase, Dr. Innes' book was consulted which leads one to believe the fish would be well-behaved in a community tank. Was this behaviour an unusual occurrence or have you later information which tends to support what my father-in-law experienced?

Answer: *Abramites microcephalus* is only moderately desirable for the community tank. Sterba describes it as quarrelsome with its own kind when large or adult. It is quite common that individuals of many species reputed to be peaceful are exceptions to the rule. Whenever a new species is introduced into an aquarium care should be taken that the established fish do not abuse it and, of course, that it does not attack the established fish. Whenever a bully shows up in a community tank, steps should be taken to remove or

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COLOR & AQUASCAPING

by GIMMIE LU COX

THE SELECTIONS OF GAYLY COLORED ORNAMENTS, gravel and artificial plants increase each year, giving the aquarist more freedom in aquascaping. Some individuals can combine these bright new colors without any reference to color wheels or laws of harmony, and do a beautiful job. On the other hand, there are many who avoid color in aquascaping, fearing a gaudy finished product. With a knowledge of color fundamentals, the hobbyist can plan his aquascaping with confidence. After these basic skills are acquired there is no end to the beauty that can be created with the use of bright colors in aquascaping.

All colors are divided into two classes: *chromatic colors*, as reds, greens, purples, blues and yellows; *achromatic colors*, including black, white, and the series of grays intermediate between black and white. For simplicity, chromatic colors will be called "colors," and achromatic colors, "neutrals."

There are two general laws of harmony: (1) The colors used must be related to one another in some definite way; (2) one color must dominate; equal competition between colors should be avoided. Simple color harmonies usually fall into one of the following groups; a single color with neutrals, adjacent or analogous colors, complementary colors, or triads.

A Single Color with Neutrals: A real discord is impossible when a single color is used with white, black or gray. But guard against giving the color and the neutral equal prominence in the design. A warm color on the red or yellow side is generally most effective with black or dark grays; a cool color on the blue or green side is most effective with white or light grays. The use of red and black is one of the most vivid examples of using a single color with neutrals in aquascaping. Red gravel mixed with a small amount of black gravel, red plastic plants, a black background and black or red-and-black fish. This is guaranteed to be a conversation piece.

When a pure color is more pale than its basic hue, a variation in the

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William T. Innes, the last member of the group of five greatest American aquarists.



Richard Dorn, one of our great pioneering aquarists and a member of the group of five greatest American aquarists in the history of the hobby.



Walter Lannoy Brind, one of the important aquarium pioneers in America.

A HISTORY OF THE AQUARIUM HOBBY IN AMERICA PART B BY ALBERT J. KLEE

WE LAST LEFT OUR ACCOUNT at about 1902, the date of publication of Eugene Smith's book, *The Home Aquarium And How To Care For It*. The period 1900-1910 was an important one for the embryonic aquarium hobby in at least two respects: the appearance upon the scene of four titans of the hobby, chronologically Walter Lannoy Brind, Richard Dorn, William T. Innes and Emile Bade; and the fact that this period saw the commercial importation of fishes from Germany for the first time on a regular basis. Let us start with the titans first.

Walter Lannoy (or Delannoy) Brind was born in the year 1873, of British parents, at Mussooree, North West Province, India. He usually accompanied his father, a civil engineer, on his trips of inspection for the British Government. These inspections included irrigation works as used for rice fields, and bridges over rivers. While on these trips, Brind's father customarily shot mahseer (a sort of carp, as game as any salmon) as they leaped out of the water in their efforts to evade the nets spread to catch them. This was considered great sport and called for crack marksmanship.

Later, as a small boy in England, Brind made a hobby of catching trout and other native fishes, keeping them alive in aquaria he himself had made. In 1896, on the basis of experiments he had conducted with trout, he was made manager of the Weston Fishery, located near Norwich, England. This later led to appointment as manager of the Solway Fisheries, near Dumfries, Scotland, after which he took charge of experimental work in the Fish House at the London Zoological Gardens. In London he met Dr. Albert Guenther, then head of the Department of Ichthyology at the British Museum. Brind also met two assistants to Dr. Guenther, Dr. C. Tate Regan and Mr. E. G. Boulenger. Guenther and Regan proved to be among Britain's most distinguished ichthyologists of all time, and the last-named, one of her most distinguished professional aquarists.

When Brind emigrated to the United States in 1899, therefore, he

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Members of the expedition negotiating a quebrada crossing. There was so little light in the jungle, that it was only possible to obtain pictures at breaks in the jungle such as this one.

AN AMAZONIAN ADVENTURE PART VI

by ALBERT J. KLEE

PREPARATIONS FOR RESUMPTION OF TRAVEL the next morning were carried out by all in a highly cheerful manner as it would not be long before, after negotiating a few more sacaritas, we would temporarily abandon our canoes and tackle the jungle on foot. In an hour, we had

packed, eaten, and broken camp.

After a short time on the river, Babalonia pointed out a landing spot for our canoes. Leaving Arnaldo to guard our belongings, the rest of us followed Pedro and Babalonia into the jungle. One of the things that slowed us down the most, however, was in crossing the quebradas, or creeks, that crossed our trail. These quebradas were generally in deep ravines and consequently, it was not possible to ford any. We were obliged to use the fallen logs that characteristically spanned them. Although the natives seem not to have any trouble in crossing the logs barefooted (indeed, Pedro and Babalonia scooted across them as if they had spiked golf shoes on!), it was not so easy for us. The logs were of small diameter (some less than 8"), wet and covered with slime. Our boots were unable to gain a good purchase on them, and the weight of the equipment we carried did not help. It would have been a serious thing had any of us "gone over," but much to our surprise, we made every one.

We did not escape the jungle unscathed, however, for we were menaced by thorns, tree prongs, and certain vines. Tree thorns are frequently in a vertical position and penetrate the skin deeply, forming nuclei for infection. There are some plants that have a poisonous fuzz which penetrates the skin, depositing a drop of acid that produces strong pain and burning. Occasionally, the pain produced by such contact causes cramps or partial paralysis of the affected limb. Further, I would recommend to all jungle travelers that they do not touch the milky sap of trees or rattan palms, for they can be a very effective poison.

At one point in our travel I chanced to stumble, and I reached out and grabbed a vine to regain my balance. Unfortunately, the vine was covered with short thorns which tore the palms of my hands. I resolved not to grab at anything again, and when I stumbled the very next time, I let my body fall against a tree trunk. It turned out to be a thorn tree, and about 20 or so 2-inch thorns skewered my arm. The thorns entered to a depth of about 1/2 to 3/4 inch, right through the cloth sleeve of my shirt. There was a great deal of blood after I pulled my arm away, and the khaki color of my shirt turned crimson. Other than to sprinkle sulfa powder on the wounds there was little I could do. Infection subsequently set in and it was two months after I returned home to the States before my arm recovered fully. Doc Stone was not so lucky. He tripped and fell from a high log, and in the process landed on a thorn tree right on his palms. The resultant infection caused golfball-sized blisters on the inside of his hands, and he was in poor health the remainder of the trip.

We were wending our way through the jungle on a narrow path, single file, when the sixth man in the line called out that the first five men had stepped over a snake, neatly coiled in the center of the path! This caused some consternation since a bite from a poisonous snake is a

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A pair of *Tilapia mossambica* in spawning "dress". The female is to the left.

HARRISON: continued from page 9

At present there are *T. mossambica* inside the Zoo compound well over twenty-four inches in length. The fish spawn successfully, even dramatically, the year around so that in most seasons the presence of fry is constant. The reproductive process goes on in the presence of bass, bluegills, gar, Texas cichlids, and a great variety of other potentially hostile fish. It appears that only the lack of space inhibits their growth and multiplication. There are hundreds of fishing birds, both large and small, in these waters but no natural enemy or condition of the environment has inhibited the evolution of a tremendous population of this fish.

The canals and lagoons inside the compound are separated from the river system itself by numerous metal mesh screens intended to keep the fish more or less where they are. However the normal drainage into the system has led to the spread of the *Tilapia* and other introduced species southward to more open water. Since this fish can adapt readily to salt water, the prospects for permanent establishment of a new species in the Gulf fauna is nearly a certainty. While adult fish may have trouble negotiating the barriers to escape from the Zoo area, younger fish can and do escape, mature and spawn.

Our first indication of the penetration of the *Tilapia* to the outer system was a personal hand netting of several young specimens a few miles away from the Zoo. Later investigation led to the discovery of young adult fish in a lily pond upstream from the spawning area.

Pan-size fish of this species are now taken by fishermen as far as twenty miles from the spot where they were introduced.

The San Antonio strain of *T. mossambica* are characterized by prodigious growth, great fertility and outstanding color. This may be explained in part by the abundance of suitable food available. The bird collection in the Zoo is fed in a manner that allows the fish population to eat to capacity each and every day. The waterbird diet is based on fresh whole-wheat bread and salad vegetables which even large *Tilapia* seem to enjoy.

Recent observations indicate that the *Tilapia* in this system spawn initially at a size greater than that reported for them in their native waters. Spawning nests, which are often upwards of three feet in diameter, are guarded by the male who retains his spawning color for about two weeks. These males are of a velvet-black color with the upper portions of the caudal and dorsal fins edged in bright-red which is visible at great depth.

After the fry leave the protection of the parental maw they spend much of their time at the surface gulping air. This is not a trait of the species, and so is believed to be a result of adaptation to crowded conditions in the lagoon and canals. It is not uncommon to take two hundred inchlings in a gallon jar-trap baited with bread. These fry

Tilapia mossambica is ready for breeding at a length of about 2½ inches, although the pair pictured here is double that size. In nature, they sometimes reach a length of 24 inches!



As part of the spawning ritual, the pair cleans the gravel from a site on the bottom of the tank.



The eggs are guarded by the male but are ultimately taken up by the female into her mouth. In 10 to 12 days, the young hatch, sometimes returned to the female's mouth when alarmed.

adapt readily to commercial aquarium seawater solutions brought in rapid stages to a specific gravity of 1.028. Whether the salinity of the water would encourage or inhibit reproduction is not known by this writer at the present.

The passage of seven fruitful years offers some assurance that the species is established in its present new waters, but that may not be the end of the story. This fish has a little to recommend it as a game fish. In hungry areas of the world the addition of a fruitful food fish



During breeding, the male *Tilapia mossambica* is a deep black, as shown here. At this time also his lips thicken, and his mouth enlarges. Out of breeding season, the male is much lighter — a metallic green in most instances. One feature is characteristic, however: the presence on the tail of an orange border. The white jaw is characteristic of the spawning phase where the orange tail is present all of the time.



Females are light-colored, in breeding season and out. Also, she displays a series of dark blotches along the side. These are not absolutely guaranteed, however, and depend upon the individual and its state.

might make a difference to the population.

Observations to date have shown no drastic alterations in the composition of the aquatic fauna, since all species which live in these waters continue to flourish. In conclusion it is suggested that there are many potential sites for introduction of new species which might have far-reaching effects on a number of aspects of the hobby and the history of fishes. Reports on other experiments in the introduction of new species will follow. ●

The package was mailed to me by my good friend, Bruce J. Turner, now a graduate student at UCLA. It contained two species of killies, *Austrofundulus dolichopterus* (which will be the subject of a future article) and a new, as yet unnamed and undescribed, species of *Nothobranchius*. These fishes were the gift of Richard Haas of the same institution, and had been bred by him. Bruce took care of the mailing and sent me some information on the species. As you will realize from the photographs, this new *Nothobranchius* was more than enough to gladden the heart of an aquarist.

The fish were part of an F₂ generation from wild stock, which had come into Dick Haas' possession by a rather circuitous route. I received a male and two females, six weeks of age, the male already colored up and intensely beautiful. Bruce stated in his letter that he considered the fish more beautiful than even the fabulous *Nothobranchius rachovii*. Making a choice like that is like choosing between Raquel Welch and Claudia Cardinale!

Let's start off by reviewing what we know about these fishes. First of all, let us emphasize that ichthyologists have difficulty clearly defining the genus vis-a-vis the genus *Aphyosemion*. In general, however, these fishes are stocky, are found in savannahs of eastern Africa, and are *annuals* (at least in nature), i.e., they occur in waters which only exist during the rainy season, the eggs lying in the sediment during the dry season and hatching when the rains come anew the following year. Like many American species of killies, they prefer cool water, but can tolerate conditions of high heat and low oxygen better than other fishes. Albert J. Klee, the editor of this magazine, reviewed the genus some time ago in the JOURNAL of the AMERICAN KILLIFISH ASSOCIATION. He considered the following to be valid species, listed here with their synonyms in parentheses:

1. *guentheri*. 2. *kiyawensis* (*gambliensis*). 3. *melanospilus* (*seychellensis*). 4. *microlepis*. 5. *mkuziensis*. 6. *neumanni* (but not the aquarium fish going under that name). 7. *orthonotus* (*kuhntae*, *troemneri*, *mayeri*). 8. *palmaquisti* (*vosseleri*, *emini*). 9. *patrizii*. 10. *rachovii*. 11. *rubroreticulatus*. 12. *taeniopygus* (*breini*, *robustus*). In addition to these twelve likely valid species, we have the aquarium "neumanni", as well as another new fish currently being called "U-1" (probably from the Lake Chad area), and the fish sent to me and the subject of this report.

The females are not at all distinct from other notho species except for *melanospilus*, in which the female has black spots, and perhaps some others which I have not seen. [It should be pointed out that in the looseleaf edition (at least) of Axelrod et al., on page F.443.00,



Nothobranchius rachovii, another brilliant member of the genus. Although most likely a prettier fish than the new Nyasaland notho (We might get an argument on that!), its eggs take 5 to 7 months to hatch. Consequently, it is relatively scarce and not usually propagated by beginners.

the author(s) were unable to figure out why the fish was said to be "black-spotted", yet their photo illustrates the black spots! Also, as will be clear from the review of the species above, their entry on page F.445.00 is snafu.]

The males are unlike any other *Nothobranchius* species. Whereas they have the brilliant black-edged red tail common to several species of the genus, the anal is intensely red as well and there is a rich, broad red area on the bottom of the fish from the pelvis (or ventrals) to and along the anal. "Redbellied nothobranch" thus would be a good name for this fish. The sides are blue-green with red-edged scales. The dorsal has a number of colorful blotches of blue on black, and is blue-edged. An important (and perhaps diagnostic) character of the anal is that its rays extend beyond the average border of the fin, giving the fin a fringed appearance.

The fish were set up to breed in a 2-gallon drum bowl (the standard set-up), with rain water plus a teaspoon of salt, and peat moss on

the bottom for spawning. Light aeration was supplied. The fish were fed live baby brine shrimp, mosquito larvae and pupae from a barrel in the woods behind the house, and occasional frozen adult brine shrimp, liver and beef heart. They also took flake food.

As with related species, they spawn on the bottom every day, the male enticing the female with rapid short darts, spread fins, and flaring of the gills. A well-fed female is usually ready to breed and will not run away. The spawning act consists of the pair pressing against the substratum, the male seeming to force the female against the bottom with his sides. He wraps his dorsal fin around her and, with quivering, the deed is done! The eggs are somewhat larger than those of *N. rachovii*, and develop much faster. At about three weeks, half the eggs show signs of development. There is a short black line and two black spots, indicating the development of the nervous system. I should point out here that I remove the peat moss periodically and take the eggs out, placing them in rain water with enough acriflavine solution to give the water a faint tinge. When the embryos become very well developed (making the egg somewhat opaque), the eggs are removed and placed in slightly damp peat moss to complete their development. They should remain here for at least three weeks, but I feel that a month or five weeks is preferable. Then, upon adding rain water, they hatch within a day and a half. One can help hatching by getting some carbon dioxide into the water. The simplest way is to add some old microworm culture, a few flakes of fish food, or some dried skim milk.

If the eggs are hatched too soon, the fry are unable to swim ("belly-sliders"), and almost all of them die. This is what happened to my first batch. I salvaged only five fish out of a hatching of about 50. One of these survivors was a belly-slider. All but one of the remainder have incomplete development of the gill covers, giving them a grotesque appearance. This, of course, has no effect on their usefulness as breeders and is not passed on to future generations, being caused by environmental conditions, not by mutation. Many deformed fishes occur because of premature hatching or damage to the fry when handling them, and such fish may be bred and produce all normal fish. They are not mutants!

Right now I have over one hundred eggs from the original fish sitting in peat moss, staring up and asking me when they can come out. I am waiting until the weather warms up a bit (it is now the end of January) and the mosquito larvae come back to my barrel. Of the five offspring that were hatched and raised, I have two females and three males. One of these males is in excellent condition and began breeding at six weeks of age. I will not hatch the well-developed, dry



A view of the Nyasaland *Nothobranchius* under different lighting conditions (and film). Proponents of color photography for identification purposes are on no more solid ground than those who advocate either line drawings or black & white photographs. The description of a fish is by no means simple!

eggs until the live food situation is back to normal, and I propose to start the fry on green water for one or two days, along with their newly-hatched brine shrimp. This worked excellently for *N. guentheri*, and should work as well with this species. Because they develop so much faster than *N. rachovii*, I expect that it won't be long before they are as popular as *N. guentheri*.

AUTHOR'S NOTE: The fish was discovered by a biologist in shallows near Lake Chilwa (S.S.E. of Lake Nyasa) in Malawi (formerly Nyasaland) in East Africa. The lake is located at about 36° E, 14½° S. For this reason it has been called the "notho from Nyasaland", but since the name of the country has been changed, such a colloquialism is inappropriate. A scientific description of the fish, and a scientific name for it, will soon be published by Jubb (Museum, Grahamstown, Republic of South Africa). ●

Suggested Reading

- GOLDSTEIN, R. J. 1966. "The maintenance and breeding of *Nothobranchius guentheri*." *The Aquarium*, 35(9):5.
 KLEE, A. J. 1965. "A quick review of *Nothobranchius*." *Journal of the American Killifish Association*, 2(2):11.
 RICCO, J. F. 1967. "Incubation of *Nothobranchius* eggs." *Op. Cit.*, 4 (2):25.



This barb is affectionately known by its scientific name in diminutive, "gollies" or, more formally, "oligolepis". Its full name is *Barbus oligolepis*.

Both barbs are among the smallest members of the family of aquarium fishes, usually measuring less than two inches. This small size is both an advantage and a disadvantage to the aquarist attempting to spawn them. The advantage lies in the fact that they will spawn in tanks as small as two-gallons, though you are seriously handicapping yourself by using less than an eight unless you intend to cull early and often. The disadvantage lies in the fact that the young are very small and often take a week before they are ready for hatched brine shrimp. As the spawning behavior of both species differs only in minor details, they will be discussed at the same time. Using the method to be outlined, I am sure that you will find that your success in spawning and raising these barbs will exceed your tank capacity for rearing.

These fish, like all barbs, have hearty appetites and so are easily conditioned. It is even possible to condition them on high protein dry food. Take their small mouths and stomachs into consideration when feeding, however, and don't expect them to eat as much as their larger brethren. Of course it is far better to condition them on brine shrimp, tubifex or whatever other live or frozen foods you may have available. They eat practically anything but be sure that your tanks receive enough



A pair of *oligolepis*, female above, male below. The vertical fins of the males have thin black edgings and are reddish.

light to provide them with a little algae to nibble on now and then.

These fish have no qualms about spawning in a community tank and it is therefore best to separate the sexes for a week prior to spawning. Their spawning season is anytime the mood strikes them. I usually condition my females at 78° and spawn them at 80°. Except when spawning, my males are held in a community tank at 75°.

In a week or so the female will become so full of eggs that she will seem ready to burst. Always keep one thing in mind with these small barbs—once the female is conditioned, she *must* be spawned. Both species become egg-bound very easily and often an unspawned female will develop dropsy. In order to keep females from wearing out due to too-frequent spawning, give them a holiday now and then by slowly lowering the temperature to 72°. This will slow down or completely stop egg production for a couple of weeks.

Many people have a great deal of success in spawning, but little or none in raising the young. In order to keep your tanks clean, start by scrubbing the spawning tank with warm salt water. Use no natural plants as these cannot be sterilized very well without killing them. Since both species spawn in plant thickets, add a number of spawning mops such as



A pair of cherry barbs, male below, female above. The sexes are distinguished as follows: the female is darker than the male, and at breeding time, the male is a deep cherry-red. Out of breeding colors, the sexes are a bit more difficult to distinguish. One can, however, rely upon the darker markings of the female.

are used with panchax. These can be boiled without harming them. The mops should occupy about one-third of the tank on the darkest end and not be too thick or the spawning pair may lose track of each other in them. These mops should reach to within an inch of the tank bottom. Below this artificial thicket place a handful of loose nylon yarn to catch those eggs which miss the mops. In my experience, eggs which lie on the floor of the tank seldom hatch.

Add the female first, about an hour before the male. Early evening is the best time for this as they can start courting but will not actually spawn before the next day. The tank should be filled to about six inches with tap water aged only long enough to get out the chlorine and allow the bubbles to work off. I aerate the water while aging but turn off the stone before adding my spawners. Be sure your tank contains no sharp rocks, thermometers or other things which your fish can bang into. They are very active spawners and I once lost a beautiful male cherry barb when he broke his jaw against a thermometer.

If your tap water is over 15 DH it will need softening. Soften the water *after* the spawners are added as this will accustom them gradually to the change. pH is of little importance so long as it is within reason. A small amount of peat moss can be added to toughen the eggs if you wish. At the same time you are softening the water, slowly raise the

temperature to 80°. Placing the tank where it will catch the first rays of the morning sun seems to be a great stimulus. If your pair is perfectly conditioned, this will often act as the trigger which starts them going.

In spawning, the male displays to the female, stretching his fins and quivering in front of her in a sort of sideways swimming motion. She will avoid him and the courtship turns into a wild chase about the tank. Occasionally, the male will nip at her vent. Eventually she gets the message and swims into the thickets where she allows him to come alongside her.

The pair press tightly together and roll over on their sides, sometimes performing a complete barrel roll. There is a sudden trembling spasm during which several eggs are expelled and fertilized. Usually there will be another short chase before the next spawning. If the pair is well fed, they will seldom eat the eggs during spawning, but the aquarist must be alert to remove them as soon as they have finished or a caviar hunt will begin which will eliminate all but a few eggs.

The eggs can be seen sticking all over the yarn. Most of them will be in the same area although many will have been scattered by the violence of the chase. In about 36 hours or so, depending on temperature, they will hatch. I don't use any fungicide as this is such a short time that the eggs will seldom fungus in a clean tank unless they are infertile to start with. Don't be discouraged if the tank seems empty for four or five days. The fry are very small and transparent and until they absorb their yolk sacs and swim up off the bottom, they are extremely difficult to spot.

As soon as they are free swimming, they must be fed. The only first food which has ever given me much success is water from a very old infusoria culture which I keep in a ten-gallon aquarium exposed to natural light. Such a culture will turn very green with suspended algae and will contain infusoria of all sizes, some of which are barely visible to the naked eye. Be very careful that such a culture does not become contaminated with daphnia or other crustaceans, or there will be little infusoria left for your fry to eat.

At the same time that you begin feeding, add several *full grown* cyclops to the fry tank if they are available. Some authorities consider this dangerous but I have had outstanding success whenever I tried it. These cyclops will spawn nauplii which are exactly the proper size for the more adventuresome fry, and bridge that long gap between infusoria and newly-hatched brine shrimp. On such a diet they will grow almost before your eyes. Be careful, however, that you obtain these cyclops from ponds which contain no fish life, for it is not the cyclops themselves which are dangerous but certain parasites which they harbor. If there are no fish as hosts, there will be no parasites.

Give this method a fair trial and I am sure that you will be pleased with the results. It works very well for me and should do so for you. ●



The frontispiece of Wolf's book, "Goldfish Breeds and other Aquarium Fishes" — a study in the Japanese Fringetail goldfish.

possessed impressive credentials in spite of his tender years. He soon became affiliated with Fred Kaempfer who, at that time, conducted the leading Chicago pet shop (then located opposite Marshall Fields on State Street). Floyd Young, who was later to head Chicago's Lincoln Park Zoo and Aquarium, married one of Brind's sisters-in-law. Thus, Brind figured early among the commercial figures of our hobby.

Although Brind's contributions were important ones, we are not persuaded to include his name in our roster of the five great aquarists in this history of the hobby in America. In our opinion, he missed out by a discernible margin. If could be said of him that he was a "glory-hound," most assuredly he was one of the major controversial figures in our

hobby for years to come. Some considered him arrogant; this, we feel, was unjust and most likely inspired by some measure of jealousy. Brind was an extremely well-educated man for the times, and a linguist of some repute. His somewhat reserved (no one ever called him "Walt"), aristocratic bearing, coupled with an outspoken self-confidence, somewhat dimmed his popularity. We shall have a great deal more to say about Walter Lannoy Brind, and readers will no doubt find him a fascinating personality.

In the past we have called the attention of readers to the fact that certain pioneers have received rather short shift in this hobby of ours, a case in point being Mulertt himself where, in the few instances where he has been mentioned at all, even his name was spelled incorrectly. Consider now the following genera of fishes and the principle species of aquarium inhabitants found among them: *Aphyosemion*, *Aplocheilichthys*, *Barbus*, *Betta*, *Brachydanio*, *Cichlasoma*, *Colisa*, *Corydoras*, *Electrophorus*, *Epiplatys*, *Gasteropelecus*, *Geophagus*, *Haplochromis*, *Hemigrammus*, *Hyphessobrycon*, *Osphronemus*, *Pantodon*, *Polyacanthus*, *Pterophyllum*, *Rasbora*, *Rivulus*, *Scatophagus*, and *Xiphophorus*. In short, we are talking about our barbs, danios, a good number of our catfishes, most of our tetras, the backbone of our livebearers, many of our cichlids, our rasboras, most of our gouramis, a hatchetfish or two, our killifishes, plus the butterfly fish, and the scat. If we were to mention further that these fishes were primarily introduced into America by one man, you might find it hard to believe that his name is all but unknown to present-day aquarists. This man was Richard Dorn.

Richard Dorn, born in Ludwigsburg, Germany, in 1867, emigrated to the United States just after the turn of the Century. His effect upon the fledgling hobby was incalculable. Although not commercially involved (he served, until his retirement, as a New York Customs House officer), he sacrificed much of his own personal savings to effect the introduction of the fishes mentioned. Often he met with failure but his perseverance won out and ultimately established the tropical fishes we rely so much upon even today.

Originally a resident of New Jersey, Dorn naturally joined Eugene Smith's group, THE AQUARIUM SOCIETY. From 1903 until 1930 (at which time he was made President Emeritus) he held some sort of office in that organization. Although Dorn could, and did, write for the hobby, it was not his greatest contribution. By importing these fishes, breeding some and circulating others to those who were expert breeders, he established THE AQUARIUM SOCIETY as the greatest society of its kind in this country and the New York-New Jersey area as the center of the hobby in America.

Richard Dorn, after his retirement, settled in San Diego, California, where he took an active interest in that city's zoo. In January 1943, he died, the fourth in our series of the five great aquarists in the history of

the aquarium hobby in America. One can hardly escape the fact that when you look at the "bread-and-butter" fishes of our hobby today, you are looking for the most part, at the products of Dorn's prodigious efforts.

Next on the scene, number five and last in our small band of "greats," was William T. Innes, Jr. Innes, a Philadelphian born in 1874 and a printer by trade, was at the turn of the Century primarily interested in that then-new pastime, photography. As a child he had shown interest in native fishes and goldfish but at the beginning of the 20th Century, he was not a "hobbyist" in the restricted sense of the term.

While attending a meeting of the COLUMBIA PHOTOGRAPHIC SOCIETY circa 1904, he chanced to mention goldfish (common) to another member. This man, Joseph Powell, turned out to belong also to the AQUARIUM SOCIETY OF PHILADELPHIA, and invited him to the next meeting. When Innes saw, for the first time, truly fancy goldfish, he was converted to the hobby instantaneously.

In our last installment it was mentioned that Herman T. Wolf (a brother of Rudolf Wolf who, by his extensive importations, was largely responsible for creating Philadelphia as the center of the goldfish hobby in America), an officer of the Philadelphia Society, had in 1901 suggested a series of topics on goldfish and allied subjects that the Society might entertain in discussions. As Secretary of the organization, Wolf took detailed notes and these led to the writing of a manuscript. Wolf had tried to get the work published but to no avail and was at the point of burning the whole thing when he mentioned the fact to Innes. After reading the manuscript, Innes offered to publish it.

What followed has become part of the history of our hobby. Innes' father set the entire 385-page book by hand, and Innes himself printed the book on a small job press. The work took almost two years, appearing finally in 1908 as *Goldfish Breeds And Other Aquarium Fishes*. It was well-written and beautifully illustrated (Wolf was an excellent artist and for many years, a number of his large drawings of goldfish types hung on the walls of the meeting room of the Philadelphia Society, until they were stolen in 1909). To the author's credit, the book was a masterpiece and it would not be an overstatement to say that Wolf's book was one of the great aquarium works of all time. But apart from this, it must be said that Innes' contribution was also a masterpiece. It was set in type and printed as was no aquarium book before it. It, of course, established Innes' reputation in the aquarium hobby as a publisher of aquarium literature, and started his ascendancy to prominence within his own Society and the hobby in general.

Before discussing Wolf's book, however, Innes' position at that time must be reviewed, if only to set the record straight. Innes was by no means, *Father Of the Aquarium Hobby*, as is so commonly believed. The goldfish fancy preceded him by some 12 years in Philadelphia alone. Up to about

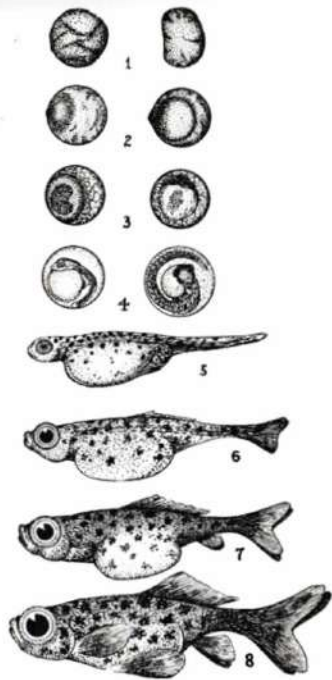


Several of the drawings from Wolf's book. Wolf was an excellent technical artist and each drawing shows painstaking detail.

1910 or 1911 neither he nor, for that matter, Philadelphia hobbyists in general, knew of the giant strides being made by Dorn and his friends in importing tropicals from far-off lands. In other words, they knew little or nothing of aquarium fishes other than the goldfish and our own natives. Neither was Innes, at that time, the "giant" of Philadelphia aquarists. Indeed, when Brind wrote to Philadelphia in 1910, inquiring about that city's knowledge of certain tropical fishes, it was to Wolf that his letter was addressed (although Brind did correspond with Innes as early as 1908, as a consequence of the latter's position as Secretary of the Philadelphia Society).

It might be well also to point out that Philadelphia was by no means the "Birthplace of the Aquarium Society In America," either. That signal honor, as will be made clear, belongs to the New York-New Jersey area. It had a 12-year head-start on Philadelphia, and although Philadelphia ultimately produced many a fine aquarist to rank with the best that New York could offer, it never did catch up with their neighbors to the East. On the other hand, in the field of the fancy goldfish, Philadelphia had no peers in America. Its goldfish fanciers were among the finest, perhaps the best, in the world. But as this is a history of the aquarium hobby and not just of goldfish, we unfortunately do not have the time to develop this interesting aspect in its own right.

Returning now to Wolf's book, we find it to consist of 15 chapters including a very scholarly introduction, and those on goldfish varieties, native fishes, goldfish propagation, feeding, diseases, and aquarium construction. Included also were detailed chapters on aquatic insects, aquatic plants, marine aquaria and terraria. Except for problems in nomenclature, Wolf's plant chapter is still probably the best ever written



Greatly enlarged. Actual size, No. 8, [—]

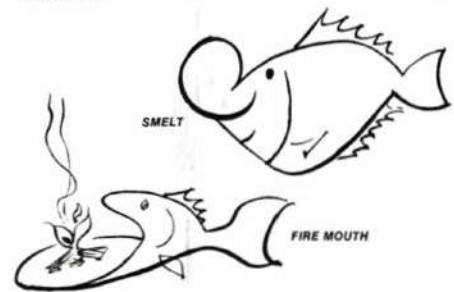
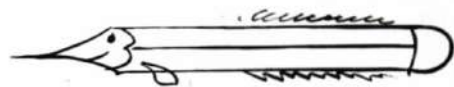
The embryology of the goldfish as presented in Wolf's book.
 1—Newly-exuded egg, unfertilized, wrinkled and unexpanded surface covered with vesicles. Full and lateral views.
 2—Eggs, four and ten hours after fertilization, showing germination and formation of membrane.
 3—Development of embryo and plasmic processes at edge of membrane, 24 and 34 hours after spawning.
 4—Development of alevin and yolk sac, 50 and 58 hours after spawning.
 5—Free-swimming alevin attached to yolk sac, showing skeleton, partly developed digestive organs and surface colors. Four days old.
 6—Alevin five days old, dorsal and caudal fins partly developed.
 7—Alevin seven days old, pectoral and anal fins developed.
 8—The fully developed telescope fry, ten days old. The line below shows the actual length of illustration number 8.

by an American aquarist. His principles of fishkeeping were sound, his advice was detailed and the text was supplemented with 280 illustrations of real value. We reproduce several of them here. Wolf's book later was to form the basis for Innes' *Goldfish Varieties And Tropical Aquarium Fishes*, a book which has appeared in more editions than any other aquarium book in the world. A goodly number of the author's friends who specialize in fancy goldfish and who have also studied Wolf's book, are amazed and annoyed that Wolf has never received his just due (in recognition) from the hobby. In this we concur, finding it to be an old story, recurring far too often. Since Wolf's book formed the basis for much of Innes' later material, perhaps it is to Wolf we owe the debt in the enunciation of the principles of fishkeeping that most every aquarist over the age of 20 today, cuts his teeth upon.

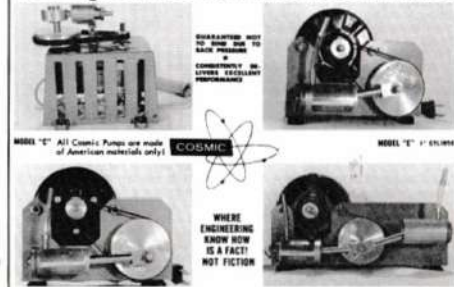
Our last titan, Dr. Emil Bade, emigrated to the United States at about the same time as the appearance of Wolf's book, settling first in New York. Dr. Bade was, upon his arrival in America, already one of Germany's leading authorities on the hobby and hence, one of the world's leading authorities. In 1896 the first edition of his comprehensive book, *Süsswasser Aquarium* (Freshwater Aquarium), appeared. In 1897 he wrote *Die Kunstliche Fischzucht nach dem neuesten Stande* (Artificial Fishbreeding According To The Latest Views); in 1898 he wrote *Der Chanchito als Zierfisch* (The Chanchito As An Ornamental Fish); in 1899 followed *Praxis der Aquaristik* (The Practice Of Aquarium Art); in 1900, two books—*Die Schleierschwanz und Telescopischleierschwanz* (The Veiltail and Telescope-veiltail Goldfish), and *Die Mitteleuropäischen Süsswasserfische* (Middle European Freshwater Fishes).

Bade is not included among the five great aquarists in the history of the hobby in America, however, since his major contributions to the hobby were made in Germany, not here. His influence upon the American hobby was not as great as the others we have mentioned. In a sense his attitude was that since he had already achieved that pinnacle of prominence, why should he do more? Bade did write (somewhat infrequently) for several American aquarium magazines (collaborating with Eugene Smith on one occasion), supplying even photographs from time to time (he was also a pioneer in the photography of fishes). In 1913 he wrote, *Das Seewasser Aquarium* (The Saltwater Aquarium); in 1923 he revised his book, *Praxis der Aquaristik*; up to 1931, he continued to bring out new editions (in German) of his major work, *Süsswasser Aquarium*. In 1911, when a German-speaking only section of the NEW YORK AQUARIUM SOCIETY was formed, Dr. Bade was its President. Possessing considerable stature in the hobby, Bade was frequently consulted by the leaders of the American hobby when important decisions were about to be made. He was often asked to judge shows, arbitrate technical discussions and speak before sundry aquarist's groups. ●

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COX: continued from page 32

brightness of the color has been produced. This is called a tint. When the color is darker, a variation in saturation or purity has occurred. This is called a shade. Tints and shades of the same color can be combined without concern or discord. To be effective, however, the arrangement must bring out contrast between light and dark values, or between different intensities. A dominant role may be given to one of the values by letting it occupy a larger area. Light-green gravel with various shades and tints of green in the plants, accented by the graceful black angel fish, make a serene display.

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The color wheel is one of the best ways to show how colors are related to each other. Some color wheels have only ten colors, whereas others have as many as one-hundred. Use twelve colors and arrange them in a circle like the face of a clock, to show how they are related. Start with the primary colors, red, yellow and blue. Place yellow at 12:00 o'clock, red at 4:00 o'clock and blue at 8:00 o'clock. Next, the secondary colors, orange, violet and green are placed at 2:00 o'clock, 6:00 o'clock

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and 10:00 o'clock on the circle. The clock face has space for six more colors. These intermediate colors are, yellow-orange, red-orange, red-violet, blue violet, blue-green and yellow-green.

Use the color wheel as reference when choosing adjacent colors. Yellow for instance, is the common factor of green, yellow and orange. Another set of adjacent colors are blue, blue-green and green. Blue and green alone might clash; however, with the blue-green to blend them, harmony can be established. One of the colors should, of course, dominate. Adjacent colors are easy to use in aquascaping. Green plants, blue-green gravel and blue gouramies as the fish, would adhere to the plan of using adjacent colors. The color scheme need not be this confining. The number of colors can be expanded by using a "mutual complement," which combines five adjacent colors (such as, blue-violet, blue, blue-green, green and yellow-green) with the complementary of the middle one, (red-orange).

Harmony of Complementaries: Complementary colors fall directly opposite each other in the color circle. Red is the complementary color of green. Blue is directly across from orange. Blue-violet is complementary to yellow-orange. Complementary colors are a balance of one warm and one cool hue.

For nearly every purpose it is best to have one of the complementary colors dark; the other, light. Pure complementary colors cause strong vibration, which is unpleasant. By choosing a tint or shade of one of the colors and giving one a smaller space than the other, the opposite is enriched and strengthened and forms one of the best harmonies. Gravel and a background of blue tints and shades would be pleasingly accented by the use of the most brilliant orange plastic plants. If the blue gravel and background chosen should be a vivid, strong blue, and the orange plants brilliant orange, it would attract attention and bring comments concerning its beauty. However, after a few weeks the owner would more than likely become dissatisfied with his aquascaping due to the eye fatigue created by using complementary pairs of colors at full intensity.

"Split complementaries" concerns using, with a given color, the hues on each side of its true complementary. An example that could be used in aquascaping is violet with yellow-green and yellow-orange. Gravel, background and plants in tints and shades of yellow-green, yellow-orange fish such as the *varietus platy*, and accents of violet in the ornaments make a glowing display.

Triads: Three colors which appear approximately the same distance apart from each other on the color wheel, form what is called a "triad". The most conspicuous triad consists of the three primary colors, blue, yellow and red. Beautiful color effects can be obtained with a triad group; however, care must be taken to avoid disagreeable contrasts. One of the safest ways would be to use the tints or shades of two of the colors and

include small additions of the third color at full intensity. In using blue, yellow and red for aquascaping, tints and shades of yellow and red, with accents of blue could be worked out nicely. Use the red tint in the form of pink. The red and yellow used for the majority of aquarium decorating could then be accented by bright blue, possibly in the ornaments.

For many years discord was avoided by using colors that were sufficiently dull or pale. To have "good taste" was to oppose any vivid or strongly contrasting colors. Today people want to take advantage of the pleasant effect of bright colors and study the methods for using them harmoniously. These methods, when applied to aquascaping, can bring rewarding results.

EDITOR'S NOTE: Miss Cox's article is well-researched and represents a real contribution to the science of aquascaping. As far as artificial ornaments and plants are concerned, however, there are aquarists at two extremes, i.e. those who freely accept their use, and those who do not. I, for example, include myself in the latter category. Under certain conditions I have found artificial plants useful (e.g., in the tanks of plant-

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eating fishes, and for use as spawning media) and as these become more difficult to distinguish from the real thing, the major objection to their use will disappear.

The case for ornaments such as "belching hippopotami," on the other hand, is less convincing. Among the files of the Croydon Aquarists' Society (Great Britain) in 1963, the following was found:

"Recommended Standards for Tank Furnishings Other Than Fishes and Plants.

1. Divers should be large-headed, big-booted and of heroic stance. Any sign of Duck's Disease will be penalized. Inclusion in the same tank as number 5 below to be considered dangerous.
2. Frogs. Bubbles ejected from the mouths of ornamental frogs shall be spherical, 1 inch in diameter, and released at regular intervals of 30 seconds. Bubbles passing out from the other end will be disqualified. The frog is to be highly colored and of no known species.
3. Sunken galleons must be small enough to look ridiculous when compared with the accompanying fishes, and must not be shown in marine tanks where they might appear more logical. It is recommended that they be placed poop over sprit. The Captain must always be visible, as a ship which sinks without its Captain will be penalized as unsporting.
4. Glass marbles are to be at least half an inch in diameter. the larger the better as more decaying food and other debris can be accumulated between them. Colors are to be violent and to clash with one another as much as possible.
5. Mermaids will be judged in two parts. The upper half is to resemble as nearly as possible Bridgit Bardot, but with hair reaching to the waist. The bosom must be well developed and evenly balanced. The lower half should bulge attractively at the hips, then taper off disappointingly to end in a caudal fin unlike that of any known fish.
6. Treasure chests should have four sides and a lid. The lid may be permanently open, in which case the treasure should be tawdry and glittering. When the lid is closed, but bursts open at nerve-racking intervals to release a gob of air that knocks fishes sideways, no one will care whether there is treasure or not. Preference will be given to chests so overgrown with algae as to be

unrecognizable.

7. Submerged castles must give no indication as to why they are submerged. The highest turret must be below water level; aerial turrets will be penalized. There should be enough room inside for dead fish to lie unnoticed. The architectural style recommended is Butlin's Fun Fair, early period.

Scale of Points	
Whimsicality	20
Gaudiness	20
Futility	20
Disproportion	20
Tastelessness	20
Total 100"	

As usual the pages of this magazine's column *ADVERSARIA*, are open to those aquarists who do not agree. ●

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ACROSS

1. A type of loach
4. Covers to aquaria
8. Where most of our fish come from (abbreviation)
9. A native killifish
11. The kind of organs barbels are
13. It makes water hard (chemical symbol)
14. Eagle's nest
15. First two letters of what used to be called "panchax"
16. A business with tracks
17. Close (abbreviation)
18. Cain's brother
20. Thus
22. Osculating gouramis
24. A nickname for a catfish.
28. A favorite striped aquarium minnow
30. The type of water we don't usually breed tropicals in
31. Half of a breeding pair
32. An Editor's initials
34. Inborn
36. An aquarium organization specializing in certain spiny-finned fishes (initials)
38. What a fish with folded fins is with his fins
42. To say again
43. *Pterophyllum's* instrument

DOWN

1. Fish with no scales
2. A popular cichlid
3. Without it, no hobby
4. Small characins
5. Preposition
6. Native predatory fish
7. Aquarium molluscs
9. *Corydoras* seem to do this at times
10. Pearl gouramis
12. Chemical symbol for a metal found in thermostat contact points
19. To exist
21. Squeeze out slowly
23. A type of catfish with big lips
25. What big fish pose to little fish
26. A University degree (abbreviation)
27. A kind of fancy goldfish
29. Toothcarp club
31. A form of algae
33. What plecostomus do with their mouths
35. A type of large aquarium barb with a distinctive body marking
36. Same as 36 across
37. Right in the middle (abbreviation)
39. Position in football (abbreviation)
41. "What did you say?"

The answer to this puzzle will appear next month.

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interests again blossomed. He was one of the founders, serving the first full term as its President, of the *Greater Atlanta Aquarium Society*. For a time he edited the Society's quarterly, the *GASSETTE*, a job which his wife Rhena has since taken over. In the art department, he has sold several nature paintings, received an Honorable Mention in the Aquatic Life Art Exhibit held in Milwaukee several years ago, and was Art Consultant to *AQUARIUM ILLUSTRATED* magazine. Currently, he is a member of the *American Goldfish Society* and the *American Cichlid Club*.

In 1966 he organized Aquatic Associates, which maintains and installs office and home aquaria in the Greater Atlanta area. Ed is now busy photographing aquatic and other nature subjects to illustrate articles and slide programs. ●

continued from page 31

separate it from its victims. This is certainly the humane thing to do.

From: Bill Avery, Greenhills, Ohio.

When I was feeding my fish this morning I discovered a worm-like thing floating around the top of the water. It had a cocoon made of plant leaves. I have read a lot on enemies of fish in an aquarium but none have appeared to resemble this thing. Can you tell me what it is?

Answer: This is the Caddice Fly (*Trichoptera*) and is often found in fresh water. This is the larva stage of the Caddice Fly which is a four-winged insect sometimes mistaken for a moth. It goes through four changes—first an egg, then the stage you have seen, the larva stage, pupal, and flying insect. The first three stages are aquatic. There are three common species found in running water. The tube of *Halesus argus* is made of leaves, sticks, and a few tiny

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stones to give it weight. *Platycentropus maculipennis* is found in ponds, and plants and sticks are used in construction of the tube. *Palaetreta frontalis* uses sand and mica. This creature may have come into your aquarium by way of a plant. It would not have hurt your fish.

From: Arthur Ticknor, Canby, Oregon.

I have two climbing perch (*Anabas testudineus*) in an eight-gallon tank. One of them has a row of black spots along its side, the other does not. Other than this, there are no noticeable differences. From this can you tell me if they are a pair? Every once in a while I catch them chasing, nipping, and playing with each other, but no eggs are ever produced. Are they trying to breed? Would it be possible to keep these with a pair of African climbing perch?

Answer: Sex distinction in *Anabas testudineus* is by the difference in the size and shape, not by the markings you describe. The female is larger, deeper-bodied, and of greater width behind the pectoral fins. Juveniles have various markings. Perhaps your fish are still too young to show sex differences in that they are small enough for you to keep them in an eight-gallon tank. They will require at least a 20-gallon tank later. Even then, they will not have too much room and it would not be advisable to share their tank with other fishes. They are a labyrinth fish but do not build a bubble nest. The eggs are laid at random and float to the surface of the tank at which time it is a good idea to remove them to another tank for incubation. Floating plants should be supplied and they like a well-planted aquarium.

Question: What is the smallest sized tank required for breeding *Corydoras hastatus*?

Answer: We recommend a 10-gallon tank for spawning.

From: Mrs. C. Drotsky, Queens, New York.

I am interested in breeding tropical fish and have crossed a female green swordtail with a red-and-black marigold platy. The result is red, black, and white tri-colored swordtails. I would like your opinion as to whether these are considered rare and what price should they sell for approximately.

Answer: A great deal of work has been done in the area of cross-breeding in which you are participating. Newcomers to the hobby very often are under the mistaken idea that because they have produced a hybrid, it should have special value. Hybrids are often produced in this hobby and when unusual color is achieved, such as in your case, the breeder might work toward establishing the strain to the point that at least a portion of the spawnings show the desired colors or the color pattern toward which he is working.

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This often takes a number of years. Your specimens might be attractive to another hobbyist but he would want the youngsters he purchased from you to breed "true" at least to some degree. He would not be willing to pay a bonus price for the fish unless he had some assurance that he was buying fish that would not revert back to type, or fish that would produce young resembling one parent or the other which would probably be the case if he bought your fish in that they are a first generation showing the colors you describe. It might be that the fish you have raised would not breed at all. Very often hybrids are sterile. You are, however, embarking on one of the most interesting phases of our hobby and my purpose here is not to discourage you but to give you some idea of what one must do before he can market what he considers an unusual strain. Much is written on the subject both in publications put

out by aquarium societies and those of a commercial nature. Your public library may have books on fish-keeping which go into breeding and cross-breeding fish. You should read as much on the subject as you can.

From: Malcolm Meldahl, Wallingford, Conn.

Question: What other species might be used with *Apocheilichthys lineatus*?

Answer: *Apocheilichthys dayi*, *A. pan-chax* and any of the larger *Rivulus* might be used. Whether you select these species or are content to work only with *A. lineatus*, the males should be well-matched in size and drive.

Question: What water conditions should prevail in a breeding tank of *A. lineatus*?

Answer: It would be difficult to find an aquarium water in which this species cannot live. It is tolerant of any reasonable water quality.

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OVERSEAS NEWS

We are pleased to announce the First National Furnished Aquarium Exhibition to be held in Bradford Yorkshire, England on the 12th, 13th, 14th, 15th, and 16th of June 1968.

This exhibition is to take place in the St. George Hall in the center of Bradford, a northern industrial town, and has already begun to attract entries from every section of England. Being solely a furnished competition, all aquariums will be a standard size, (24 x 12 x 12) Metaframe aquarium. Entries are expected to be well in excess of 100. This should create a wonderful spectacle.

To attract a first class top quality entry, big cash prizes are being awarded as follows: best decorated aquarium receives \$240 cash, plus a 6-foot Metaframe aquarium; second prize is \$150 cash, plus a 20 gallon Metaframe aquarium; third prize is \$60 cash, plus a 15 gallon

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PHOTOS:

THE AQUARIUM, A. Roth, P. 4-5, 8, 38-41, 46-48; Robert J. Goldstein PH. D., P. 6-7, 43-45; William A. Tomey, P. 10, 76-78; Gimmié Lu Cox, P. 32; THE AQUARIUM, A. Klee, P. 36, 73-75.

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Metaframe aquarium and cash prizes down to 10th position.

Judges have been appointed from all parts of the country. Mr. Barry Pengilly from Lancashire, Mr. J. Skinner from Yorkshire, Mr. G. Reid from Scotland, and Mr. A. A. Jessop from London. In an effort to attract the general public to the exhibition and further the interest of fish keeping, space has been taken on television. This is the first time an aquarium exhibition has been advertised this way in England. A full color souvenir catalogue has been provided, including in it many articles on fish keeping and tips for beginners.

Most major English equipment manufacturers, plus the Metaframe concessionaries are represented with trade stands. An anticipated crowd of some 15,000 people is expected.

The venture as a whole, is sponsored by K. B. Tropical Fish of Bradford with assistance from the Inter-Pet organization. We at The Aquarium Magazine must praise our British friends for this tremendous undertaking and wish them every success.

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continued from page 27

There is a fine tribute to Thomas J. Schubert in the Newsletter of the South Jersey Tropical Fish Association. Thomas J. Schubert developed the "Schuberti" barb and for this feat alone has earned a firm place in the history of the aquarist's hobby. This was accomplished by "anchoring" a mutation of *Barbus semifasciatus*, a somewhat understated species colorwise but one that enjoyed a modest amount of favor among aquarists. The "Schuberti" barb is a golden strain of this species and has held its place in the hobby since first introduced by Mr. Schubert. In his tribute to Thomas J. Schubert, Robert Adams tells us that the "fish world and the whole world lost not only an active hobbyist but an author, a breeder of great skill, and a friend to everyone." Mr. Schubert ran a tropical fish business for over 30 years in Camden. It was more than a business for it was a place where every hobbyist felt he could go for information, fish-talk, and encouragement in whatever he was attempting to do in the hobby. This in itself is a great tribute to the man for he gave of himself and in any walk of life this is the most that can be said of any individual. The South Jersey Tropical Fish Association meets at the Community Hall of the Cherry Hill Mall, Route 38 and Haddonfield Road, Cherry Hill, New Jersey. Information regarding the society should be addressed to Box 614, Camden, New Jersey. ●

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KLEE: continued from page 37

serious matter in the jungle. Fortunately, the snake turned out to be harmless, but very rare. Win Rayburn captured it but the sight of those who volunteered to hold open the snake bag was something to see! In due time the snake was bagged and we were on our way once again.

After almost 5 hours of hacking our way through the jungle, we neared the Yagua camp. Babalonia went on ahead to announce our presence and explain to the Indians the nature of our visit. It was not safe, of course, to "barge right in." Those poison darts smart! Babalonia returned with negotiations successfully completed, and we entered the Yagua village. Most of the Indians welcomed us cordially, but a few were openly hostile. A rather large thatched lodge served as a communal sleeping area; smaller non-walled structures were used for cooking, weaving and other chores. The Yaguas are a very colorful tribe. The men wear skirts of grass with neckpieces and arm bands to match. The grass is dyed an ochre color, its length reflecting the status of its wearer in the tribe. The Chief, for example, wore the longest skirt. The women, on the other hand, wear very little. Most have very tightly-bound string around their ankles that cut deeply into the flesh. However, they do paint their faces and wear beaded necklaces. The remainder of their costume consists of a short, orange colored skirt of rough cloth.

Lunch with the Yaguas was an interesting experience as it consisted of cassava root and roasted grubworms. I had already developed a dislike for the cassava root as it is dry and tasteless, but the grubworms were something new. They were cooked in a sort of frying pan in ashes, which gave them a slightly salty taste. The head end was crisp, the abdomen end mushy. They smelled and tasted pretty good, regardless of what some readers may be thinking!

We traded with the Indians and I acquired a Yagua drum, the drumheads being made of the intestine of some animal. This I carefully wrapped in a plastic bag. As it was not safe to stay overnight with the Yaguas, we headed back on our long march through the jungle. It was necessary to get back to the boats before dark as the trail was poorly marked and dangerous to travel at night.

It rained hard all during our trek, making the crossing of the quebradas very hazardous. We were all at the very edge of physical exhaustion, although there was one "humorous" incident. Jon Krause, who had also secured a Yagua drum, saw the drumheads dissolve in the rain before his very eyes. They were soluble in water! The rain also affected our cameras and it was two days before I could get my movie equipment to work properly again. Two rolls of film were also ruined. Hours later, when every bone in our bodies ached, we reached the canoes. In a driving downpour, we set out for our camp of the previous evening.

After we reached camp, the rain stopped. Our guides poured gasoline on some wet brush and managed to get a fire going. We had very little

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A vine, covered with short thorns. Because it is instinctive to reach for a vine when one trips, these are a real hazard.



Grass being dried in a Yagua village. After drying, the grass will be dyed in the traditional ochre color used by the Yaguas.



food left but decided to "go for broke" and finish off what we had, hoping that we could secure food from some natives the next day. Stripping down to my shorts, I managed to dry my clothes by the fire. After a while, our spirits rose and we all felt much better. After all, we had "conquered" Yagua territory!

The first order of business the following day was to return Babalonia to his people. Rather than take two canoes for the job, Pedro was elected to take him home while the rest of us waited, anchored at the junction of the Rio Yacarite and a tributary. During the 2 1/2 hour wait, we watched dozens of freshwater porpoises (genus *Sotalia*) playfully break water all around us—they were present in impressive abundance. These animals, called "bufeo" by the natives, appeared in both light and dark-colored phases. We had the very devil of a time photographing

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Note the ankle bands on this Yagua woman. The sling is used for carrying her children. Note also the neck-piece.



A Yagua woman, preparing cassava root for the noonday meal.

A group of Yagua Indians, posing outside of the communal sleeping lodge. The one near the middle with the longest dress, is the chief.



Two Amazon porpoises of the genus *Sotalia*, breaking surface. On occasion, these creatures came within ten feet of our canoes!

them because we would never know just where they would surface next. To my knowledge, no one had ever made a water analysis of such an Amazon porpoise blackwater habitat before, so I secured a sample for an abbreviated analysis, the results of which are shown in Table I. The water was extremely acid and soft. Indeed, there was very little dissolved material whatsoever. Although iron was present, the concentration was not as high as that in the yellowwater streams and rivers I investigated previously. This, however, was to be expected as blackwater obtains its color from the presence of organic material, notably humus, while yellowwater obtains its color from the iron-bearing clay which it carries.

To be continued

TABLE I

Water Analysis: Rio Yacarite, Yagua Territory, Northern Peru, May 1966

pH	5.9
Hardness	less than 10 ppm
Total alkalinity	17.5 ppm
Chloride	0.5 ppm
Iron	1 ppm

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A closeup shows that *Cryptocoryne lingua* closely resembles *C. versteegii*, another squat, fleshy-leaved member of the genus.

Against a background of a Madagascar laceleaf plant, this specimen of *Cryptocoryne lingua* boasts a fruit. Note its rather large size as compared with the rest of the plant.



versteegii, the main difference being that *C. lingua* is a smaller plant.

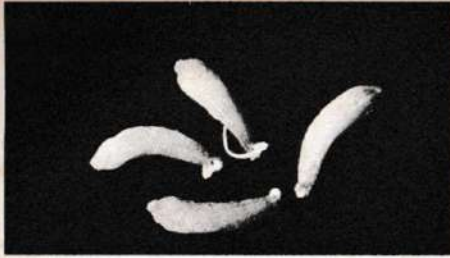
The submersed form of *C. lingua* grows but slowly, and the florescence (or blossom) is very seldom seen. However, in some aquarium setups they do grow very well. What is needed, of course, is a bottom substrate rich in nutrients, i.e., a mixture of sand and soil. Such a substrate is best obtained by planting in pots to avoid muddying the aquarium water. Another requirement is shade; too much light actually deters growth.

On a trip to an aquarium shop some time ago I was pleasantly surprised to find a specimen of *Cryptocoryne lingua* bearing a fruit. For me, this was the beginning of a new adventure. The fruit, which was supported on a greenish-white stem about 1 1/4 inches in length, was formed of several pointed lamellae or covers. Inside these strongly bent covers, I discovered four compartments, each holding 10 to 12 seeds.

The fruit of *Cryptocoryne lingua*, showing its pointed covers.



This closeup of the fruit clearly shows the pistil and one of the seeds nestled within its cover.



Four seeds, showing the hooks referred to in the text. The seeds are banana-shaped, their surface containing many fine grooves.

The seeds were cream-colored and shaped like miniature bananas with very fine surface grooves. One remarkable aspect of these seeds was the presence of small hooks at one end which served to anchor them in the fruit.

The fruit took quite a while to ripen, after which the covers loosened, permitting the fruit to open. As the covers bent outwards, the seed hooks broke under the stress, freeing the seeds. At this point the seeds floated up to spread over the surface of the water. It is still not clear to me whether the hooks are fastened to the pistils or to the covers of the fruit. It may also be that the purpose of these hooks is to hold the whole seed package together until the time comes to release the seeds. There is considerable internal pressure generated within the seeds as they rise through the water because the seeds are provided with an air-filled skin. It is no wonder that they can float upon the surface, to be scattered by wind and wave.

After about 48 hours in the aquarium, the seeds absorbed sufficient water so that they swelled up and sank to the bottom. At this time, germinating took place. When the seeds reach this stage they are completely surrounded by a somewhat clear slimy mass, apparently the remains of the seed skin. It was my experience that fishes as well as snails ate the seeds of *Cryptocoryne lingua* with relish (I have found this to be true also with the seeds of other aquarium plants). Certainly my emperor tetras (*Nematobrycon palmeri*) and even pronounced carnivores such as the halfbeak (*Dermogenys pusillus*) ate them to the extent that I was able to save only a small number of the seeds. However, these survivors have produced young plants. There is a chance then, that *Cryptocoryne lingua* may prove to be satisfactory growers and useful aquarium plants, but in the meanwhile, a few aquarists must take the time and trouble to develop the necessary techniques to insure its popularity. ●



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X-Raying the Digestion



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