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

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

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

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

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

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

## TROPICAL FISH HOBBYIST

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### Contents

Vol. XIV, June, 1966 (#124) No. 10	
The King Cobra Albino Guppy	4
Southern Trichoptera Leaf Fry Grow Better When Thrombosed	21
How to Become an Ichthyologist, Part 3	26
Three Familiar Cyclopteroforms	31
Keeping and Breeding Cichlasoma auratum	35
Indigenous Fishes	49

**FEATURES**  
Notes from all over: p. 17; Mail Call, p. 33; Guppy Corner, p. 44; Sails from The Seven Seas, p. 47.

**COVERS**  
A surprising number of aquarists nowadays keep some of the larger, non-aggressive cichlids. These fishes usually require large tanks of their own and copious amounts of food. Why keep them? Their owners will tell you that no other tropicals come near them in personality and intelligence (at least in their development of intelligence-like instincts). In addition, numbered among these fish are some of the most beautiful of tropicals. The oscar, *Cichlasoma auratum* is a good representative of the group and appears on our cover this month. For the complete story on how to raise and breed this fish and for some more color photos, read the story that begins on page 35. Photo by Wolfgang Bechtel.

**EXOTIC TROPICAL FISHES SUPPLEMENTS**  
Pages 33 and 34, 51 and 52. These pages are prepared for easy removal and pasted in to fit into the Loose-leaf Edition of EXOTIC TROPICAL FISHES.

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June, 1966

## EDITORIAL LY...

I have often dreamed of this happening, but imagine my surprise when last summer it did! In Dallas I was taken to a tank and asked if I could identify the fish in it. Nothing unusual: sometimes the dealer knows the name of the fish in question and wonders if I know it too. Other times he suspects he has been misinformed and wants my opinion, for what it may be worth. But this time I was genuinely astonished. Here was a tankful of a tetra that I had always suspected nobody would want: *Hemigrammus vorderwinkleri*. The only ones I had ever seen before were the ones that had come in with a shipment of cardinal tetras and were named in my honor by Dr. Jacques Gery, of France. To say I was staggered would be putting it mildly. All I need now is to see a shipment come in of the other fish that Dr. Gery was kind enough to name in my honor: *Hemiodopsis vorderwinkleri*. Only on the one occasion that a shop in Irvington, N. J. had these as "new ones" have I seen them. At that time, I picked up a pair for photographing and identification. Dr. Gery, in this instance, first named them as a subspecies of *Hemiodops quadrimaculatus*, and subsequently renamed them as a new genus, *Hemiodopsis*, and gave them the specific name *vorderwinkleri*. Strangely, I have never owned a pair of either species. This is what I want to do some day: walk up to one of my tanks and with an air of false modesty say: "Now, this little number happens to have been named for me!"

*William Vorderwinkler*

3

Tropical Fish Hobbyist

## The King Cobra Albino Guppy

BY A. MARTINEZ, M.D.

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The telephone rang; I picked it up, and the excited voices on the other end said, "Al, we have an *albino snakeskin*." The voices were those of Mac Kalichstein and Jano Cardillo, the owners of Mac's Guppy Hatchery in Long Island City, New York.

I was surprised, for I had not thought it could be done. I remember having seen several green King Cobra guppies in a tank together with some albino females several months prior to our telephone conversation. We had discussed the possibility of developing an Albino Cobra, but it did not seem genetically feasible to me.

This is a pair of King Cobra Albinos. In most fishes, the body must be completely white or pink and the eyes pink or red before they are considered true albinos. Pastel coloration is acceptable in albino guppies, however, so long as they exhibit the pink or red eyes. This strain has dark red eyes which look black until observed closely under good light. Note the snakeskin body pattern of the male. Photo by M. F. Roberts.



4

June, 1966



Two King Cobra Albino females. Both carry the genes for snakeskin markings, but only the lower fish displays the type of tail-color pattern that is typical of many female snakeskin guppies. Photo by M. F. Roberts.

I hurried down to the hatchery, and there, among the 400 carefully arranged aquariums, in a corner 2 1/2-gallon tank was the prize in question. He was small, but his colors and markings were distinct. His eyes were pink, his body and tail were pink with brightly-colored pastel-red markings. An albino without a doubt, but what made it unique were the distinct white iridescent snakeskin markings on its body.

Here was the beginning of this beautiful new strain. Its creation was not a matter of chance, but a painstakingly deliberate act. And now more work began. From this small Albino Cobra the specimens which we see today had to be created. Some 30 tanks were set aside for this purpose, and females with known albino recessive genes were mated with this one prize male. After months of careful breeding and cross-breeding the strain was developed.

A visit to the hatchery would convince anyone of the beauty of this new strain. The males sport reddish pink eyes and pink bodies with iridescent white snake markings. The dorsals are large, and the tails are gaily-colored pastel-red deltas. The females are large with pink eyes and bodies. Their dorsals are also large, their tails rounded, usually with iridescent red markings but sometimes with white and dark gray patterns. At present, Mac and Jano are working on still other color patterns.

5

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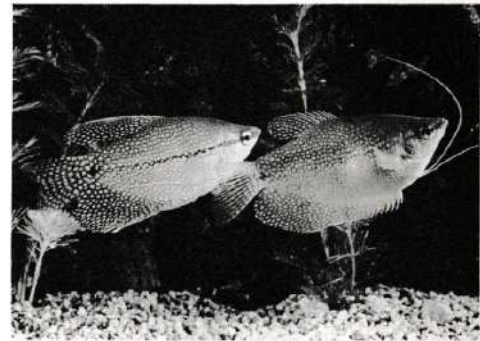


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An adult pair of pearl gouramis. The male (left) has more elongated and pointed dorsal and anal fins.

### Spawning *Trichogaster leeri*

BY RUDOLF ZUREK  
BENO, CZECHOSLOVAKIA  
Black and white photos by the Author

This fish, known as the pearl, lace, or mosaic gourami, is one of the most beautiful species in the family Anabantidae from southeastern Asia. It has been found on the Malaysian Peninsula, Sumatra, and in parts of India and Borneo. It was first brought to European hobbyists in 1933.

The body is elongated, high, and strongly compressed laterally, and the head is pointed in front. The light gray and frequently-variable coloration has a silvery blue shimmer. The fins are strongly developed. When the light comes from behind the observer, the body and fins of the fish show spots that gleam in a mother-of-pearl shimmer, lightly edged in black. The throat, the breast, and the forepart of the anal fin are orange, red, or violet when the fish is in optimum condition. Other fins, particularly their tips, are yellowish. The first rays of the ventral fin are extended into long threads, or "feelers," and are delicately colored. They serve as both touch and taste organs for the fish. From the mouth, through the eye, to the caudal base, there is a black line which is partly broken up with white.



This female is bulging with eggs and ready to spawn. Photo by Payson.

A pearl gourami pair in breeding colors. The top fish is the female. Photo by G. J. M. Timmerman.



The elongated first rays of the ventral fins act as sensory organs and are particularly active during courting.

Sex differences are easily recognizable. The male is slender and has a long, pointed dorsal fin. At spawning time, the entire lower and forepart of his body is deep red. In length, he attains up to 4½ inches. The female is fuller in the abdomen, is not as intensely colored, and has a shorter and more rounded dorsal fin. She is also a bit smaller in size.

These fish should not be housed permanently in a tank smaller than 20 gallons in capacity. For keeping them, I suggest a temperature of 73° to 76° F. Ideal breeding temperature is a bit higher, 78° to 84° F. They are fairly shy, peace-loving and long-lived; one of my males lived more than 9 years.

*T. leeri* will not bother even the smallest fishes kept with them. In my tank, they are kept with *Ctenopoma fasciolatum*, *Colisa lalia*, *C. labiosa*, and *C. chana*. Their water should not be hard or excessively acid. Neutral water of medium hardness is best.

To spawn them, I put out a young pair in an 8-gallon aquarium. Because they were placed in a slightly higher temperature, the male assumed his heightened colors at once, and in a few hours he began to butt the female. He also began to build the bubble nest. The nest of the pearl gourami cannot be compared with the elaborate nest of the dwarf gourami. The male blows his bubbles almost haphazardly around a floating plant.

The next day, the male refused tubifex worms that I offered him, although the female accepted them. Again and again, the female was nibbled lightly in the tail and anal fin, and chased about the tank.

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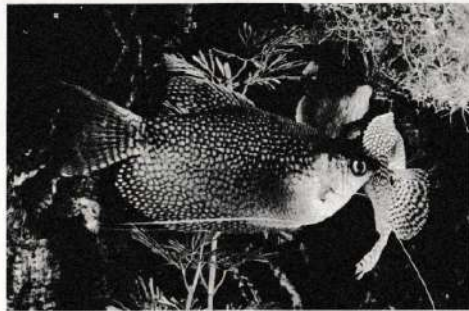
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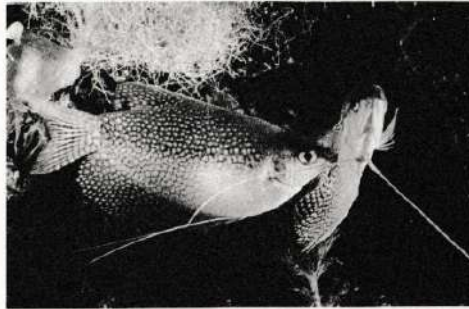
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The female signifies her readiness to spawn by nibbling gently at the male's tail.

his actions become more bragging than threatening. Now the female approaches and plucks gently at her mate's tail. He turns around at once, and the female butts him in the abdomen. The male strikes an imposing attitude and curves his body to enfold the female. After a few false matings,

The male takes up a position directly in front of the female.



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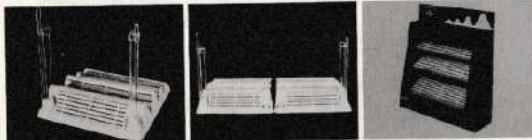
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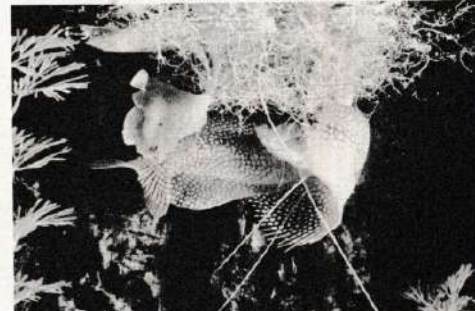


The female butts the male gently as encouragement and as an indication that she is ready for his embrace.

the pair indulge in their first embrace.

Normally the egg-laying procedure is the same as with almost all of the anabantids; the male embraces the female and turns her so that her belly is upward, toward the water's surface and the waiting nest. My young male,

The first loose embrace. The male's body is only slightly curved.





The embrace has lightened, but the male is having trouble turning the female over into the normal position.

however, evidently did not have enough strength or experience and could not turn the female over. So he merely embraced her more closely. The pair turned in a semicircle, and then egg-laying began.

*T. leeri* eggs are light and immediately float to the surface. After spawning,

finally, wrong position or not, the eggs start to come. They are expelled about 20 of a time.

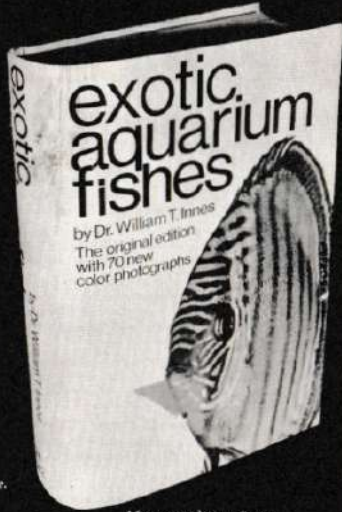


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the male quickly busied himself gathering the stray eggs, but the female remained stiffly below the nest. Fearing for the safety of the eggs, the male drove her away and did not allow her to approach until all the eggs were gathered.

The whole spawning procedure takes 2 to 3 hours and sometimes longer and results in hundreds of eggs, the exact number depending on the size and ripeness of the female. After spawning has been completed, it is best to remove the female. After 24 hours, the fry can be seen hanging at the surface. (The water at this time should be no more than 6 inches deep.) On the second day, the male is also removed. (Sometimes I remove him immediately after spawning is over.)

When the fry become free-swimming, on the third or fourth day, feeding is begun with very fine dry food. Growth of the fry is very much varied, and for this reason the youngsters should be carefully sorted according to size after about a month. Sexual maturity is not attained for about a year.

## Notes from all over

### DOLPHIN RESEARCH

The eminent biologist and author, Dr. David K. Caldwell and his equally prominent associate and wife, Melba C. Caldwell, are conducting research experiments at the Aquarium of Niagara Falls in order to obtain sounds made by the sacred dolphin (*Sotalia*), pink dolphin (*Inia geoffrensis*), and the marine bottlenose dolphin (*Tursiops truncatus*). Using specially built electronic devices attached to underwater listening gear, they are recording the range of sounds made by these mammals.

The research they are conducting in the Aquarium of Niagara Falls is made possible by grants from the National Science Foundation, the National Institute of Mental Health, the American Philosophical Society, and the Office of Naval Research.

The Caldwells are also observing dolphins in connection with extensive research on mental health. It is believed that the dolphin's emotional makeup resembles that of man. The dolphins are now providing man with an insight into such problems as ulcers and low reproduction.

Dr. Caldwell is the Curator of Ichthyology at the Los Angeles County Museum of Natural History; Research Associate of the Florida Museum, and Collaborator in Ichthyology for the Institute of Jamaica. Mrs. Caldwell, an animal behaviorist, is Research Associate of the Los Angeles County Museum of Natural History and Staff Research Associate of the Allan Hancock Foundation of the University of Southern California.

Dr. and Mrs. Caldwell have co-authored hundreds of scientific books concerning their research projects.



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## Fry Grow Better When Threatened!

BY KLAUS FRUEHAUF

At first glance, this title seems a bald statement, but such is not the case. I intend to prove what I have said in the following account.

For the past two years I have given very intensive attention to this subject, and I have made numerous tests. What led me to this was pure chance. For a long time I have been breeding a species of *Rivulus*, until the entire procedure has become routine. The breeding pair was separated for 14 days, at which time the female develops eggs when well fed. Then both fish are placed in a small tank, some nylon thread is placed in with them, and they do the rest. Only one precaution must be taken, because these *Rivulus* are fond of eating their own eggs. When spawning is completed, I remove the nylon thread and place it in one of the larger aquaria, to give them a chance to harden. Then about three hours later I remove the eggs from the thread and place them in hatching jars; in this manner there are few losses. Once I put the bundle of threads in a large, shallow 50-gallon tank which was heavily planted and contained two pairs of Blue Gularis of very respectable size. The bundle lay on top of the plants, as I had made the observation that *Rivulus* eggs are not damaged by light. Somehow two of the eggs must have remained hanging on the plants; in any case I discovered one day that there were two youngsters in this large tank, which must have been highly dangerous for them. At first I surmised that they were young Blue Gularis, but close examination later proved them to be *Rivulus*. They swam freely in the open spaces of the aquarium and remained constantly close to each other. At the slightest disturbance they disappeared with lightning speed into the thickets of *Watersprite*. At this time they were about three weeks old and immediately appeared to me to be larger and more vigorous than their brethren of the same age, which were growing up in a 17-gallon rearing tank where they were being fed generously. I netted out the two youngsters, a difficult task, and compared them carefully with the others. They were not larger, but they were more vigorous. Above all, the fins were bigger. In time to come they surpassed their brothers and sisters, with which they were now growing up, in size. They also attained their colors sooner, but when fully grown their body size was no greater than the others. I have this explanation to offer: because of a certain training (fleeing, having to travel more for their food, etc.), the propelling mechanisms of these fish became better developed than those of their brethren; later, when the danger was removed and their feeding increased, their nature reacted with quicker growth.

This gave rise to the following questions:

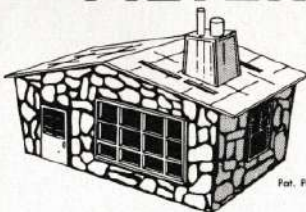
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3. Or was it merely a result of the bigger tank size?
4. If the fish were allowed to attain their full growth under these conditions, how would they look then?

For the past two years I have been looking for answers to these questions, and I think I have found them. I began by repeating what took place accidentally at first. Results were the same, and therefore it was not chance.

Then I tried to raise the *Rivulus* to full size in company with the Blue Gularis, but here I ran into trouble. The little fellows could manage to stay out of harm's reach until they were about half grown, but then they and, consequently, the answers to my questions, were eaten up. The reason for this is that a small fish in his natural environment is beset with more dangers than a larger one, and for this reason speed is the essence of existence for him. Therefore I had to provide some sacrifices to get my answer. After some trials I was finally able to pull through two females and one male. The male and one of the females are today my best breeding pair. At the end of the experiment they had much larger, more powerful fins than their brethren. Body dimensions were the same. Coloration was no different. Because this experiment cost me too many fish I tried it only once.

Next I placed half of a spawning in a similar 50-gallon tank which con-

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tained no other fish, and the other half in the 17-gallon rearing tank I had been using. There were no differences. I am of the opinion that growth is influenced only in smaller tanks, which was not the case here.

My tests were therefore at an end.

Very recently I had the opportunity to make one last test. In the same large tank there is now a pair of Butterfly Fish, *Pantodon buchholzi*, fine specimens which remain in one place during the day and go out only at night. They always remain at the surface, even when in search of food. I was able to raise some *Rivulus* to full size in company with these. During the day they were fairly safe, because a well-fed *Pantodon* has no thought of snapping at anything then, even if it swims right in front of his big mouth. At night the *Rivulus* no longer stayed at the surface; instead, they rested among the plants in the middle region. Therefore there was no threat. In this test the experimental fry differed in no way from their brethren at any time.

This answered my four questions. I do not want to be the cause of having anyone jump to conclusions after reading this account, but I would like it to spur others on to further tests, perhaps seemingly small and insignificant ones, but all helping slowly and surely to unfold the secrets of Nature.

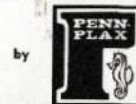
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## How to Become an Ichthyologist

## Part 3\*

BY DR. GEORGE S. MYERS  
Professor of Zoology  
Stanford University

If you haven't done well in high school, present conditions are such that you may not be able to enter a college of your choice. However, let us suppose now that you have nearly finished high school with a good record, and you are looking for a college or university in which to continue your preparation for the career of ichthyologist. There is considerable information here that you need.

First, it doesn't matter a great deal, in some ways, what college or university you select for your 4 years of undergraduate work for the bachelor's degree—except in a few particulars about which you might not think. Relatively few universities specialize in ichthyological training, but not too much specialization is desirable, necessary, or possible during the 4 undergraduate years. You simply "major" in zoology or biology, and learn the basic parts of biology, with whatever chemistry and math and non-scientific subjects are required in that school. You can do that in almost any good college or university, and then transfer to an institution specializing in your chosen kind of ichthyology for your graduate work. In fact, such transfer for graduate work is often recommended, even if a student spends his undergraduate years in a university which does offer graduate work in ichthyology.

However, the 4 undergraduate years are usually the formative ones in determining, finally, what type of work a man will choose for his career. The subtle influences of his professors have a great deal to do with that choice, and it is a rare student who, at the end of his undergraduate years, has not to some extent shifted the aims that he had when he entered college. Professors are only human beings. They have likes and dislikes and prejudices, just as other people do. They are very persuasive, often unobtrusively or even unconsciously so, in turning the interests of students towards their own special fields of study. I have seen more than one potentially first-class ichthyologist completely turned away from that subject and towards one in which I believed he would do less well, through the influence of one or two of his undergraduate teachers. My own belief is that a student who has a burning interest in fishes, or frogs, or the bio-electric potentials of cells, will do best if he is not weaned away from that

\*The first and second parts of this series appeared in the April and May issues of T.F.H. Part 3 was to have been the final installment, but another part is being prepared as a result of the great interest in and many questions about the series.

primary interest—if he is permitted to retain it, and if his interests are nurtured and expanded.

I suspect that not one out of every half dozen potential ichthyologists, who have retained a long-time interest in fishes, will continue his interest in fishes unless, during his undergraduate years, he is in a university which specializes in fish study and has some rather close undergraduate contact with an ichthyologist there, even if he happens to take no formal courses from that man. The ichthyological professor becomes a helper, an adviser, and a holdfast, who keeps the student's interest alive.

Thus, my strong suggestion is to select a college or university for undergraduate work in which there is at least one professor who specializes in the type of ichthyology you like, and to whom you can go for advice and help, and perhaps for some special course work (when you have time). You may transfer to another institution for your graduate work, but at least you are not likely to be weaned away from your primary interest. For one thing, if you have been interested long and deeply enough in fishes to have survived the rugged kind of high-school program outlined in Part 2 of this series without losing that interest, you have a considerable head start and a heavy investment in fish knowledge that it would be wise to conserve and put to use. Think it over carefully before discarding such an asset.

My advice, then, is to select an institution for your undergraduate years in which you could either continue as a graduate student or leave for your graduate work. Contact the ichthyologist there, and make him aware of your interest in fishes, during your freshman year.

There are many more American universities specializing in various types of ichthyology than there used to be. There is not space here to list them all and give the specialties in which their teachers excel. Always remember that it is the men on the faculty, and their special interests and abilities—not the general reputation of the university—in which you should be interested. I cannot tell you all these things. All I can do is list some of the universities, and leave it to the student to look carefully into the specialties of the men concerned, by inquiring verbally from ichthyologists known to you, or getting catalogs, or writing to a few men, stating your own interests clearly and asking for advice.

Here is my partial list of universities in which you can count on the sort of ichthyological contacts (during undergraduate years) of which I speak. The same list will do for graduate work.

**WEST:** Hawaii, Washington (fisheries especially), Stanford (systematics), California at Los Angeles, Southern California.  
**MIDWEST:** Kansas, Michigan (systematics and fisheries), Indiana (fish ecology), Wisconsin (fish ecology).  
**SOUTH:** Texas, Tulane, Miami.  
**EAST:** Cornell, Harvard, Yale, N.Y.U.

You should inquire pretty deeply about the man you expect to advise and help you in your undergraduate years. Do not always take the opinions of those you contact. Look into the scientific papers the man has published to determine his interests. Remember that your ideas will have changed during your 4 years of undergraduate study, and you will probably eventually go into the type of work in which somebody has engaged your interest during that period.

As to graduate work, when you get close to your bachelor's degree, you will probably already know where you want to go. In all likelihood, it will also be a place I have listed.

A final word to the prospective student about biologists as a whole is necessary, especially about those who are professors in universities. They are usually pretty bright men, or they wouldn't be where they are. However, in all groups of learned men, from ancient times down to a scientific laboratory of today, there always has been a good deal of pride, prejudice, and intolerance, often directed at those specialized subjects which some feel are less modern and up-to-date than their own specialties. In my own student days the geneticists and experimental embryologists looked down on the morphologists, who looked down on the systematists, who in turn felt huffy about it and looked down on morphologists and ecologists. Nowadays all of these are looked down on by the so-called molecular biologists, and all those who are dealing with medically-oriented biology look down on almost everybody else. It would be comical if it were not for the effects these little prejudices and intolerances have on students, who often cannot help but feel and absorb the attitudes of their professors, as well as for the fact that the newest types of medically-oriented biology usually get the lion's share of research money—a great deal of which comes from medical sources. Students must beware of unconsciously absorbing such prejudices from their professors. The great psychologist-philosopher William James (himself a professor), once said, "The natural enemy of any subject is the professor thereof." In part he was right, especially about biologists, over half of whom are professors. At the moment, medically-oriented biologists are on top, but the fact that most of them know biology only inside white-painted laboratories has blinded many of them to one of the two greatest biological problems of the future—the rapidly increasing destruction and poisoning of man's environment by the increasing billions of man himself. (By detergents and insecticides and sewage and plain careless use of land and water and living things.) Some of the associated problems may be solved by men in white lab-coats, but many such problems will (and already do) require the services of biologists who work out-of-doors, and who know the environment and the plants and insects and fishes in it! Ichthyology need not hang its head before any other science!

(To be concluded in a later issue of TFH.)

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A pair of Severum in a typical cichlid prespawning tugging battle. If neither fish panics and runs, a lifetime "marriage" relationship will be formed. Photo by Wolfgang Rechla.

The Discus that weren't.

## Keeping and Breeding *Cichlasoma severum*

BY HANK JAFFE

For years my wife was after me to buy a pair or two of Discus. Although I usually try to foster any enthusiasm she shows for my hobby, I have never purchased any of these fish. It's not so much the cost that stops me as the requirement of regular feedings of large quantities of live food.

Anyway, one day last spring I stopped in at a large tropical fish store downtown to pick up some glass wool. While I waited at the counter my wife wandered amongst the fish displays. Suddenly she was by my side. "Come look," she said, excitedly taking my hand and fairly dragging me toward the rear of the store. She stopped in front of one of the tanks and pointed. "Look, young Discus for a quarter apiece." Just for an instant I was fooled too. It was the first time I'd ever seen young *Cichlasoma severum*, but I'd seen many young Discus and these fish weren't quite the right shape.

We took six of the fish home, put them in a small isolation tank for about 10 days, and then put them in a 20-gallon aquarium. At this time they were all about three-quarters of an inch in length. They were colored light tan with



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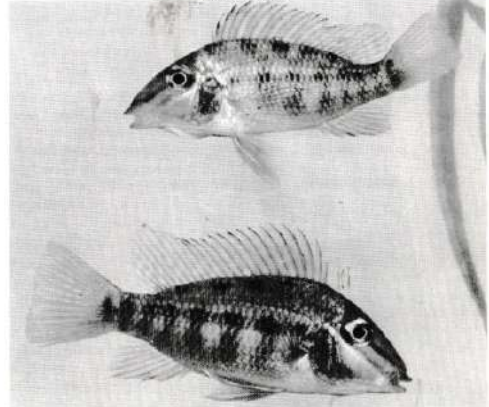
June, 1966

dark vertical bars running down their sides. Although they were shaped somewhat like small Discus, their bodies were not quite as compressed sideways nor were they as disc-shaped from a side view. They took dry food greedily but were not aggressive and lived peacefully amongst the Guppies and Platies that shared their home.

After looking them up, I knew that they would get quite large (up to 7 inches), but I was not prepared for the rapidity of their growth. By the beginning of summer one had died mysteriously, but the rest were large enough to put in my 50-gallon tank. Here they joined larger fishes, including Kissing and Blue Gouramis, Firemouths, *Anostomus*, *Geophagus*, and a number of others.

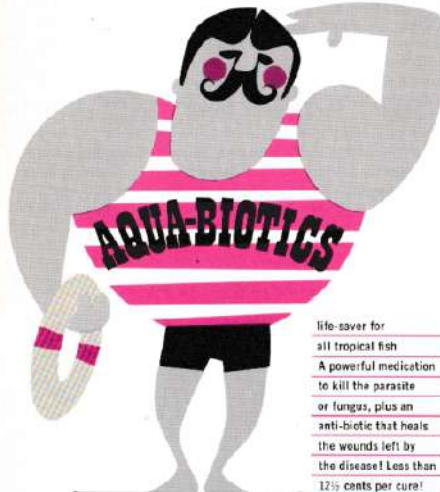
Their new home seemed to spur them on to even faster growth; by the time fall rolled around the smallest one was over 4 inches long. The largest one was a whopping 6½ inches and just about the biggest fish in the tank. Perhaps it was the size of the tank that kept them calm, for they rarely showed the aggressive tendencies which are supposed to be even more characteristic of them than most other cichlids.

Severums can be kept with other large fishes in a large tank. *Geophagus jurupari* is a good tankmate because it can take care of itself, but rarely will start a battle. Photo by Harold Schultz.



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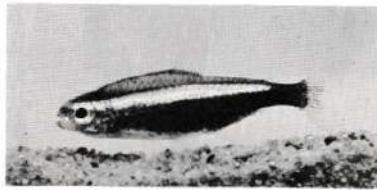
The Firemouth, *Cichlasoma meeki*, is another good tankmate for Severums. So long as their sizes are about equal, there will be much threatening but few actual battles. If the tank is too small, however, these two species may fight to the death. Photo by Wolfgang Bechtle.

Their colors had changed considerably and were quite variable. Their bodies were now dark tan speckled heavily with spots that were usually dark brown to black but sometimes greenish pink to dark red. The spots were more numerous and dense on the males than the females. The distinct dark bars that were present in their youth had virtually disappeared, with the exception of one that ran up the rear of the body and through the caudal peduncle. A beautiful light blue pattern marked the entire head and face and was particularly gorgeous when the fish donned their darkest body colors. The dorsal and anal fins, which had been clear, were now dark brown and sometimes tinged with gold. As is typical of cichlids, the males' fins had become larger and more pointed. Now sexing was a matter of simple observation. There were three males and two females.

All the books say that *C. severum* is hard to breed, so I wasn't planning to try. However, one day when I returned home from work my wife informed me that there was "something wrong with one of the *severum*." It was the largest female (about 5½ inches long) and what was "wrong" was that she was ready to breed. Her body color had faded to a very pale golden tan. Most of her spots had disappeared, and those that remained were mere pin-points. She spent most of her time behind a large slate rock which stands in

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Coloration in Severums is quite variable, particularly during courting, spawning, and egg tending. Above, a Severum in its darkest coloration. Photo by Dr. Herbert R. Axelrod. Below, a Severum in light coloration. Photo by G. J. M. Timmerman.



continued to flirt through the glass. Even more remarkable, the black stripes of her youth were back, and she faded them in and out with the same remarkable control she showed in varying the gold of her belly and fins. The male? Still not interested!

After a total of five days I decided to remove the partition even though the male was as unresponsive as ever. The female immediately began to swim coxingly around him, but by evening he had still shown no interest and she had lost her patience. She kept him on the run with vicious attacks, nipping his tail fin as he fled. Obviously, all was lost. I disgustingly netted him out and returned him to the big tank. My wife suggested I try my biggest male; since I'd already put so much time and effort into the thing, I agreed reluctantly. Once more I set up the glass partition.

The female began her flirtation again almost immediately. After about an hour the male was darting at her so insistently that I wondered if he would break the glass between them. He seemed more angry than amorous, however, and this plus the fact that the female seemed somewhat afraid of his vigorous attention kept me from removing the divider. By the next evening the fish were swimming slowly side by side (with the glass between them) and stopping occasionally and pressing against the glass. If the female swam away,

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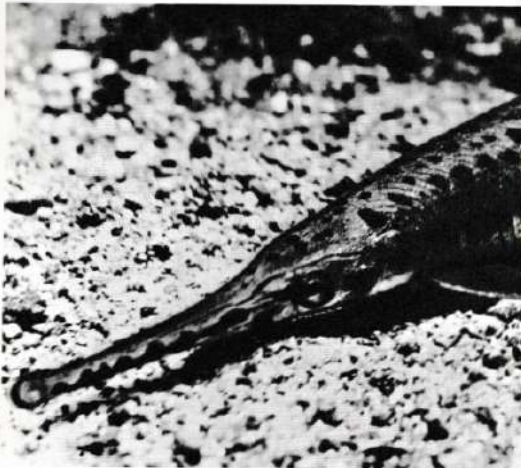
An unusual and extremely attractive color phase for the Severum is gold- and silver-spangled. Photo by Marcus.

the male posed motionless at the divider, fins spread and tinged with a golden hue. Surprisingly, he never did match the female in color. Other than the gold in his fins, the best he seemed able to do was fade out the brown on his back and upper sides, leaving a relatively unimpressive light pink color. Before I turned the lights out in the tank that night, I took out the divider.

By the time I awakened the next morning, the action had begun in earnest. It was the first time I'd ever seen the mating battle that is typical of cichlids. Jaws locked and bodies twisting, the two thrashed about the tank in what looked like a battle to the death. They paused momentarily now and again but returned with renewed vigor each time. The male outsized the female by at least an inch, and more than once I was tempted to break the thing up because she seemed to be taking such a beating. However, she was game to keep at it and never showed a hint of running.

When the battle was over, they began to prepare their spawning site. It seemed worth all my previous work and aggravation when they started

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fanning and carrying the gravel off the white plastic tile. They uncovered about half the tile and continued to fan and scrape it long after it looked spotless to me. As they worked, I noticed that their small tube-like breeding tubes had appeared just in front of their anal fins. After a final examination of their work, the actual spawning began.

The female made repeated passes over the tile and was followed closely by the male each time. Two things kept me from seeing well. First, I was afraid to get too close for fear of fouling the whole thing up by frightening the pair. Second, the white tile wasn't such a good idea. Ever try and see fish eggs on a white surface?

Although cichlids usually care for their eggs and fry, there is always some danger that they will eat them, so I removed the parents when they had finished spawning. After examining the tile with a magnifying glass, I estimated that there was a minimum of 400 to 500 eggs! Since I knew I would want to breed the parents again, I checked the water conditions so that I could duplicate them next time. The temperature was 81°F. and the pH was 7.2. I have no materials for testing hardness, but I know that the water in New York City, where I live, is soft.

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Left, a view of the intent look on the face of a female Severum as she fans and inspects her eggs. Right, top, Severum tending eggs deposited on quartz rock. Right, bottom, close view of eggs and parent guarding them. Photos by Wolfgang Sechle.

Next I made the first of two serious mistakes that cost me well over half the fry I could have had. I placed an aerating stone on the gravel just in front of the eggs. The idea was to create artificially the cleansing water motion usually provided by the fanning of the parents' fins. When I started the aerator, however, it raised a cloud of filth from the gravel which settled right on my precious eggs. Cursing my own stupidity, I placed an inverted saucer in the tank and laid the aerator on it. This did the trick and even "blew" some of the settled particles off the eggs. There was nothing I could do about the dirt that remained. My second mistake was not adding a few drops of methylene blue to the water to combat fungus. I guess most amateur aquarists are afraid to add chemicals with newly laid eggs.

The eggs began to fungus in large numbers the next day. After two days so many were infected that I thought I would lose the whole batch. By the morning of the third day, however, the fry were in their wriggling stage and things didn't look quite so dark. On the sixth day the fry were free swimming; I estimated their number at between 175 and 225. For the first week my wife and I fed them newly hatched brine shrimp twice a day (afternoon and late evening) and a prepared liquid formula twice a day (morning and early evening). They grew rapidly and by the eighth day we could substitute a finely granulated dry food for the liquid preparation.

50

## MAIL CALL

By William Vorderwinkler

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

### Female betta dropping eggs

**Q 1.** About a month ago I attempted to breed bettas. I set up a 15-gallon tank in the usual manner: 80°F. temperature, 6 inches of water, no gravel, glass partition, pH 6.8, and some floating cabomba. After a week of separation and conditioning with brine shrimp, the male had built a bubble nest of about 2 inches in diameter, and the female was just about bursting with eggs. The night before the glass was to be removed, I saw the female squirt out about 35 eggs and promptly got them. In the morning she was nearly depleted. Did I wait too long or is this common?

**2.** Recently I purchased a can of elastic aquarium cement. I used it to patch up the 15-gallon tank mentioned above. I filled the tank with fresh tap water and allowed it to age for a week. At the end of a week I noticed a sort of fungus-like growth forming on the

cement along the seams. I had not introduced any plants, fish, aging tablets, or gravel. The same thing occurred in another tank with the same cement. Could it be the cement?

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Silver dollars.

3. Do you know of any plant a silver dollar won't eat?

Richard S. Bunce,  
West Hartford, Conn.

A. 1. Sometimes a female's eggs become so crowded in her body that they simply push their way out. Your experience will give you an excellent idea how long to avoid waiting.

2. Next time you allow a tank to age, keep the filter going. You may still get some fungus growth on the cement, but you will not get as much. Better on the cement than on the fish!

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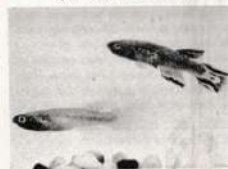
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DH is 3. I have been told this is bad for fishes, and that it should be brought up to 5 by adding tap water. Is this right?

2. Is any kind of peat moss good for getting copper out of distilled water? Does it need an acid content?

3. Why is it that my fishes seemed to do well in the softened water? My lyretails spawned in this water. I took the

Lyretail pair, Male above.



eggs out and put them in a 1 1/2-gallon tank using the same water, but the eggs never hatched. Some of them fungused. What happened?

4. Is a 3 by 3 corner filter very reliable for a 20-gallon aquarium?

5. If one particular fish has ich in a tank with others that are free of it would you advise taking the sick fish out? Should I refrigerate a solution of .75% brilliant green and 90.25% inerts? I don't have much faith in methylene

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blue any longer. What do you use for ich?

6. How do you change a fish say from 15 DH water to its special requirement

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of say 3 DH? EXOTIC TROPICAL FISHES says soft water is required for aphysemonia. How soft must the water be if you want to breed them? Who acclimates imported fish to the tap water of the buying U.S.?

7. Since many of the U.S. areas have hard water, and many hobbyists would like to raise fish with soft water requirements, what kind of a home set-up would you prescribe, and what procedure should we follow when we buy those fish or plants?

Leslie Ray,  
Costa Mesa, Calif.

A. 1. It is not advisable to use a tankful of water which has all been softened synthetically. Better to use tap water and soften it a little at a time by putting a

"softening pillow" in the filter. Sudden changes put an unnecessary strain on a fish and should be avoided. A DH of 3 is low for most fish species.

2. Peat moss will not take copper from aquarium water, I fear. Some types will not even acidify your water. If you are looking for a means to give your water an acid reaction, use an acid peat moss. This is an excellent spawning medium for bottom-spawning fishes.

3. Once the fish get over their initial shock of being put in the new water, they are very apt to like it. The eggs which the female is carrying when the change is made, on the other hand, may not take as kindly to this change. Give her a little more time to develop eggs in this water, and you can be fairly sure that they will

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hatch in about 14 days at a temperature of about 78° F.

4. No, unless your tank is very sparsely populated, a filter of this type and size would be too small.

5. Yes, by all means, and watch very carefully that it does not appear on your other fish. The solution you propose does not need to be refrigerated. What do I do for ich? I isolate all new fish before putting them with healthy ones, and keep an eagle eye on all new purchases. If ich does strike in spite of all these precautions, I try to avoid the use of medications, and keep in mind the fact that ich does not take kindly to high temperatures. I raise the temperature to 82-84° F. A few days of this generally takes care of things, but if it does not, I try some of the remedies sold in pet shops to treat the disease. Early detection of this disease is the important thing.

6. 3 DH is quite soft, even for aphysemonia. I have done quite well in water

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8-10 DH. The important thing is that the water gets no drastic changes over a short period of time. As for acclimating imported fishes, the dealer who imports them begins the job by putting them in water which approximates the water most of his customers are apt to use. The local

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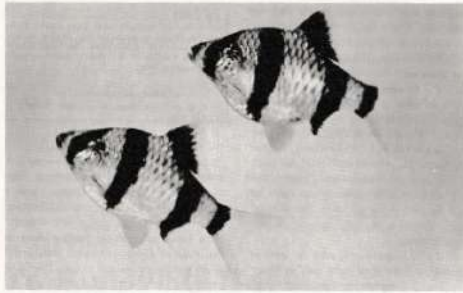
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started swimming around and eating guppies with great gusto. My questions:

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best for a piranha, or should I vary his food?

**Bruce Nowlin, Austin, Texas**

**A. 1.** I would say it probably was the result of the fish being put into water that was considerably different chemically from the water he was kept in. I have heard of this type of shock lasting for several days, but for it to last a little more than 3 weeks is new to me.

**2.** Only time will tell. Fish frequently make remarkable recoveries.

**3.** Live fish are of course the natural diet for a piranha, but live fish are not always available or inexpensive. Piranhas can be taught to accept a strip of raw food fish if it is dangled in front of them. This can also be done with a raw shrimp. Don't hold it with your fingers, however, for obvious reasons.

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2. What DH of water in degrees does the mono prefer?
3. What live food does the fish like most? Please name a few.
4. What aquarium plants are native to the monos' surroundings?
5. How long does it take for this fish to reach maturity?
6. If possible, how do I distinguish male from female?

**Bryan Lepkowski, Mechanicsville, N.Y.**

**A. 1.** Monos occur in fresh as well as salt

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*Monodactylus argenteus.*

water. Your best bet is to match monos to the water in which they were kept. If the water in which you intend to keep them is different from the water they came from and the change is sudden, your fish are very likely to suffer from shock.

**2.** The previous answer also goes for this question.

**3.** Small specimens are fond of daphnia and tubifex worms. As they grow larger they are very likely to become predatory and should not be kept with fish they could swallow. At this time they become very fond of newly-born livebearers.

**4.** As monos switch from fresh to brackish to salt water, the plants native to their surroundings run quite a gamut. Give them any freshwater aquarium plants and don't worry about their damaging them.

**5.** About a year.

**6.** I read an article in a German magazine which gave a method for sexing *Monodactylus argenteus*. The male's anal fin is nicely rounded, while the female's is almost pointed, the point looking as if it were cut off with a pair of scissors.

**A rave**

**Q.** This letter is in reply to one printed in SAITS, CALI. (March '66) written by Mr. Terence McInerney of Pittsburgh, Pa. I am one of many. I am sure, who do not want to see changes in TFM. The magazine is interesting, informative, and quite enjoyable exactly as it is. We would be unfortunate indeed if TFM neglected



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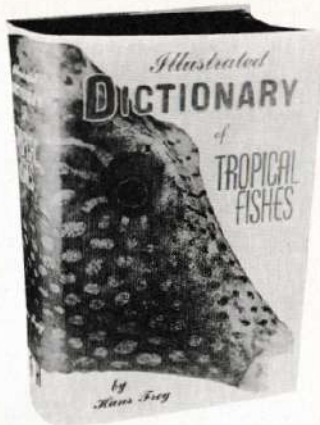
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freshwater fishes are concerned. And yet we are not so bad off as it might at first seem.

Think for a moment of the last time you went fishing or hiking along a stream or lake. Do you remember how the sun glistened off that Speckled Bass, that Rainbow Trout, that Pumpkinseed Sunfish? The shimmering color, caught in the right light, of various Sunfishes is indeed breathtaking—at times downright unbelievable. The blending of many small dots of color, the vertical play of stripes that aren't quite complete stripes, the bright yellow paired pelvics, and the yellow belly with the greenish sheen above it of the lowly, Common Sunfish I have in the tank before me right now rival in their soft radiance the colors of many of my tropicals. I would not give up this particular wild fish for almost any of the tropicals which I have paid good money for.

One of the purposes of this article is to describe my experience with such indigenous fish, and to get you interested in our native fish—if, indeed, you have not already discovered the pleasures of maintaining a wild tank.

But I'm not much of an expert on native fishes; in a way, though, I'm rather happy that I'm not! For me, being an expert would immediately exclude half the fun I experience with each new find.

Imagine how it would be to know everything about fish—if that could be possible. What a dreary thing that would be in many respects. Why, when one came across a fish in a stream, or another in a lake, or another in a pond—and if he knew everything about these fishes, if he

could identify them immediately, tell their habits, their behavioral quirks—well, what an uninspired situation!

But imagine what happens to a true hobbyist, one who is constantly trying to learn and to perfect his procedures. He might come across a new fish. And then what happens? He has before him the joy of examining his fish for the first time! He wants to acquire new knowledge about it. Here lies an opportunity for discovery—a handsome, challenging, exquisite thing in itself.

Well, it is with something of this feeling of challenge, of a love for a new find—of a spirit perhaps akin to that of an anticipating explorer—that I eagerly await those first few weeks after the ice has left our northern streams and lakes. Soon, soon now, I'll be ready with all my gear to tramp out into the Michigan woods as nature melts her winter clothes, and I'll be up with the sun to trap my share of the hungry, sluggish fish that have survived the winter. And I'll be looking for a new (to me), a strange, or a beautiful find. The thrill of exploring will be warm about me and will more than ward off the slight morning chill.

A new specimen, or a better one than I now have, will make my day very bright. The hike into the woods and along the streams, the row across the lake to where I've laid my traps, the fresh air that is tart enough to tingle and let me feel that I am really living (the woods, ever a new experience, always lets a man know that), these fresh things, these outdoor things when a man is by himself, or with his son or a good friend, these are the things that count.

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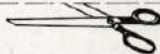
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And the awakening time of nature is fraught with a wonderful mystery that heightens such jaunts. It is altogether a good experience.

These so pleasurable few weeks after the demise of snow and ice, when the sterile, dead earth decides to bring forth the new, the living—these few weeks hold a promise. So this time of year means much to me besides a chance to add to my hobby. It is a comfort that I would like to introduce more people to.

Let me give you some pointers about how you might get some native fishes *early*; then I'll discuss some of my experiences with them.

First, let's cover how you might get the fish. There are many methods. Probably the most common ways are by means of seines, nets, and fish poisons. I'll cover another, simpler method—the one I use most of the time—after we talk about the rest briefly.

All three of the first-mentioned methods might be used if you want to get a great number of fish, from which to select only a few, choice specimens. Of course, the use of poisons should be (in many cases must be) restricted to lakes, ponds, and streams that are entirely or almost entirely on the property of the person collecting the fish. But, even so, extreme caution must be used lest too much poison be used.

After all, you want to use enough only to stun your fish. Books in your local library probably cover the use of fish poisons. The government also puts out free information regarding the use of chemicals for controlling fish and vegetation, and I'll soon show you how to obtain this.

When collecting fish that are not on your land—those on state-owned lands, say—you must, unless you live in certain southern states, contact the fish division of your state conservation department. Often it is necessary to get a rather easily obtained state license for collecting native fishes. Simply write to the state conservation department and explain why you want the license. You might also say that, as a fish enthusiast, you will try not to harm the fishes and that most of the ones you capture will be returned immediately to their native habitat (after all, you want only the *best* for your aquariums). It has been my experience that these, professional fish and game people are more than interested in being cooperative. Your state conservation department will also be of help in suggesting to you books and leaflets which will enable you to identify the fishes you catch.

I don't want to bore you with a lot of talk about seines and nets, so just let me say that you can order

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either of them from almost any major mail-order house. They are easily come by; in fact, the other day I bought one from a florist. It had been used in a store display, and it is approximately six and one-half feet wide. With numerous folds, it stretches the length of my aquarium room ceiling. It cost one dollar—and it adds the finishing touch on what I like to think is a fine exhibit of tanks and fish.

The main difference between a seine and a net is that seines have wood, cork, or plastic floating devices on top, and weighted materials on the bottom. Usually there are two sticks, call brails, attached to the ends; these supports make the net stand upright in the water. Frankly, although they are quite effective for obtaining many fish all at once, seines and nets are somewhat bulky and difficult to work with. Often you need a helper. About the best procedure I've heard of for using one is to set up the seine in a stream and then go far upstream and muddy up the water so that the fish between

you and the net can't see well; then make your way to the net while you carefully overturn rocks and sticks and kick away at the banks. Fish, scurrying for cover, will usually be trapped by your net or seine.

Seines may also be hauled along shores that aren't too cluttered with debris.

But the simplest method I know of for getting small fish easily is one that fishermen have been using for years—the minnow trap! The one I bought long ago at a hardware store for \$2.50 has given me countless fish and many hours of enjoyment. Basically, it consists of a small "barrel" of wire mesh with a small hole in the top and one in the bottom. The "barrel" rests on its side in the water. Attached to each end is an inward-converging passage-way that narrows to an inlet hole for the fish. A fish can swim in, but he finds a mighty rough time of it when he wants to get out. Anyone who has seen a standard lobster trap knows what I am describing here.

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Simply bait the trap, attach a piece of heavy twine to the top, and toss it into the water where you know fish of the type you want school. What should you use for bait? Almost anything! I use two things: bread that I've rolled into small dough bits and a few small bones that I get free from a grocery. I find that this combination appeals to almost any fish I'm trying to catch, although I have had much trouble getting small Catfish.

I've tried many lakes and streams. I set the trap in the evening and check it in the morning. In this way I hope to eliminate some slight discomfort to the trapped fish, and at the same time I can be almost sure that I will get to my trap before someone walks off with it. I have, however, never lost a trap—and I've always accounted for this fact by saying that most people who would take time out to visit our woods and streams—hunters, fishermen, aquarists, picnickers—are all basically trustworthy. I realize that there must be exceptions to such a general statement. But I do think that people who are interested in nature's creatures live close to the eternal scheme of things, which somehow rubs off onto them and makes them just a little more appreciative, sensitive, honest.

Incidentally, you'll often find a crayfish or two in your traps. Why not keep at least one for that wild tank?—they complete the aquarium picture. I've had no great luck trying to keep the occasionally trapped water beetles, although the small ones lasted a long time.

A final tip about the fishes you might gather: quarantine them. I suggest that you quarantine your

fishes for two weeks, and feed them very little during this time. Look for disease and parasites. In actual practice, though, I find that I am a little too anxious after a week or so has gone by, and I usually then add the healthy looking specimens to my main wild tank. At least one other aquarist that I've interested in wild fishes uses only a one-week quarantine, and neither of us has had difficulty from pests and infections. Your wild fishes are susceptible to white spot and other diseases that tropicals have, so it pays to play it safe by quarantining them. Probably the sanest thing to do with fish that prove to be sick is to do away with them.

I'd now like to talk about some of my favorite wild fishes, the ones which have given me the most pleasure. But first let me say something about a fish I don't and won't have—the Stickleback. The fish is extremely interesting as it hovers, almost motionless. At times it progresses in fits and starts, like a hummingbird. But it is not docile—in fact, if you ask me, it is downright warlike. I've seen a small one attack another fish which was at least fifty times its bulk! One kind that is indigenous to the Great Lakes area is the Brook Stickleback, which is often brownish, or dusky white with black diamondlike markings—and which has five "spikes" on its back. In the spring, during the breeding season, the male's pelvic fins turn red. He constructs a birdlike nest, borer a tunnel through it, and courts a female. After the eggs have been laid, he guards the nest and fans the water through it past the eggs, while sometimes trying to kill the female.

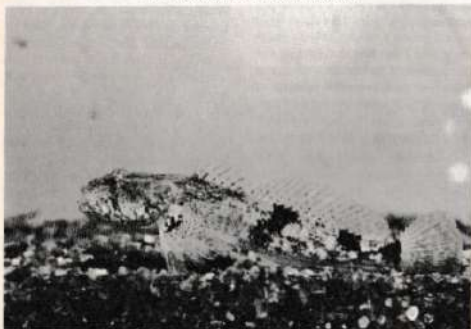
I used my minnow trap one spring after the ice had thawed. During one of my hunting trips that winter, I had spied a small pond fed by a spring. Its outlet had been filled with rocks, dirt, and other debris, and I made a note then to see what kind of fish it might contain the first chance I got. When I hauled in my trap, I had over thirty fish—all Brook Sticklebacks. I re-baited the trap and set it again. The next morning, I again hauled in more than thirty Sticklebacks, and *only* Sticklebacks. I was then rather sure that this pond contained no other kind of fish. When I later saw these same Sticklebacks, after the quarantine period, ripping into some of my good tropicals, I surmised why there might be no other fish in the pond.

Of course, this fish is small enough (2½ inches) to be eaten by larger fishes, but in my experience with

them, it was usually the other way around. I did, however, see a Mudminnow (5 inches long) try to eat one until it decided that trying to get the Stickleback's spines past its lips, mouth, and throat was too much. It spit up the Stickleback and refused to attack it again.

One of my favorite captured native fishes is a Slimy Muddler, which gets its unflattering name because it closely matches the color of the bottom on which it always rests. It is a member of the Sculpin family (Cottidae), and one of the most "lovable" pets we have—simply because of its awkward antics. It swims in fits and starts, but most of the time it is inactive, resting on the bottom of its tank, surveying its tiny world with a kingly haughtiness. Usually, nothing perturbs it, not even a few loud taps on the glass. But it can be stirred into very quick motion by me when I'm trying to

The Slimy Muddler. Photo by Fred Howard.



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catch it with a net. Often I either give up trying to catch this bit of lightning, or I get two large nets and come at it from fore and aft until it gets tangled in one of them.

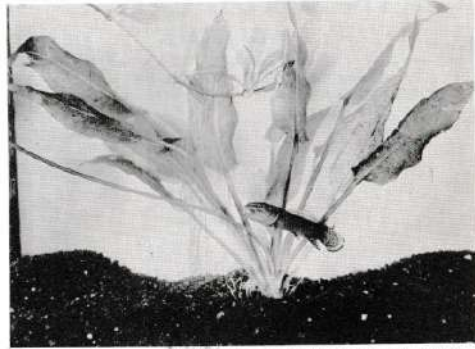
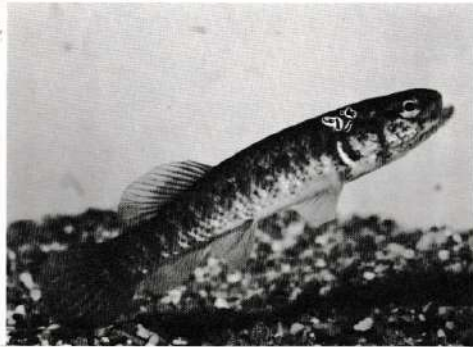
When it is resting, it often props itself up on its frontal fins while its head expands and contracts as it passes water through its huge gills. It has two protruding eyes—which change in color from a dull brown to a very bright green, like small fiery beads.

Speaking of changes in color, I must mention that the Muddler adapts to the colors of its environment. At times, on a sandy bottom, it is almost brown, the black bands almost nonexistent. At other times, areas of its body are pure white, and the bands are full and jet black. The fin arrangement itself is quite attention-getting.

Many of the indigenous fishes you

might catch are well suited to the home aquarium if you arrange their environment properly, approximating the conditions in which you originally found them. For instance, I caught the Muddler in a fast-flowing stream and set up temporary quarters for him in a ten-gallon tank. It was my hope to establish a system of flowing-water aquariums lined along the bottom of my tropical aquarium shelves, using as a source of water supply the capped artesian well in my basement, heavy mineral content notwithstanding. I still intend to do this, but I'm no longer in a hurry, because he's doing fine in a large tank with no circulation other than that supplied by normal filtration. But other native fishes don't adapt to changed conditions as well. *Belostoma nigrum*, for instance, one of the Darters, comes from about the same type of en-

The Mudminnow, *Umbra limi*. Photo by Fred Howard.



This little fellow is a young Dogfish, *Amia calva*. Photo by Dr. Herbert E. Axelrod.

vironment as my Muddler, but is less able to adapt to an absence of good circulation. Other native fishes require special attention, especially in the matter of temperature control; they cannot live in warm water, and provision must be made to keep their water cool.

Another interestingly strange fish native to my area is the Mudminnow. I like it for its fin configuration and its habit of resting on its fins, head up and straight; body slightly inclined. Some of its scales form luminescent lines of golds and pinks, very pleasing against the mottled brown background. It is amusing to watch the Mudminnow swim, for its pectoral and pelvic fins paddle in the water like a dog's legs. Except for its short dorsal, the Mudminnow might be confused for the young of the Dogfish, *Amia calva*. As a matter of fact, its manner

of swimming and its pleading puppy-dog eyes make it a better candidate than *Amia calva* for the name Dogfish.

Well, suffice it to say that collection of native fishes can be an engrossing pastime, and one that is never finished. Just as stamp collectors and coin collectors have trouble completing their collections and finding better specimens to augment the ones that they already have, so the collection of indigenous fish seems never-ending—and never-endingly enjoyable. For there are, in my state alone, according to the Michigan Department of Conservation, 28 families of fishes that encompass 141 species!

I have a long, enjoyable collection task ahead of me. And I invite you, too, to obtain the benefits of a healthful journey into the woods and the thrill of a magnificent find.