

January 1968

tropical fish hobbyist

DOMESTIC 35¢ / British Isles 2/6



MUDSKIPPERS

tropical fish hobbyist

January, 1968

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features

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cover

This month our cover features a mudskipper (*Periophthalmus* species). These amusing looking little fellows are terrific to keep as a novelty. They must be kept in a tank that is set up with dry areas upon which they can climb. Their water must have 2 or 3 teaspoonsful of salt per gallon in it. They should get living foods; they are particularly fond of tubifex and small earthworms. Every now and then, when they are having a little difficulty swallowing a mouthful, these strange little fellows will depress their eyes into their heads. This evidently puts pressure on the food that is caught in their mouths or throats and forces it down. When they do this they look very much like partially deflated rubber toys. For much more on these fish, read the article that begins on page 52. Photo by H. Hansan.

exotic tropical fishes supplements

Pages 33 and 34, 67 and 68. These pages are perforated for easy removal and punched to fit into the Looseleaf Edition of EXOTIC TROPICAL FISHES.

rates

15c per copy in the U.S. 35c per copy in Canada or foreign. \$3.50 for 12 issue subscription in U.S. Add 60c per year for foreign subscriptions. Index available in every 12th issue.

In England and the western Sterling area Tropical Fish Hobbyist magazine and T.F.H. Books are distributed exclusively through T.F.H. Publications (London) Ltd., 13 Nurley Lane, Pangole, Surrey, England. All subscriptions and inquiries should be sent directly to them.
©1968 T.F.H. Publications, Inc.
Second Class Postage Paid at Jersey City, New Jersey. Published monthly by T.F.H. Publications, Inc., 245 Commerce Avenue, Jersey City, N. J. 07302. Printed in U.S.A.

editorial

With the start of the new year, we also start a new regular feature for our readers. The feature is "Bettaphile", a column to be devoted exclusively to the beautiful *Betta splendens*.

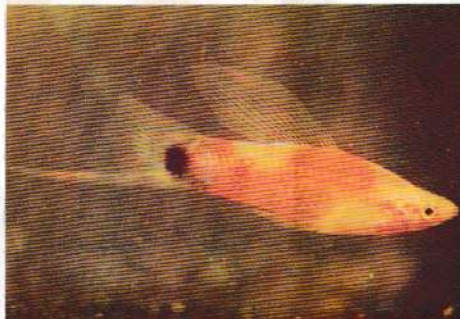
The author of the new column is Frederick J. Kerr. His articles have appeared in TFH many times throughout the years. His most recent article, "Practical Guppy Breeding", was the cover story of our November '67 issue. His special interest for a long time has been the betta, and he is one of the most knowledgeable men on the subject.

I think you're going to like "Bettaphile", and I hope you will give Fred the same enthusiastic support you have so generously given all our other columnists.

Also in this issue, you will find "Wish I were on the Amazon", a story written by our old friend William Vorderwinkler. He wrote the article quite some time before his recent serious illness, and we thought you'd like to read one of Bill's typically fine tales. In it he reminisces about a trip he once took to South America. The article is Vorderwinkler at his best...and that's about as good as you can get.

Mike Reed

Tropical Fish Hobbyist



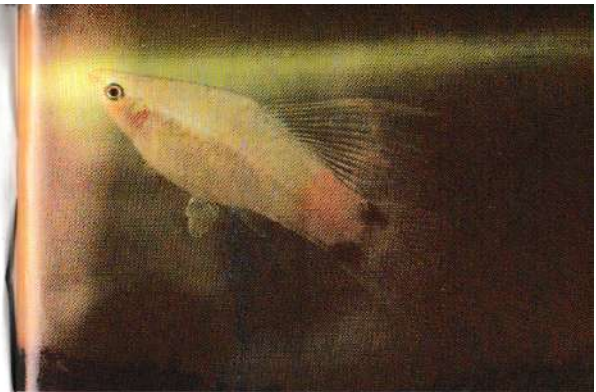
Above—a piebald hi-fin male swordtail. Below—a piebald hi-fin female. Both fish are mature. Photos by Dr. Joanne Norton.

Piebald Hi-Fin Swordtail

BY DR. JOANNE NORTON



4



Normal-finned piebald swordtails like the male above and the female below were used to produce hi-fin piebalds. Photos by Dr. Joanne Norton.

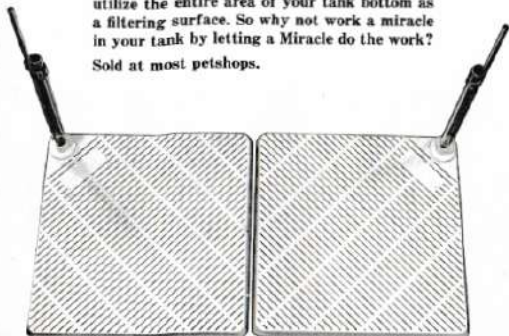


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In the past there have been reports about several species of aquarium fishes, that lose color as they develop, not just a color fading but an actual loss of pigment.

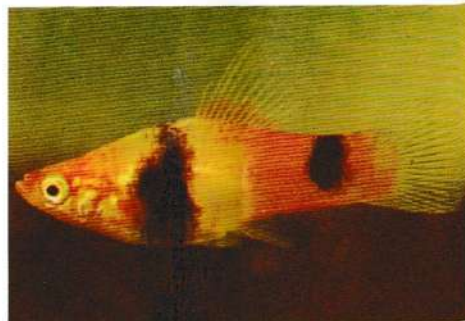
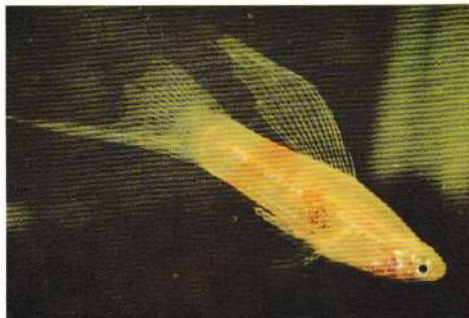
Occasionally there may occur swordtails that are white with red markings. About 2 years ago I noticed, among some black-spotted, red hi-fin swordtails, a male hi-fin with white body color, a large black spot on one side, red streaks in the dorsal fin, and red markings on the body. Since this male's coloring was very attractive, I decided to try to develop a strain of hi-fin swordtails with this type of color pattern. A red hi-fin female mated to this male produced mostly reds and black-spotted reds, but also several females that lost their color, becoming white. These females were definitely white at 2 months of age. The pale yellow coloring of gold swordtails and the small black stipples that a gold swordtail has (mainly along the back behind the head) were not present. When the white females were about half grown, they began to get red coloring, which first appeared on the sides of the body and then spread gradually over either a small or large area of the body, depending upon the individual. When these females were mated to their piebald male parent, they produced some each of red, red and white, white, red and black, black and white, and tricolor (red, white, and black). After two more generations, the piebald swords were producing about 50 percent piebald offspring.

In this strain of piebald swordtails, the fish that become piebald are ones that lose their color. Color loss begins in some when they are about a month old. Some have lost not only their red color but also some or most of the black pigment. None have lost the black color in their eyes, so none have become pink-eyed. However, except for the dark eyes, the all-white individuals resemble albino swordtails, but they lack the red body markings that albino swordtails may have. Loss of red color in a piebald swordtail usually starts at the head. Often the line of demarcation between white and red progresses from head to tail. One day a fish may be red all over. The next day it may be red with a white head. In another day this fish may be white on the front half, red on the rear half. In 1 or 2 days more, all of the red color may disappear. Also, red color in the dorsal and tail fins disappears, this color loss often starting on the outer edge and progressing toward the body.

Some individuals lose all of their red color in a period of 3 to 5 days, while others may lose the red more gradually. Not all piebalds lose color at the same age, although 1 month is about the youngest age when color loss occurs. Some do not lose color until a month or more later. However, color loss has been observed only in young, growing individuals. It has never been seen to occur in full grown fish. In many cases, a fish that loses red color also loses at least some of its black color if it has black splotches. Apparently an individual that is heavily spotted with black retains most of its black

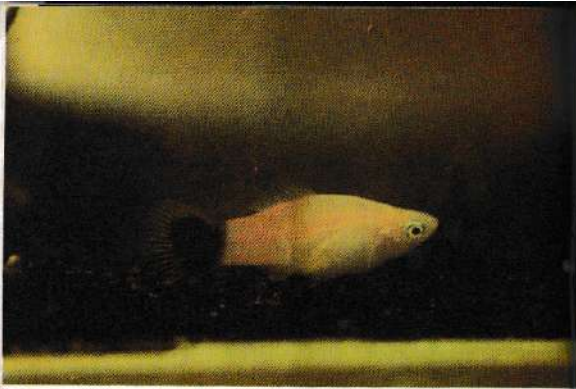


Both photos are of the same male piebald hi-fin sword. When very young, the fish was all red except for a large black spot on its side. Above—the fish has lost all of its red color and most of the black. Below—3 months later only a trace of the black spot remains. Photos by Dr. Joanne Norton.

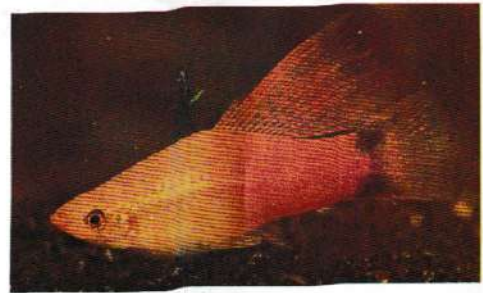


The development of this hi-fin piebald male sword took a course slightly different from that of the fish to the left. The photo above shows the fish after it lost some red and retained two large black spots. The photo below was taken 3 months later. Much of the red has come back and the two black spots are all but gone. Photos by Dr. Joanne Norton.





The development of piebald coloration in females is similar to that of males. This fish was originally red all over except for the black tail. The photo above shows her after half of the red has disappeared. Below—3 months later all the red and most of the black have disappeared. Photos by Dr. Joanne Norton.



This is a developing brick-red piebald swordtail male. Photo by Dr. Joanne Norton.

markings even though it may lose all of its red color. A fish having less black originally may lose all or most of the black pigment if it loses the red. This loss of black pigment may be slow, the black areas gradually decreasing in size and/or intensity until the fish reaches 4 or 5 months of age. In some cases, a black marking may disappear entirely. Although some red color comes back gradually in all of these piebald swordtails (none has ever stayed white), black markings, as far as I have observed, do not reappear or increase in size or intensity once they are partially or entirely lost.

I decided to try to eliminate the black markings, so I selected red and white breeders. From these came the present strain of piebald hi-fin swordtails which do not produce any offspring with black markings, but now they produce red, white, or red and white (piebald) offspring. In mature piebalds, usually some portion of the body is white, especially the head and tail areas. The dorsal fin may be clear, or it may have red streaks.

There is evidence that the piebald characteristic is inherited. After several generations of piebald to piebald breeding, the proportion of piebalds per brood has increased. Also, two outcrosses with probably-unrelated strains produced no piebalds. One of these crosses was with a piebald female and a tuxedo male. The other cross was with a piebald female and a red male.

Piebald hi-fin swordtails seem as healthy and productive as other red hi-fin swordtails. Some individuals are beautifully marked, and even those at the all-white stage of development are different from other swordtails, because of the completely white body, unlike either gold or albino swordtails.



Left—*Aphyosemion calliurum* can be spawned in groups. In such cases there should be two or three females for each male. Below—A female watches warily as a male spreads his fins provocatively. Photos by Rudolf Zukal.

Aphyosemion calliurum calliurum

BY RUDOLF ZUKAL
BRNO, CZECHOSLOVAKIA



A male *A. calliurum* pursues a female relentlessly. Photo by Rudolf Zukal.

I would like to say in advance that with this species I cannot say with certainty which fish I refer to. Is it the true *A. calliurum* or the product of a hybridization with *A. australe*? Certain differences to the description by Walter Häfelin cast doubts. The author describes the male *A. calliurum calliurum* as having a pronounced sulphur-yellow band in the anal fin, which may become white inside. After this there is a bright red band. Some males may have this band pure white instead of yellow.

Who is right? Dr. Jan Rus says that my pair is *Aphyosemion calliurum calliurum*. I myself am of the opinion that they are hybrids. Be that as it may, my fish attained a length of just under 2½ inches and were placed in a 4-gallon, well-planted tank. To spawn this fish, soft water is not a necessity, but seems to help. My fish were kept at a temperature of 68° F., raised to 76° for spawning.

The fish spawned willingly among the fine-leaved plants. They rarely produce many eggs on any single day, but they continue to spawn almost all the year round. Existing literature gives the best spawning season as

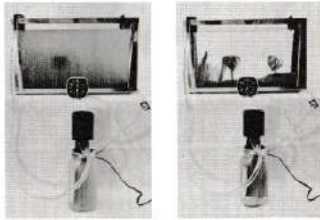


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autumn and winter, but in my opinion spawning is equally as good in other seasons. There are several methods of getting these fish to spawn easily. These methods follow.

A. The two fish, which were previously kept apart for at least 10 days, are put into a 3-gallon tank with slightly acid water (pH 6.0 to 6.8). Seemingly on command, the fish spawn into Javarnoss, similar plants, or an artificial spawning mop. Almost all the *Aphyosemion* species show this willingness to spawn. Two or more females may be used to each male. The fish are left alone for 14 days, or as long as they continue to spawn. The eggs are not eaten by the parents, if they have gotten enough other foods. At this time the first youngsters begin to put in an appearance, and they can be moved with a spoon to another tank with similar water. The fry are sensitive to changes of water. Since they hatch at different times over a period of many days, they must be sorted according to size to keep them from eating each other.

A male *A. callurum* crowds a female into some plants where she will lay a single egg for him to fertilize. Photo by Rudolf Zokal.



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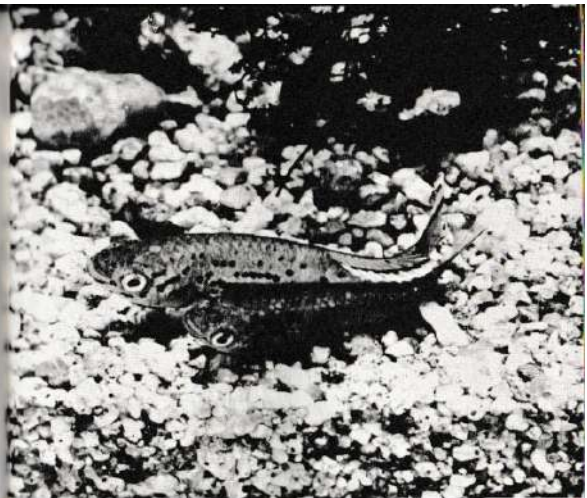
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Sometimes, but not often, an *A. callurum* pair will deposit and fertilize an egg in the gravel. Photo by Rudolf Zokal.

B. This is my method: I allow a pair to spawn for one day. After this they are removed, the water level reduced by half, and the tank darkened. After 14 days the fry hatch, and everything is as before. The work of removing the first youngsters is saved, for the parents are not there to molest them. However, as the youngsters grow at varying rates, they must still be sorted in time.

C. Here we also remove the parents. Then the eggs are picked up with a glass tube or with your fingers (the eggs are quite durable), and kept in a bowl. After the eggs have been removed, another pair may be put in the tank to spawn. The fry hatch in the bowl and may be transferred to a tank having water similar to that in which they hatched.

D. Not only this species, but other *Aphyosemion* species as well will spawn in a community tank. Here also it is possible to remove the eggs with the help of a glass tube. The spawning fish do not allow themselves to be disturbed.



A view of the show as it opened. Photo courtesy of the Greater City Aquarium Society.

My First Show

BY DANIEL J. CARSON

A full-page ad in the May, 1967 issue of FFIH announced the "First Metropolitan New York Tropical Fish Show and Exhibition". The thought that immediately popped into my head was, "As long as it's their first show, they probably won't mind if a beginner like me enters it."

The ad said the show would be held at the Gertz department store in Jamaica, New York, which is only a half hour's drive from my home. The show was being sponsored by the Greater City Aquarium Society, so I immediately dropped a note to the show chairman. I told him that I had only been a hobbyist for about a year, except for having kept some guppies as a boy in the 1930's. I admitted that I had never even seen a tropical fish show, much less entered one, but that I had raised a few snakeskin guppies that I thought were pretty respectable and might be worth showing.

The show chairman was most encouraging. "By all means, enter your snakeskins," he said. "You are eligible to enter as a novice."

The day before the show I called the department store to find out exactly what I had to bring with me. I found myself talking to one of several members of the Greater City Aquarium Society who were at the store getting things ready for the show. He told me all I had to bring was the fish! Tanks, filters, and aeration as well as aged water would all be available, free. Also, the feeding during the week-long show would be done by members of the society. The temperature and lighting in the room would be controlled, too. The member did say that most exhibitors prefer to bring their own water and suggested that I, too, do so. I couldn't help thinking that this operation sounded pretty efficient for a first show.

The next day, full of confidence, I arrived at the department store. I don't know just what I expected to find, but, believe me, I was not prepared for the sight that greeted me when I walked into the room where the show was to be held.

The room was the size of an auditorium, and in it were rows and rows of neatly arranged tanks; I guessed that there were at least 500. At the desk where entries were being accepted, a line of hobbyists was being checked in, and members of the Greater City Society were escorting individuals to their assigned tanks. At a nearby table other members of the society were unpacking cartons of airmailed entries that had been shipped in from hobbyists from distant places. I began to feel just a little less confident.

I looked at one man checking in at the entry desk and thought his face was familiar, but I just couldn't place him. Then I remembered I had seen his picture in a book on fancy guppies. It was Frank Alger, and I had seen his name mentioned frequently in guppy literature right along with such great names as Hahnel, Sternke, and others. Suddenly a light began to dawn on me: first show or not, this was *not* a bunch of beginners. I began to think about pretending I had come into the room by accident, and I was about to leave quietly.

As I looked for an escape route, another entrant stepped up to the check-in desk. It was a little girl (she could not have been more than 7 years old), and she was carrying her fish in a small mayonnaise jar. "Blue betta, novice class," she announced as she plunked down her \$1.00 entry fee. The society member at the desk handed her a gummed label on which was written an entry number. Another member escorted her to her assigned tank. They had shown her the same respect and courtesy as had been shown Mr. Alger a few moments earlier.

The youngster plopped her fish in the tank, carefully affixed the gummed label to the glass, and then started to examine with a critical eye the other entries in her class. I was encouraged and decided to stay awhile.

I sought out the show chairman, and, in spite of the fact that he was nearly exhausted from tending to the many details connected with putting on such an ambitious show, he was pleased to answer all my questions. At the time

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we were talking, which was a few hours before the deadline for entries, nearly 400 had already been accepted. An official of the department store joined us and said that the show would attract about 8,000 visitors during the 6 days it was to be open to the public.

Finally the talk turned to my own entry, and I asked about entering the novice class. I told him that although I was a beginner, I didn't feel I should compete with youngsters like the little girl with the betta. He said that I was eligible for the novice class because, technically, this class is for anyone who has never won a trophy. But, in fact, he said, most entries in the novice class are young people, usually under 15 years of age, who are operating on a very limited budget. I said that the opportunity to compare my fish with the best in the show was more important to me than winning a trophy. As long as I felt that way, the chairman said, I ought to enter the open competition.

Trying to appear as nonchalant as possible, I went to the entry desk, paid my dollar, and said, "Snakeskin guppy, open class."

Gummed sticker in hand, I was led to an empty tank in the snakeskin-guppy section of the show. After placing my fish in the tank and putting the sticker on, I stepped back to compare my entry with those near by.

My first reaction was to heave a sigh of relief. While the other fish were beautiful, mine didn't embarrass me. I felt there were a few good points going for my fish and realized that some of the other entries had some good points going for them. While I was making these observations, I became aware of some of the other hobbyists, who were looking at my fish and, apparently, making the same sort of mental judgements that I was.

Pretty soon we got into a lively conversation, and comments, both complimentary and critical, were being exchanged freely in the friendliest fashion. I think I learned more about certain things in the next half hour than I had in all the previous years reading of every available book and magazine article on guppies that I could lay my hands on. This is not a criticism of the books and magazines; it's just that printed words and pictures can only tell and show so much. Placing your fish side-by-side with the best that others have been able to raise and observing them under identical conditions . . . well, sir, the differences in size, color, and deportment are so much more obvious under show conditions.

As I drove home from the show that evening, I decided that whether I won a trophy or not (as it turned out I did not), I was already a winner! The new knowledge and friendships I had acquired were worth far more than the effort of carrying the fish to the show and the modest entry fee.

The guppies that I am raising now have some of the qualities that were missing in my first entry. I'm hoping to win a trophy in the next show I enter, but, trophy or not, you can be sure I'll be entering many shows in the future.

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This is "Bettafile." In future issues you will find this feature devoted exclusively to that arrogant and frustrating beauty called variously the Siamese fighting fish, fighting fish, fighter, and betta. Perhaps it should be said you will find this feature if you, the reader, support it. Like our senior features "Mail Call", "Salts From The Seven Seas", and "Guppy Corner", "Bettafile" will depend heavily on questions in letters from our readers. Like the writers of those features, too, it will be impossible for me to acknowledge or answer these letters personally. Each letter will, however, be read carefully, and those finally selected for publication will represent the questions of a number of aquarists.

It is hoped that our readers will not limit themselves to questions. If you have information about bettas which you think would interest other betta fanciers, feel free to write to this column. Such information may include anything from techniques for maintenance to unusual bettas you have raised or the results you

got from crossing a yellow with a cambodia.

Because of limited time, these contributions, like your questions, cannot be acknowledged by return mail, but all will be read and carefully considered for use in the column. If your letter is selected, your name will be presented with it, unless you request otherwise.

An occasional column will be devoted



Frederick J. Karr

in part or in its entirety to topics which call for special consideration. Such columns will be presented even if no letters on these topics have come in from aquarists.

All this is what "Bettafile" is intended to be, but above all it will be versatile, and if it is necessary to change its pattern in order to serve the interest of betta fanciers, it will be done. This is your column. Let me hear from you soon.

Live Foods for Aquarist Fishes by Robert Gannon. Are any live foods dangerous? What are the best all-round live foods? How much live food should be fed? How do you maintain live foods? These and many other questions are fully answered in this remarkable booklet, which lists and describes all of the available live foods. It is a "must" addition to the reference library of anyone who thinks of himself as an aquarist, and who would like to speak knowledgeably on the subject of live foods. 36 pages.

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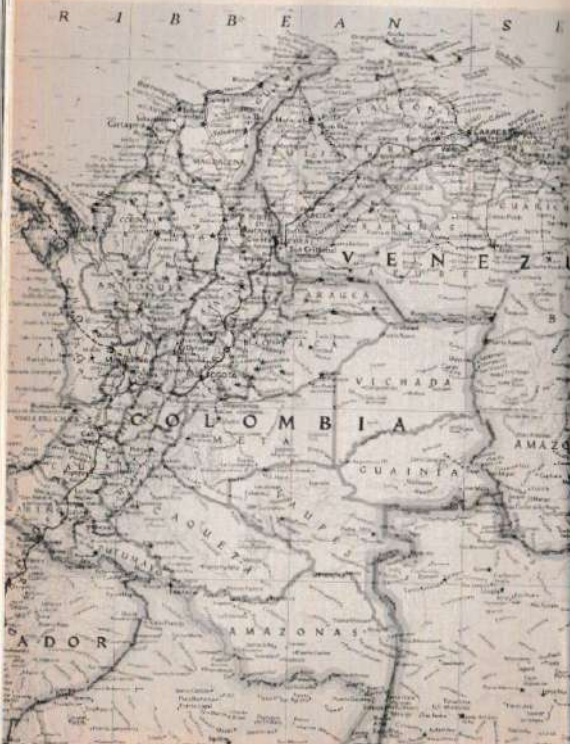
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Tropical Fish Hobbyist

Your editor reminisces.

Wish I were on the Amazon!

BY WILLIAM VORDERWINKLER



January, 1968

Actually I spent only three days on the Amazon River, which hardly qualifies me as a seasoned traveler in these parts. But at least I was *there*! When I first saw the river from the cockpit of the big 4-engine plane which is shuttled back and forth by the Paramount Aquarium and Keith Mitchell, the pilot, told me that it was the Amazon I was prepared to see something big, but what I did see was *immense*! When we landed in the little airport which belonged to the city of Leticia, Colombia, and walked to the muddy shores, the Amazon looked twice as big and ten times as dirty as I had imagined it. It had a uniformly coffee-with-cream color which I was told was constant. There were some fair-sized river-boats tied up, and a few moving up and down the river. Mostly they carried live cattle and pigs, but some had other cargoes. One which particularly interested me was a load of large white slabs which turned out to be dried Pirarucú, the huge *Arapaima gigas* of which my good friend Harald Schultz has written in detail.

Life along the river is unbelievably lazy. There was always a group of natives who had nothing to do but stand around and watch every little thing that went on. When one of the boats had a big ball which had to be gotten ashore and led to the slaughterhouse it seemed as if half the town had dropped everything and gone there to watch as the poor animal was shoved, beaten and dragged off the boat and up the muddy bank.

One of the numerous tributaries of the Amazon, the one which led us to the Baja Loretto. It was not easy to get a decent picture from the moving speedboat which whisked us through these waters. Photo by William Vorderwinkler.



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Paramount Aquarium's big B17, which covered more than 4000 miles on this trip. Note the huge Betta painted on the tail. Photo by William Vorderwinkler.

blanket completed things. Strange thing was that I slept like the proverbial log; maybe being tired had something to do with it. Early the next morning Don Rafael, an Indian youth and I piled into the aluminium speedboat and in no time at all we were bucking the push of the current. We stayed close to shore where the going was easier, and made very good time. Our Indian boy steered skillfully and he had to keep his eyes open too, with all the tree limbs and other floating and half-sunken junk he had to avoid. The river bank along which we sailed was fabulous: it was lined with trees which looked as if they belonged to another world, not just another continent, with occasional flocks of raucous, brilliantly-colored parrots flying among them. Once in a while there would be a huge dead tree festooned with hundreds of hanging nests of a bird which looked a great deal like a Baltimore Oriole, but much brighter in color. There were many Indian villages along the shore, with naked little tots waving a greeting as we passed their dugouts. Floating on the water were patches of a familiar plant, *Pistia stratiotes*.

Finally we turned into a tributary stream. Away from the Indian villages and the other signs of comparative civilization, and with nothing but wild life around us, it became very quiet and all that was heard besides the wild noises was the purr of the outboard and the lapping of the water against the sides of the boat. It was the most serene spot I had ever seen in my life.

At last we came to a wider spot where we could see a clearing on the shore. There was a house and several sheds, and our boat headed for the shore. We climbed out and walked to the house on a narrow path made of logs. I made the mistake of letting my foot slip off one of the logs and went into mud up to my ankle. This explained why the cows I had seen around had stains up to their knees. Seems that all this land, which is on the side of a hill, is well soaked by several springs.

Our Indian friend immediately went to work preparing a meal for us. Let me tell you a little about the food in this part of the world: the first thing you learn here is that you have to cut up your meat in very small pieces with a sharp knife. If you don't, you'll never chew it small enough to swallow without choking on it. To describe it as tough would be the understatement of the year. If you don't like rice, don't look for potatoes because they simply don't have them down there. And the coffee! This is coffee country, but all you ever see is instant coffee which nobody but an espresso lover would think of drinking with enjoyment. They have a special blend which the big coffee firms pack for South American consumption. It is served in small cups, and one cup is just about all that a person can stand.

After eating we went to inspect the fish shed. There must have been about 100 wooden troughs which held about 30 gallons of water each, and all were crowded with fish. Don Rafael showed me some Neon Tetras which were so small I'd swear they were no more than 2 weeks old. There were about a dozen species of *Corydoras*, all of which were kept in trays where the water was covered with a sort of duckweed. Don Rafael told me he found they stayed much healthier this way, but when shipping them they had to be very careful not to get a single leaf into the shipping bag, or the whole lot would not pass customs inspection. There were several fish which Don Rafael could not identify: one was *Colomesus psittacus*, a very attractive species of Puffer, and the other the familiar (to us) *Pterolebias peruanus*. Among the Indians the *Pterolebias* were known as "Africanos." What was African about them I couldn't figure out.

Don Rafael got the fish from the Indians by trading clothing, tobacco, canned goods and other necessities of life for them. They were shown what was wanted and provided with cans and nets, and the next day or two they came back with the desired fish. I would have liked very much to go into the back country with some of these Indians to collect fish, but time did not permit.

It was an intriguing experience to sit on Don Rafael's porch and watch the waters of the Baja Loreto, which I was told this tributary was named, flow by. Out in the deep water there were sometimes huge swirls where a big fish had surfaced. Then at times you could see a big alligator ease out its nostrils and eyes, and after a while sink down again. And the pink porpoises! They'd come up by twos and threes and dive down again, arching their backs just like their cousins in the ocean.

All too soon we were back in the boat headed downstream. About halfway back I was treated to my first real sample of a tropical rainstorm. It didn't last any more than about a half hour, but we were drenched as if we had fallen overboard, and the three of us had to bail to keep afloat. Our excellent outboard never missed a tick during the downpour, and the blazing sun soon came out once more. In no time at all we were dry, and as we neared Leticia I suddenly realized that, barring miracles, I'd never be down there again. I've often longed to be back again since, telling myself what I was going to do next time. If only some day there could be a "next time!"

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CONDÉ PUMPS



Some Observations on East African Mudskippers

BY DR. WOLFGANG KLAUSEWITZ
FRANKFURT, GERMANY

Some years ago Mr. Kenyatta of the British Kenya colony was the most feared and hated man in East Africa. Under his leadership the Mau Mau guerillas waged a dreadful underground war against the white farmers. Today the same Mr. Kenyatta is the President of Kenya and is recognized as the "popular old wise man." Now, the white technicians and farmers like him as much as do the native inhabitants. His usual residence is in Nairobi, the capital of Kenya, but his summer castle is situated near the village of Bamburi, north of Mombasa on the coast of the Indian Ocean. North and south of this village a fish enthusiast can find fish that are of great interest to him; fish that live like amphibians outside of the water.

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To the south are high rocks, and on them we find blennies that never go into the water . . . rockskippers, *Lophalticus kirku*. They are resting several inches above the surface, climbing up and down with the tides, and eating the algae growing on the rocks. When they escape from real or imagined danger, they never dive; they jump upon the surface until they reach another rock.

The habits of the mudskippers, *Periophthalmus koelreuteri*, are quite different. They live in large numbers north of President Kenyatta's castle, along the muddy coast of Mtopa Creek. This long creek is connected with the Indian Ocean and therefore contains seawater and has tides. Along this coast there grow different kinds of Mangrove trees. Here, during the day-time, the hot and smelly mud is perforated by thousands of holes of fiddler crabs. But the animal most fascinating for an ichthyologist is the mudskipper. With their high eyes and jumping motions, mudskippers are not unlike frogs.

It is anything but easy to study these fish. If you try to come close to them, they escape with surprisingly long jumps. To observe them, you have to lay down and crawl slowly in the wet, soft mud. In this way you can get quite close to them and really study their behavior.

The coast of the Mtopa Creek with many mangrove trees is the habitat of the mudskippers.



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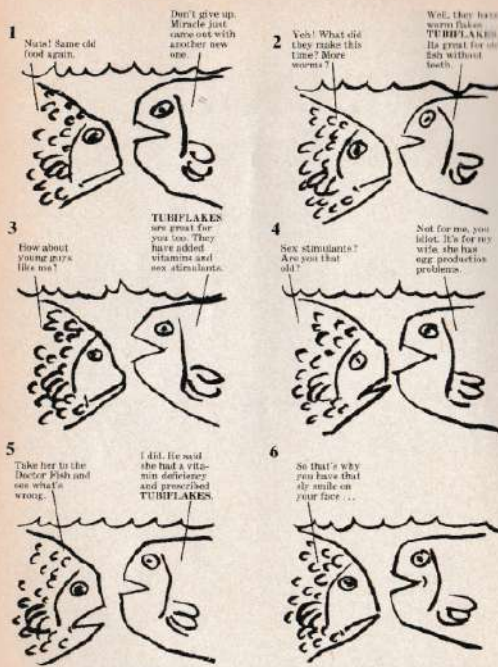


During low tide there is soft mud on which fiddler crabs and mudskippers live together.

As you can imagine, this method of approach is not very comfortable. There are thousands of insects flying about, and most of them bite you eagerly. Then there is the broiling sun. It burns your skin and heats up the mud. As you crawl, you are above the holes of the fiddler crabs. When you feel stinging pain, it is nothing to worry about, merely a crab trying to get out of its hole. Anyway, you mustn't be disturbed by these secondary considerations, for you are anxious to study the mudskippers.

These fish are out of the water and jumping on the wet ground most of the time. Their pectoral fins are specialized for use as little legs which can easily move their long bodies. The rays of these fins are very thin and look quite fragile. But when walking on land, the fish pulls them together to form a rod of each fin. With these rods they crawl and make short jumps. For long and high leaps (undertaken only when the fish are frightened), they use their long caudal peduncle as a catapult, curving it beneath themselves and opening it rapidly. Not only the pectorals, but also the pelvic fins are of importance for movement along the ground. They alternate with the pectorals in action. When the fish is relaxed, it holds its pectorals along its

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flanks and supports its body with its pelvis. The mudskipper can climb the large roots of Mangrove trees—using both sets of fins.

Normally fishes breathe by taking the dissolved oxygen out of the water with their gills. But how can a fish that lives out of the water use his gills? The places where the mudskippers jump and crawl are never absolutely dry. The mud is wet, and there are always narrow streamlets and little water-filled hollows. Thus, these fishes can always keep their gills wet enough for breathing. They also roll their whole body in the moisture to keep their skin wet. This leads me to wonder if they also breathe through their skin. But this is a question which can be cleared up only by experimental studies. There is another unanswered question: often one sees these fishes swallowing something by depressing their high eyes down into their head in much the same way as do frogs. It is possible that they are swallowing air from which oxygen is extracted in their stomachs. Besides all this, mudskippers have tissue for breathing within their mouth cavity. But the exact method used by these fish for breathing is still unknown.

The mudskipper of the Mupa Creek on the East African coast belongs to the species *Periophthalmus koelreuteri africana*.



Another problem was to find out what these fish eat. To this question, we found the answer. In most publications, one reads that the fish eat insects. There are flies, gnats, mosquitos, and other insects flying around. But do the fishes really get enough of them? The mud is covered by sea water two times each day, during high tides. In this marine environment very few insects breed. Therefore, the mudskippers could not possibly get enough insects as food.

In 1826, the zoologist of the Senckenberg Museum in Frankfurt, Eduard Rüppell, did research along the coast of the Red Sea. He found that *Periophthalmus* eat small crustaceans, but what kind he did not mention. I observed them eating mostly young fiddler crabs of the genus *Uca*. With their pointed front teeth, the fish catch the little 2 to 4 mm long crabs, which are then crushed by the fishes' cone-shaped jaw teeth.

Mudskippers are rather good aquarium fish and are, from time to time, imported from Ceylon or Indonesia. This makes it possible for the aquarist to study their behavior.

To keep them, a normal saltwater tank will never do. What should be set up is an aqua-terrarium. At bottom should be sand and some fairly large stones. There must be enough dry land for the fish to be outside of the water. Water must be present, but it should never be deep, for the fishes don't like swimming. Since mudskippers live both near the coast and along rivers, one can use fresh, brackish, or salt water in keeping them. As *Periophthalmus*

During the relating phase the pectorals are put along the flanks and the pelvic fins bear the body. All photos by Dr. W. Klausewitz.



The main food of the mudskippers are young fiddler crabs. Shortly after this photo the fish caught the crab and crushed it with his strong teeth.

likes rather high temperatures and humidity, one should keep their tank closed and use a lamp for added heat if necessary.

Feeding these fish is a problem. Of course it is impossible to feed them fiddler crabs. But they eat tubifex worms, very young stages of locusts and grasshoppers, and very small pieces of earthworm. However, all this material must be living. It must show some movement.

The naturally aggressive behavior of mudskippers is another problem. In their natural environment, each fish has a territory of 3 to 4 square feet. When another mudskipper enters this area, the "possessor" erects his dorsal fins and is ready to fight. The newcomer turns back and jumps away. Therefore, in an aquarium, it is almost impossible to give the fish a suitable natural environment. When you have a great number of them in one tank, no single fish tries to establish a territory. But under these conditions, you will never be able to observe natural habits. If you keep only a few of the fish, they start fighting and mass slaughter is a possible consequence. Therefore one should use a very large tank and divide it with glass into as many small "rooms" as one has specimens. With this arrangement you will see much threatening, erecting of dorsal fins, and intentions of fighting. But the fish cannot harm each other. You must not keep them from seeing one another. When you put each of them into different aquarium and they cannot see each other, they lose interest in life, do not eat, and slowly die.



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MAIL CALL

By Mike Reed

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 Cornelison Avenue, Jersey City, N. J. 07302.

Noisy thermostat

Q. I have some swordtails which have black tails, but where there is black they develop what looks like blisters. The fish show no other signs of being sick. Please help.

2. What is the best algae-eating fish?

3. What fish other than scats eat hair algae?

4. I have a heater which has a pilot light that seems to be half on and half off at times. After that goes on for a while the light comes on like other heaters. When it is in this position (half on, half off) there is a sound on the radio which sounds like static. How can I stop the noise? When in this half on, half off position is it on or off?

5. Does the season have any effect on tank-grown plants?

6. Where can turkey fish be bought? What do they eat?

Carroll M. Barrett, Fairfax, Va.

A. 1. Your swordtails are sick, very sick. A fish which has black pigmentation is very apt to get a melanoma, which is a sort of cancerous growth. Like human

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Tropical Fish Hobbyist

cancer, an area affected like this does not just clear up in time, and is usually only detectable when it has advanced to such a stage that it is too late to do anything but wait for the fish to die.

2. For a large tank, the Plecostomus group. For smaller tanks, the Otocinclus species or Gyriinocheilus aymonieri, the so-called "Chinese algae eater".

3. Most of the livebearers are very fond of nibbling on hair algae. Angelfish also like to pick away at it. If it does not get out of hand, it is a good thing to have growing in the tank.

4. You have a thermostatic control on your heater which probably has dirty points and buses when the points come close together. The points should be cleaned, by the dealer who sold it to you if you do not want to do it yourself, like I do. The position you describe as "half on,

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half off" is just that, close enough to buzz but not to make a clean contact. The noise you hear on your radio is caused by a defective condenser, which can be replaced inexpensively if you have a soldering iron.

5. Many plants go into a sort of hibernation period in the winter.

6. You are evidently under the impression that turkey fish are fresh water species, but they are saltwater species. They can be bought from dealers in saltwater fishes; they are very fond of live goldfish or other small fishes.

Scale protrusion
Q. I. Last week I cleaned out my molly tank. A few days ago one of my mollies died. I noticed that the scales on her sides protruded slightly. I have lost mollies before and all died with

January, 1968

scales protruding. I am completely bewildered. Please help!

2. Some of my green swordtails have narrow dark vertical bands on their sides. Is this common, does it signify poor stock or does it indicate that the fish have a platy strain?

Gail Gilmore, Dorchester, Mass.
A. 1. The molly did not die because you cleaned out her tank, unless you introduced something that was harmful to her. What happened to make her scales protrude was that she probably had a case of dropsy for which there is no sure cure as yet.

Read YOUR FISHES' HEALTH, in our March 1967 issue for more complete information on scale protrusion and dropsy.

2. This is not particularly rare, and does not indicate that she has a platy

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strain, although it does show up occasionally on platies. It is not an indication of poor stock but is often found on wild specimens.

Butterfly fish
Q. I recently purchased a pair of Pantodon buchholzi (butterfly fish) and can't seem to find enough information about their natural habits, breeding, food, water conditions, etc. Can you help?

Kenneth Rosenberger, Hyattsville, Md.

A. Pantodon buchholzi are native to the Congo region in Africa. They occur in pools and tributaries where there are many insects hovering over the water and falling into it, making easy picking for these fish, which have a healthy appetite. In captivity, it is difficult to duplicate this state of affairs, which makes it quite a stunt to

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keep these fish well-fed, and they seldom breed. The water in these regions is soft

and slightly acid, and I would recommend that their temperature be kept from 78 to 80° F. They prefer a shallow tank with a generous water surface, covered at all times because they are excellent jumpers.

Daphnia

Q. 1. Do you know of any daphnia species native to the Northwest? If so, where should I look for them? I have searched for them in swamps, creeks, ponds and in any body of water large enough to support them.

2. Are *Cichlasoma meeki* exceptionally vicious? Will they tear up plants?

Eric Holt, Vancouver, Wash.
A. 1. *Daphnia* species occur in most parts of the world. They occur in numbers in places where the water supports a large amount of life but at the same time is not quite food. Look for them in freshwater ponds where there are no fish to feed on them and where a certain amount of rubbish has been dumped. One of my favorite places was a pond adjacent to a factory that made wall-boards and dumped old pieces that were broken. The paste that was used to fasten the paper surface to the board would disintegrate in the water and feed a great number of infusoria which in turn supported the daphnia.

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2. Actually, *Cichlasoma meeki* are among the more peaceful cichlids if they are not crowded. The only time they get a ship on the shoulder is when a pair decides that they would like to raise a family. Even then, I have heard of spawnings taking place in a community aquarium. Now about them tearing up plants: about 80% of the plants that most cichlids uproot are torn up accidentally.

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- B. Wetterer, Palo Alto, Calif.
A. 1. The fish most commonly called earth-eaters are *Geophagus jurupari*.
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hardness of the water, but it should not be too hard. The best temperature is about 80° F., and the water should be neutral to slightly acid.

3. These fish prefer white or tubifex worms but will also eat live earthworms and frozen, freeze-dried and dried foods.

4. They are found from Northeastern South America to the Guianas.

Too many snails

Q. I am an enthusiastic hobbyist, and I read your column monthly. I am 13

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Margaret Roach,
New York, New York

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A. Snails often have a way of getting out of hand once they are introduced to an aquarium. A simple method of controlling them is to take the excess out by hand and discard them or crush them and feed them to your fishes. Some of the large cichlids love to eat snails and are capable of breaking the shells. There are also products on the market which can be added to the aquarium water to eliminate snails.

Fighting fish and blind gouramis
Q. I have enjoyed collecting tropical fishes for over a year, but there are two questions that really bother me.

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1. I have heard from all my friends that you should never place a male and a female betta in the same tank or they will fight. If this is true, how can you breed them?

2. I keep a number of gouramis in my tank, and some, such as the blue and dwarf gouramis, have feathers. What are they for? Can't the fishes see?

Mark B. Flashen,
Newton Hills, Mass.

A. 1. It is true that a male betta may injure the female if she refuses to spawn when he wants her to. It is best, therefore, to keep the two separated by a pane of glass until the female is swollen with eggs and ready to spawn, if spawning them is your aim. A pair may be kept together

fairly safely in a large community tank if it is well planted and stocked with enough other fish to act as a distraction.

2. These "feathers" that you speak of are characteristic of many fishes in the gourami family and are merely a modification of the ventral fins. Much work has been done to determine exactly what they are used for. It is obvious that the fishes use them to feel things cautiously and judge distances to and between objects, but it is suspected that these modified fins may serve other, more specialized purposes in addition.

Discus and salt

Q. 1. I would like to purchase a pair of discus. Is it true they have to be in an

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aquarium which has slightly acid water?

- If so, how can I make the water in my aquarium slightly acid?
- Would this hurt other fishes?
- What should I look for in buying a discus?
- How do you detect if a discus is male or female?
- What temperature range and kind of food do discus like?
- I have heard that you can put one teaspoonful of salt per gallon of water in an aquarium without harming the fish. Is this true?
- Is there any fish which might be harmed by this salt?
- What kind of fishes benefit from the salt?

**Douglas Dittman,
Warren, Michigan**

A. 1. It is best to keep discus in water that is slightly acid

2. You can do this by adding sodium biphosphate to the water. This is best done by first dissolving the chemical in a glass

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of warm water and then slowly adding the solution to the aquarium. Be sure to effect any major pH change slowly, over a period of a week or more if necessary.


- It would not, if it is done carefully.
- Be sure the fish looks healthy and is not too dark in color. Check for any scrapes on which fungus could start.
- The only sure way to tell is to get them to breed. The one laying the eggs, of course, the female. The other is the male.
- Discus like high temperatures: around 80 to 82°F. They are fairly hard to please when it comes to food. They prefer live foods, but also take various frozen and freeze-dried foods.
- Salt will not harm most fishes in this small concentration.

8. Most species of Corydoras come from almost completely salt-free waters, and even a slight concentration of salt is not recommended in their water by most authorities. However, it is my experience

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that even they will tolerate moderate quantities.

9. Spiro, mollus, and Monocactylus generally need some salt in their water. As for most other species, it is hard to say if any benefit is derived.

Undergravel filters

Q. I am planning to purchase an undergravel filter for my 10-gallon aquarium. Maybe you can answer these questions for me.

- What are the advantages and disadvantages?
- How well do they clean compared with other types of filters?

Anthony Aloise, Willow Grove, Pa.

A. 1. The undergravel filter has many advantages. When you use it, there is no glass wool and charcoal to change. The

filter breaks down the wastes from the fishes and converts them into products which plants can use to grow and are soluble in water and, therefore, easily removed by regular water replacement. Not necessarily a disadvantage is the fact that the pH of tank water sometimes tends to drop when an undergravel filter is used over a long period of time.

2. A power filter filters a greater volume of water per minute, but for a 10-gallon tank, it is not necessary. Inside and outside filters allow the removal of the waste matter when the filter wool is replaced. However, their filtering surface is relatively small. Our January 1967 issue's "Your Fishes' Health" covered filters and filtration in detail. I suggest you read that month's column.

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Guppy Corner



By Paul Hahnel

back his tail, but it will never look as good as did the original tail. I think the betta was probably responsible for the loss of your guppy's tail.

2. In a pool the guppies breed at random. In a tank you can select the best fish and control their mating.

"Ideal" pH and DH

Q. 1. My local water supply has a pH of 7.8 and a hardness of about 100 ppm. I have never attempted to adjust these conditions and have had several veiltails die of what was apparently pH shock a few days after purchase. Is there a particular way of consistently adjusting

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Who damnit?

Q. 1. I admire your work and your advice. I wish you would solve a serious mystery. I have a beautiful red veiltail guppy in a 10-gallon tank with a 4-inch goldfish that is very gentle and a male betta. In the same tank is an algae eater and two smaller goldfish. This morning when I checked, the guppy was minus his tail; a complete amputation! He was swimming well, but no tail. The tail had been cut at its branch with the body. Can you tell me which fish was most likely to have done it?

2. What are the major differences between tank-raised and pool-raised Paul Hahnel guppies. Where do they grow and breed best?

Unsigned

A. 1. Your poor male guppy will grow

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pH in eight 20-gallon tanks, or should I try to adapt my new stock to the unadjusted conditions.

2. What do you consider to be the ideal pH and hardness for vicatils? (This is an elementary question, but, strangely enough, I cannot find a precise answer in any of my literature.)

3. Watersprite is rarely available in my local shops, and as I am very interested in cleanliness, I am considering using bare tanks. Do you think that plants are vital water conditioners?

4. I would like to develop one vigorous strain and will be starting with six or eight tanks. What would be the most logical combination of breeders to purchase: two pair, two trios, one trio, etc.?

Glenn Godeezy,
Tulsa, Okla.

A. I do believe that there is a best pH as well as a best hardness for guppies. The ideal pH is 6.5 to 6.8. The ideal hardness is 185 to 270 ppm. Of course, this is not to say that newly purchased fish should just be dumped into water having this water chemistry. The water chemistry that they have been living in should be matched as closely as possible at first. Then, after they have adapted to their new tank, you should begin changing the water chemistry to those I suggest. Most water falls within the hardness range I mentioned. I have never had to adjust pH myself, but I

understand that most hobbyists use sodium biphosphate to bring the pH down. Add the sodium biphosphate slowly, slowly enough so that it takes you several days to bring the pH down to the desired level.

2. See above.

3. Many top breeders keep their fish in bare tanks. I myself use only the five-leaf watersprite. My personal belief is that plants contribute a lot to the balanced condition of an aquarium.

4. There is no set rule in this. Various breeders use different numbers and different combinations. I use four to five females for each colorful healthy male.

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Salts From The Seven Seas



By Alfred A. Schultz

Q. I just purchased my fifth pair of dwarf seahorses. I have not been able to keep them alive for more than a month. I followed all the instructions that came from the shipper, but to no avail. Can you offer any advice?

George Tikijian, Helena, Mont.

A. Not having more details than the above, I find it difficult to give a positive answer. However, I find, from past experience, that most people tend to over feed and use the wrong type of food. Dwarf seahorses should have an abundance of newly hatched brine shrimp. Brine shrimp eggs can be purchased inexpensively at any local petshop. They should be

hatched in a separate container, not in the aquarium. The hatching takes from 24 to 48 hours. The live baby brine shrimp should then be siphoned off and added to your tank. This will supply enough food for several days, as the shrimp live in salt water, and they will not die off as they do in a freshwater tank.

Q. 1. Is water and sand from local beaches safe to use?

2. Can a regular tank be used if the water level is kept an inch or two below the top of the tank?

3. If I keep crabs, such as hermit crabs, how will they get their air supply?

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4. What kinds of food do saltwater fishes eat?

Bill McNally, Santa Barbara, Calif.
A. J. Water can be obtained from the

ocean, but should be filtered carefully before it is used. Sand must be washed at least six times before it is safe to use.

2. Any stainless steel tank of good quality can be used for saltwater fishes.

3. Use airstones to supply air for your tank.

4. Brine shrimp, live or frozen, are good foods for marine fishes.

Q. I recently purchased two pipefish. Can you tell me what is the best food for them.

Dom Garofalo, Orlando, Fla.

A. Pipefish resemble seahorses, as both have an outer skeleton. They also both require the same type of foods. As a matter of fact, if you are looking for something to add to your aquarium of seahorses, give pipefish a try.

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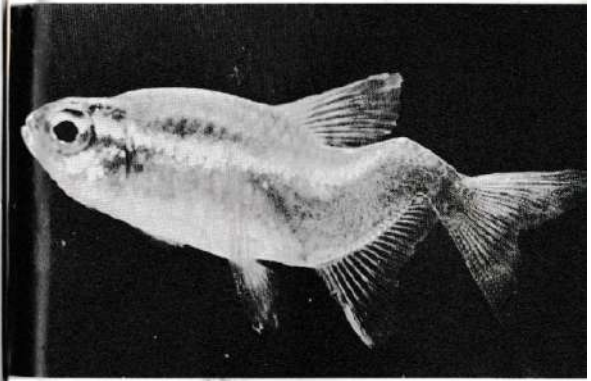
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A neon tetra with a severe case of bent spine.

tions of close inbreeding, tend to throw many young with bent spines.

Assuming that tropicals are getting a well balanced diet, bent spine might be the result of any of three different causes: hormone imbalance, genetic factors, and severe parasitic infection.

An aging fish that develops a bent spine probably is suffering from an imbalance in its hormone production. Such an imbalance affects the overall metabolism of the fish. When calcium metabolism is disturbed, the spine can weaken and bend quite easily.

In fish that you are inbreeding for particular traits, the inbreeding often results in a tendency toward the production of bent spines. This is especially difficult to avoid in that the fish carrying the traits for which you are breeding are often the fish carrying the genes for bent spine as well.

When a fish suddenly develops bent spine and is neither old nor from an inbred line, the chances are that it is the result of a severe parasitic infection. In such cases the affected fish is often lethargic and sometimes shows other signs of disease.



Polycentrus schomburgkii, the Guyana leaf fish.
Photo by Dr. Herbert R. Axelrod.

The Guyana Leaf Fish

BY ROBERT J. WYNDHAM

You're so right if just one look at this stately, colorful fish convinces you that it is not suitable for the community tank. It thinks nothing of putting away, in one swallow, a fish almost its own size, which is about 3 inches. Yet you won't feel sorry if you accommodate a few of these spectacular fish in a roomy tank by themselves or with companions their own size or larger.

As the name leaf fish suggests, the fish's body is strongly laterally compressed. The dorsal and ventral fins have a number of spines, hence the name *Polycentrus schomburgkii*; polycentrus means having many spines. The coloration varies greatly with the local scenery, light, temperature, the fish's condition or mood.

Spots are its trademark: three dark ones offset by light-colored seams on

each gill cover. A number of similar markings appear in the dorsal and ventral fins. A double black band, running in a semicircle from the anterior part of the dorsal, through the eyes, to the ventral fin, gives this fish a rakish appearance. The flanks show four slanting blue-black bands, the edges of which are adorned by numerous shiny light blue and black dots. The colorless, transparent tailfin and the ends of the dorsal and anal fins form a strange contrast. When friend *Polycentrus* hides in ambush among plants, his basic color may be grayish blue, but when he swims in open water, the coloration fades to much lighter hues. This is evidently camouflage both for protection and to keep his prey from seeing him. Your *Polycentrus* may look leathery brown or reddish brown in the aquarium, as colors vary from one individual to another. The female is lighter colored, often brownish, and her markings are less pronounced.

In the streams and drainage canals of its native Guyana and adjoining territories, *casarab*—the native name for this species—often hides in dense vegetation or in rock crevices, waiting for an unsuspecting fish to swim by. Then, lightning fast, it darts out of its hideout; its cavernous mouth opens, and, if its prey is large enough, food worries are over for 1 or 2 days.

The Guyana leaf fish's tank should be in part densely planted with broad-leaved plants, such as *Sagittaria sinensis*. *Elodea* is also very suitable. Some floating plants and some dark material on the bottom make the tank

Polycentropsis abbreviata, the African leaf fish, strongly resembles the Guyana leaf fish. Photo by Karl Knaack.



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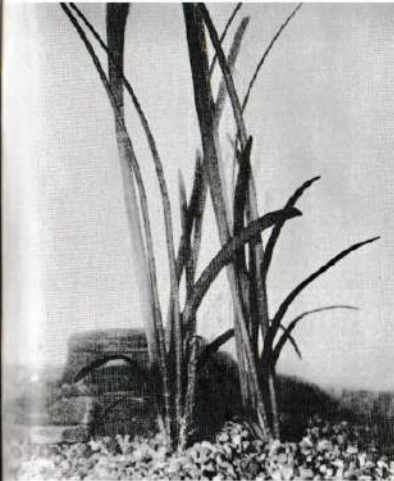
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Tropical Fish Hobbyist



Areas of the tank should have tall plants like this *Sagittaria natans*. The plants should, however, be in dense clumps. Photo by Laurence Perkins.

a real home for the fish. A water level of 8 to 10 inches is fine. A flat rock leaned against the glass at the darkest side of the tank will provide the hideout they need.

The Guyana leaf fish may settle for mosquito larvae and tubifex, but this is not an optimum diet for them. If you hope to breed them, feed them heartier foods at least some of the time: live fishes. Reportedly they also take live earthworms. They tolerate a temperature range from 73° to 82° F. and aged water without aeration is recommended. Oxygen requirements are low. The waters of their native habitat are heavily shaded by luxuriant vegetation, so direct sunshine is not their ticket; keep the tank partly shaded.

You may see a male who has staked out a claim in the tank, boldly defending it against all trespassers and digging near the plants. This is a sure sign that he is ready to breed. Breeding the Guyana leaf fish is not too

Tropical Fish Hobbyist

difficult, especially if you can acquire half a dozen or so of them and let them pair off naturally. That way you overcome the problem of compatibility, for a self-respecting *Polycentrus* male usually does not want dealings with just any female.

The sexes are not too easy to tell apart. The males have deeper coloration, while the females' ventral fins are shorter. Then, of course, females ready to spawn are full in the belly region.

Provide a roomy tank, partially shaded and, at least in part, densely planted. The writer used *Cryptocorynes* and *Myriophyllum*. By all means give them some rocks stacked in such a way that they form a little grotto. A second choice is a flower pot, the bottom of which has been knocked out, placed on its side in the darkest nook of the tank. Sterilizing the flowerpot before use may prevent trouble.

When ready for mating, the male looks almost black, while the female shows a 2 millimeter-long ovipositor. Breeding temperature is 77° to 80° F. When the pair is ready to begin and the conditions are right, the male will inspect a likely looking hideout and, if approved, he cleans it thoroughly.

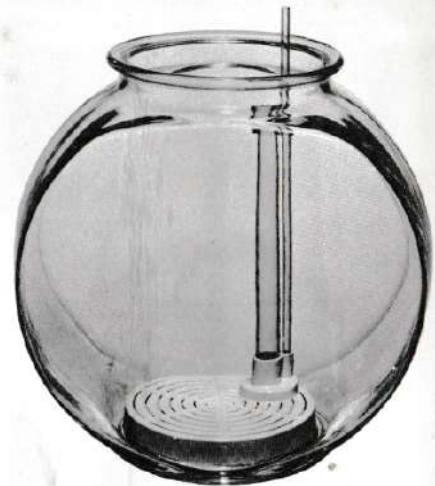
With elegant ceremony, the male engages in beautiful loveplay. His fins spread to the limit, his gill covers extended, he lures his mate with him into the grotto. There spawning takes place as, in upside-down position, the female attaches her eggs to the "ceiling".

This is repeated several times, and each time a dozen or so yellowish eggs are attached to the rock. The eggs measure just under 1 millimeter in diameter. Spawning usually is completed in a few hours.

The male fans and guards the eggs zealously, and he will not tolerate the female near the spawn. If the vegetation in the tank is dense in spots, it is not strictly necessary to remove her, though it may be safer. The fry emerge in about 3 days, and they spend another 2 or 3 days in the grotto. This fish is very productive: broods of from 200 to 500 are not too exceptional. Next, the youngsters start trying to swim into the great watery world in search of food, while the male keeps a keen eye on them. At this point knowledgeable breeders usually remove him to prevent cannibalism. However, it is the writer's experience that if the male is kept well fed, and if any disturbance around the tank is carefully avoided, you can risk letting the male take care of his family a little longer.

As soon as the fry start to swim, they should be fed large amounts of infusoria and/or *Cyclops* nauplii. They seem to grow best at a temperature of 77° F., and temperature fluctuations should be avoided. Pretty soon they will take freshly hatched brine shrimp, sifted *Daphnia*, *Cyclops*, mashed tubifex, and freeze-dried fry food. We have to keep in mind that they grow fast (to 1 inch in about 10 weeks), as the result of a ravenous appetite. So feed accordingly.

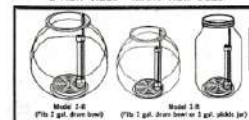
January, 1968



"The Little Miracle!" FISH BOWL FILTER

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difficult, especially if you can acquire half a dozen or so of them and let them pair off naturally. That way you overcome the problem of compatibility, for a self-respecting *Polycentrus* male usually does not want dealings with just any female.

The sexes are not too easy to tell apart. The males have deeper coloration, while the females' ventral fins are shorter. Then, of course, females ready to spawn are full in the belly region.

Provide a roomy tank, partially shaded and, at least in part, densely planted. The writer used *Cryptocorynes* and *Myriophyllum*. By all means give them some rocks stacked in such a way that they form a little grotto. A second choice is a flower pot, the bottom of which has been knocked out, placed on its side in the darkest nook of the tank. Sterilizing the flowerpot before use may prevent trouble.

When ready for mating, the male looks almost black, while the female shows a 2 millimeter-long ovipositor. Breeding temperature is 77° to 80° F. When the pair is ready to begin and the conditions are right, the male will inspect a likely looking hideout and, if approved, he cleans it thoroughly.

With elegant ceremony, the male engages in beautiful loveplay. His fins spread to the limit, his gill covers extended, he lures his mate with him into the grotto. There spawning takes place as, in upside-down position, the female attaches her eggs to the "ceiling".

This is repeated several times, and each time a dozen or so yellowish eggs are attached to the rock. The eggs measure just under 1 millimeter in diameter. Spawning usually is completed in a few hours.

The male fans and guards the eggs zealously, and he will not tolerate the female near the spawn. If the vegetation in the tank is dense in spots, it is not strictly necessary to remove her, though it may be safer. The fry emerge in about 3 days, and they spend another 2 or 3 days in the grotto. This fish is very productive: broods of from 200 to 500 are not too exceptional. Next, the youngsters start trying to swim into the great watery world in search of food, while the male keeps a keen eye on them. At this point knowledgeable breeders usually remove him to prevent cannibalism. However, it is the writer's experience that if the male is kept well fed, and if any disturbance around the tank is carefully avoided, you can risk letting the male take care of his family a little longer.

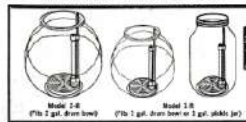
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2 NEW SIZES - MANY NEW USES



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