

September, 1969

tropical fish hobbyist

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tropical fish hobbyist

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cover

If your dream is to get a discus for your tank, then our cover this month is really something special for your eyes. According to the latest aquarist polls the discus is still considered the king of freshwater aquarium fishes. How do you rate this fish? Our managing editor Joe Bellanca says that the Red Discus, *Symphysodon* discus is one of his favorite aquarium fishes even though it requires special attention in feeding and water chemistry. He maintained for 5 years three of these red beauties in a 55 gallon tank, having purchased them when they were medium-sized and rearing them to maturity, at which stage they display their finest colors. The *Symphysodon* discus is truly the "Dream Discus."

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rates

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editorial

The aquarium hobby owes a great deal of what it is today to the dedicated efforts of pioneering individuals such as the late Paul Hahnel.

Although our respected and beloved Paul Hahnel passed away this summer, his specific aquaristic contributions will be evident for many years to come, and his spiritual legacy to the remaining aquarium world will live on ad infinitum.

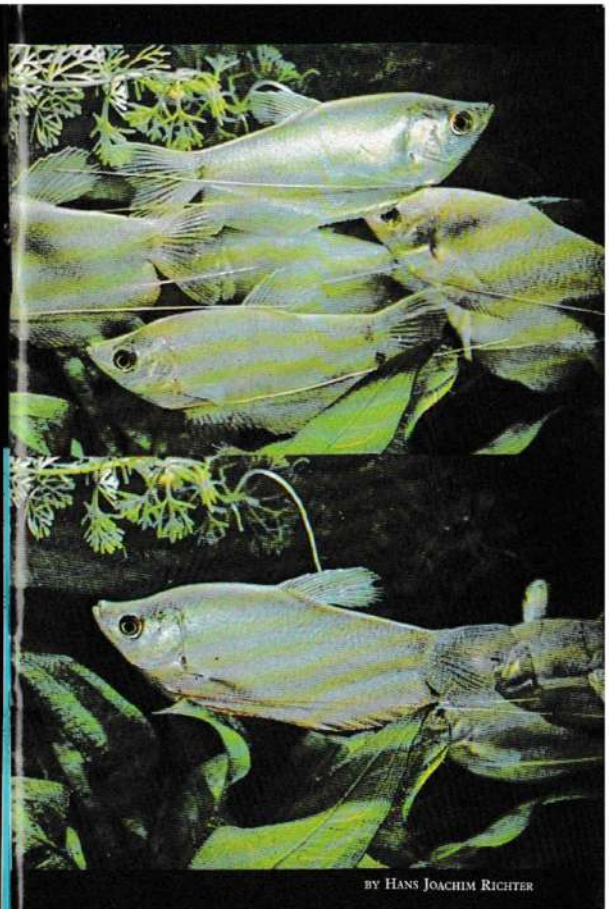
Mr. Hahnel is considered by many to have been the father of the contemporary fancy-guppy. His experiments in the breeding of *Poecilia reticulata* were indeed some of the giant-steps into this present vital guppy-era. Paul Hahnel was constantly striving towards perfection; that was the essence of his personal philosophy. And this essence expressed itself in every detail of his daily life whether in the care of his majestic guppy creations, or in his thoughtful manner of discussion with other aquarists, to the meticulous craftsmanship he gave to the grand subtleties of his trade as an artisan European cabinet-maker.

Paul Hahnel loved beauty and order, consequently, he respected the sweat and toil sometimes necessary to achieve this world of beauty and orderliness. He gave up many hours of personal time answering the numerous questions of hobbyists in the pages of this magazine. He was an interested and devoted friend to the problems of aquarium societies and their quest for the development of standards of excellence for judging fishes in exhibitions.

The limitation of words in attempting to express the impact and meaning of such a great human loss makes any commentary or tribute hopelessly surface and insignificant. Probably the finest tribute would be our own individual silent inner recognition of the merit of the man. So please join in with Dr. Axelrod, myself, Neal Pronek and the rest of T.F.H. in a moment of meaningful silence to honor Paul Hahnel who in many ways personified what the German poets refer to as "der Zeitgeist"—the spirit of the ages.

Joseph M. Bellanca

SACO
SA
ANABANTID
The
Moonlight
Gourami
*Trichogaster
microlepis*



BY HANS JOACHIM RICHTER

Little mention is made so far in our technical literature of this gourami, which is seldom found in the tanks of the fancier. This may perhaps be a consequence of the fact that the current data do not exactly contribute in advertising this majestic fish.

The fact is that the moonlight gourami (sometimes called moon-beam gourami) should never be kept in small tanks, for it reaches a size similar to that of the pearl gourami, meaning 4½ to 5½ inches.

Perhaps another reason for the lack of popularity of *T. microlepis* is that it is not a colorful species. Young of the species are especially noted for their unassuming looks. Just two words are sufficient to describe them: "silver fish." Full-grown males show quite more fetching hues—nothing flashy, true—but colors that are harmoniously adapted to their physical shape. The silvery base of the fish is flushed with a bluish tone which looks especially attractive under indirect sunlight. The pectoral region shows a yellow hue, and the insertion of the ventral is red, shading to orange towards the middle, and with orange colored tips. A not very clear band stretches from the gill covers to the caudal peduncle, where it ends in a black spot. The upper part of the eye is scamed by an elongated red spot.

What makes the fish attractive is its manner of moving, which harmonizes clearly with the general looks of the species. One characteristic feature of the moonlight gourami is its "saddle nose," an indenting of the head above the eyes.

The home range of *T. microlepis* extends over a good portion of southeast Asia, but the species is reported to be quite rare throughout its range.

Basically, keeping the moonlight gourami is no problem as long as you offer it sufficiently large tanks. In small tanks the species becomes very shy and keeps hiding itself away, so that you will rarely be afforded a good look at your pets. It is advisable to keep the fish in tanks of at least 25 gallons in capacity. Convenient planting contributes to the well-being of your fish. Food difficulties are something unheard of with moonlights, for they will eat nearly anything, including dry foods.

Moonlight gouramis may be sexually mature after having reached a length of 4½ inches. Like that of all labyrinth fishes, the belly size of the female increases strongly during the spawning season.

If you want to try breeding the species, place a female full of roe in a breeding tank and join a male to her. The tank should be well



The important moment has arrived. The female *Trichogaster microlepis* has been brought under the bubble nest by the male so that his embraces will help eject from her those many tiny precious eggs. The male of the species can be easily identified by his long graceful orange-red, thread-like ventral fins.

Under the proper conditions, the moonlight gourami is a handsome fish in its own right; its astral-silver color glistens at its every turn as it swims about the tank in its interesting unabashed fashion. Keeping a group of these fish enhances any positive individual characteristics and the total effect is moon magic. Photo by H. Richter.

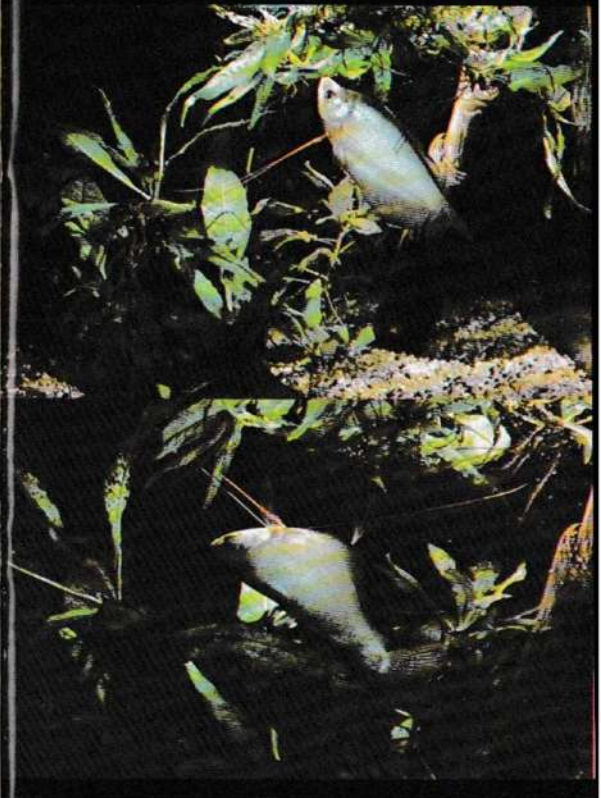
Camera Close-up

Photos by Richter

Guardian Gourami



T. microlepis builds a rather large bubble nest with comparatively little depth. The egg production of the *Trichogaster* genus can range into the thousands with the male of the species usually in constant vigil. Sometimes the female can also be seen performing this guard-duty.



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stocked with plants, and the water temperature should measure about 84° F. From then on everything is just bound to go well.

The point about this gourami that I find most interesting is the way it builds its bubble nest, so allow me to describe the spawning.

In a 36-gallon tank I placed a pair of breeders, with the female showing quite a distended belly. The tank was planted with several kinds of *Echinodorus*, *Potamogeton* *geayi*, and *Synnema triflorum*, plus a few tufts of *Microsorium pteropus* from some ornamental rocks.

The male started building his nest in the darkest corner of the tank. The first building material used was foam bubbles. Then he started searching the tank for plant components. Dead leaves of the different *Echinodorus* were brought to the bubble nest and supported by foam bubbles so that they remained stationary under the nest. Most of these dead leaves were not exactly what one could call small, and were at first still clinging to the plants where they had grown. The male took the stems of the leaves in his mouth and sec-sawed them off. This was visibly an effort. The tufts of *Microsorium pteropus*, too, which he used for the finishing touch, first had to be loosened from their foundation. This too was grueling work. Add the transportation of the plants and the tufts of ladder fern to the nest and you will see that his work was no picnic. Most of the plants and

parts were visibly larger than the male himself. Now each individual part had to be placed in the right position beneath the nest. Finally this had reached a diameter of six inches, not counting the protruding leaves. It was a wickerwork of plants and plant parts cemented together with plenty of foam bubbles. Above the water level, though, there were only bubbles to be seen, forming a cupola about 2½ inches high.

During the building period the female kept to herself among the plants. It was only occasionally that the male approached his mate courting her. When he left, the female always accompanied him part of the way. But she was not permitted near the nest.

Of an intense mating game in the usual sense of the word little was really seen. Indeed, a few times the pair stood side by side "shaking their tail fins," but that was nearly all. The two fish then stood motionlessly facing each other, after which they glided together in a leisurely fashion, embraced, and spawned. The extruded eggs rose slowly to the nest, but were never gathered. The only activity of the male after spawning was that of spitting a few bubbles onto the nest, while the female absented herself from the vicinity during this time. After spawning was completed, the two partners behaved as if there were no nest at all. They simply paid it no attention.

In my tanks the act of spawning



Trichogaster microlepis in these spawning embraces exhibits a certain physical intensity which if seen out of context might be interpreted as being a little violent. But these fish, once the eggs are hatched make excellent parents and are as peaceful and gentle a species as *T. leerii*. The moonlight gourami spawning behavior is not atypical of its genus but there are details in nest building and in the egg characteristics which are dissimilar.

always takes place after 7 o'clock in the evening.

Like those of most species of the genus *Trichogaster* each spawning yields several thousand eggs. For this reason I transfer the nest and eggs to a nursery tank within 24 hours. This is a 25-gallon tank with a bare bottom. The fry hatch 24 hours after spawning and swim free after another two days. This is the time to start feeding the young. The best foods for the fry are rotifers, but in a manner that the fry are literally surrounded by food. In other words, there should be such an abundance that they have only to open their mouths in order to have rich sustenance come floating in. If your conditions are this way, you will hardly sustain any losses,

and the little ones will grow quite quickly.

At present I have a batch of 2½-inch fish in one of my tanks, and these youngsters are only eight weeks old. As you see, growth is amazing, provided you feed abundantly and make frequent radical changes of water. Since I have reared some 2,000 specimens so far (and in an 80-gallon tank) you may imagine what huge quantities of food I have had to provide and that I had to renew the water in the tank nearly every day.

But once you have reared your fish to adulthood, you will not only have the joy they afford you, but quite a nice financial compensation, too, for the species is still relatively expensive.

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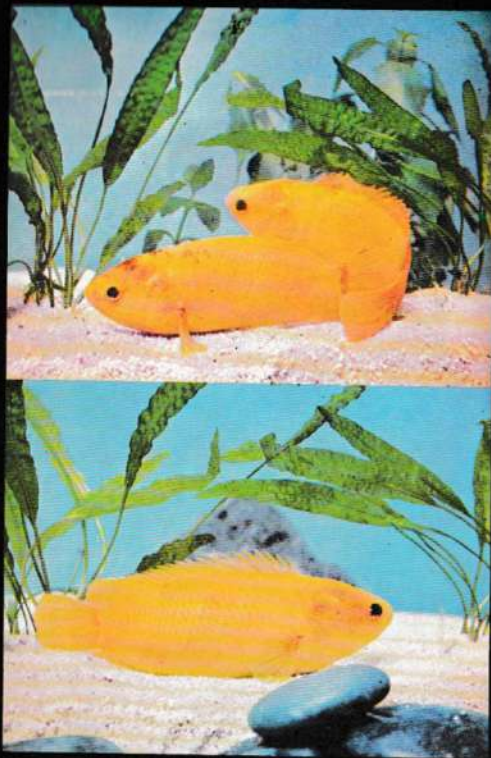
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The other day, my friend and buddy-aquarist, Phil Weinstein, were discussing fish-species that were not usually considered suitable for aquarium-life. That's when I mentioned hearing of a fish that is actually supposed to walk. Phil thought that I was kidding. "Danny, I think maybe you're letting your imagination take over."

"No, Phil, I'm positive. I'm sure that there is definitely a certain kind of fish that leaves the water and travels over land."

"I suppose, Danny, that this fish even goes jogging!"

"Look, Phil, what's the use. You're gonna razz me till I prove what I'm saying."

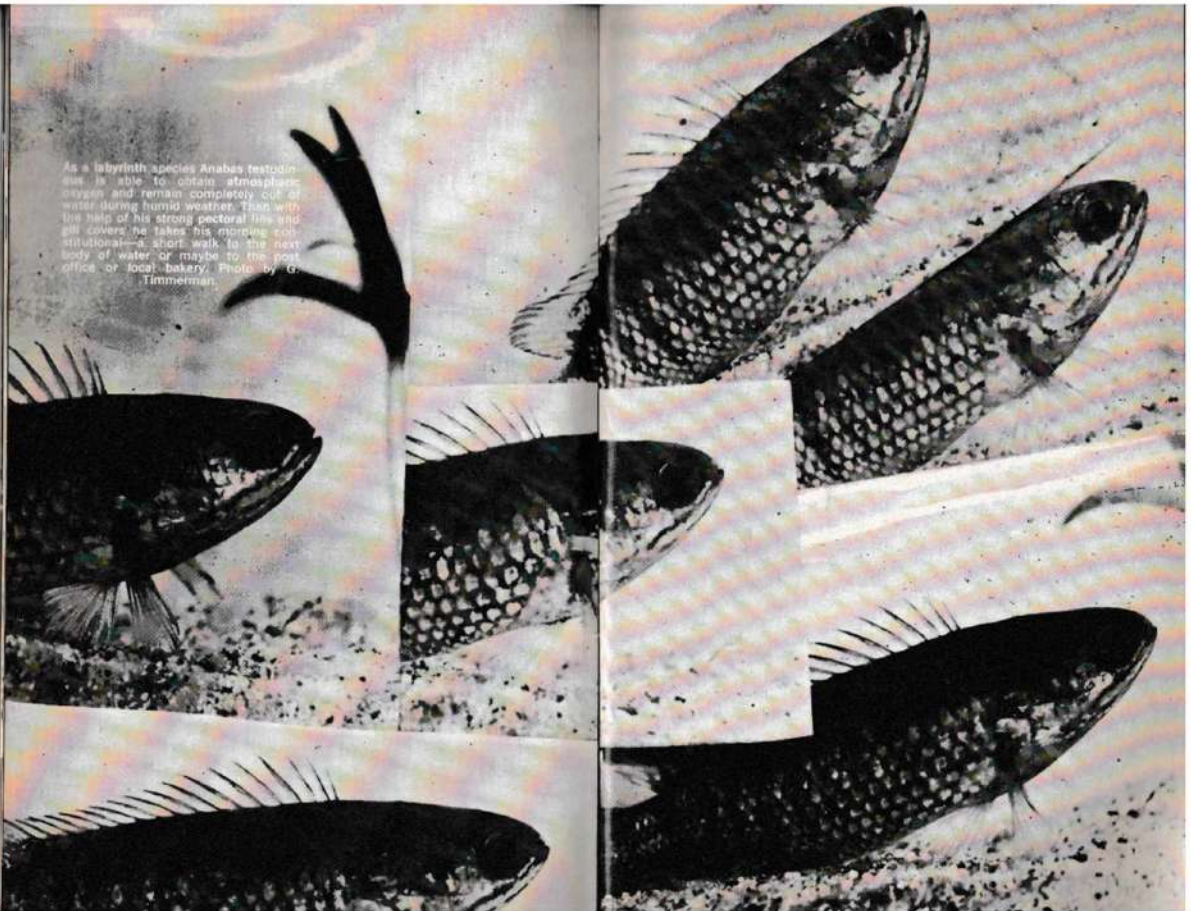
"Danny, let's face it, fish gotta swim, birds gotta fly, but fish gotta walk . . . no sir, never! I tell you what, though. I'll wager you that old 2 gallon aquarium I constructed against that extra 5 gallon aquarium hood I saw in your cellar that there is no such creature as your walking fish."

"It's a bet, Phil. Maybe after I prove to you that the walking fish does exist, this proven fact will teach you that there are some things in the fish-world that are sometimes stranger than your imagination or mine could ever dream up."

Ever since talking with Phil, I've skimmed some aquarium books

This attractive yellow variety of *Anabas testudineus* in the photos on opposite page gives all the appearance of a gentle, peace-loving fish, but in reality *A. testudineus* is a tough, predatory species, best kept by themselves in a special aquarium set-up.

He Doesn't Jog But He Does Walk a Little



As a labyrinth species *Anabas testudineus* is able to obtain atmospheric oxygen and remain completely out of water during humid weather. Even with the help of his strong pectoral fins and gill covers he takes his morning constitutional—a short walk to the next body of water or maybe to the post office or local bakery. Photo by G. Timmerman



Bettaphile

Frederick J. Kerr

Black Bettas

I receive many letters from fanciers about rare colors in bettas. In answer to these many inquiries I have decided to select one rare color to discuss in each month's column. This month I have selected what may be the most common of the rare colors, the black.

No completely black betta has yet come to my attention, but there are many fish which are justifiably called black. There are two factors which prevent the development of a completely black betta. One is the difficulty in eliminating the iridocyte colors and the other is the difficulty of excluding red from the fins. The iridocytes are especially difficult to eliminate from the base of the fins and the posterior section of the caudal peduncle. While the rays of the fins are often very black, all too often the spaces between the rays are distinctly reddish. Intensity of the black color tends to vary with the mood of the fish, with the color being darkest when the fish is aroused.

Some strains of blacks tend to become paler when placed in dimly lighted situations for extended periods. The

pigmentation is regained when the fish is returned to light for several days. Like red, black pigmentation is sometimes incompletely expressed in females, and many females from black strains appear to be merely dark red in color.

Age

Q. 1. What is the average life-span of a betta?

2. At what age are the bettas considered ready to spawn?

Marin Moriarty

West Peabody, Massachusetts

A. 1. After the number of bettas lost by poor care are averaged in, I doubt that the average is much more than a year. There are reports from fairly reliable sources that bettas may live as long as nine years. With reasonably good care the average aquarist would be doing well if his bettas lived three or four years.

2. Your question is based on the incorrect assumption that the only thing which determines spawning readiness is age. This is only one factor. Size and conditions under which the fish are kept are also important. I have had males build nests at ten weeks of age and males which died at two or three years of age without ever building a nest. In the first case the body length was less than one inch and in the latter case the body length was nearly three inches.

Night Light

Q. After my bettas hatched, I dropped an infusoria tablet into the 31-gallon aquarium. The next morning the tank was cloudy and about one hundred fry were dead on the bottom. Did these babies die because the infusoria tablet was put in too soon and fouled the tank, or because the male could not see at night to pick up the babies when they fell out of the nest?

Betty Mallinovsky
Crivets, Wisconsin

A. It seems possible that both factors contributed to the death of these bettas. When properly manufactured, infusoria tablets should not cloud even a small aquarium.

Next time you might try a half a tablet. It is best to leave a small light burning over the betta spawning tank until the young become free swimming. If this is not possible it is desirable to provide floating plants near the nest. This allows the fry to cling to something near the surface when they fall out of the nest and thus be in more oxygen rich water.

Tranquilizers

Q. I have heard that tranquilizers can be used to keep male bettas from fighting. If this can be done, wouldn't it be much cheaper and more convenient to use a drug and raise all the males in one aquarium?

Steven McNally
Vineland, New Jersey

A. Experiments in this area have been extremely erratic. One researcher reports that a particular drug has a tranquilizing effect only to have another, apparently doing the same experiment, contradict his

findings. My own experiments with Meprobamate failed to disclose any tranquilizing effect. If an effective tranquilizer could be found, it could very well affect the fish undesirably in other ways. Jarring seems to still be the best way to raise beautiful male bettas.

Libby Bettas

Q. What exactly is a Libby betta and how does it differ from regular bettas?

Mr. Carolyn Schulman
Houston, Texas

A. The Libby betta is a strain developed by Warren and Libby Young. It appears to be a single gene mutation for longer fins and is easily maintained in pure condition. Unfortunately, commercial breeders have indiscriminately crossed this strain with shorter-finned forms. After several generations of this crossing, the only difference between the "Libby" bettas and regular bettas is the price.

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Tropical Fish Hobbyist

Heavy rains had just begun to fall. The afternoon crowds in Tokyo scurried for shelter. Amongst those running for cover from the warm rains of May were six American G.I.s on rest and recuperation leave from the war in Korea. As the khaki-clad soldiers looked up from their short quick run for shelter, they noticed that they had stopped by chance

By Carol Le May

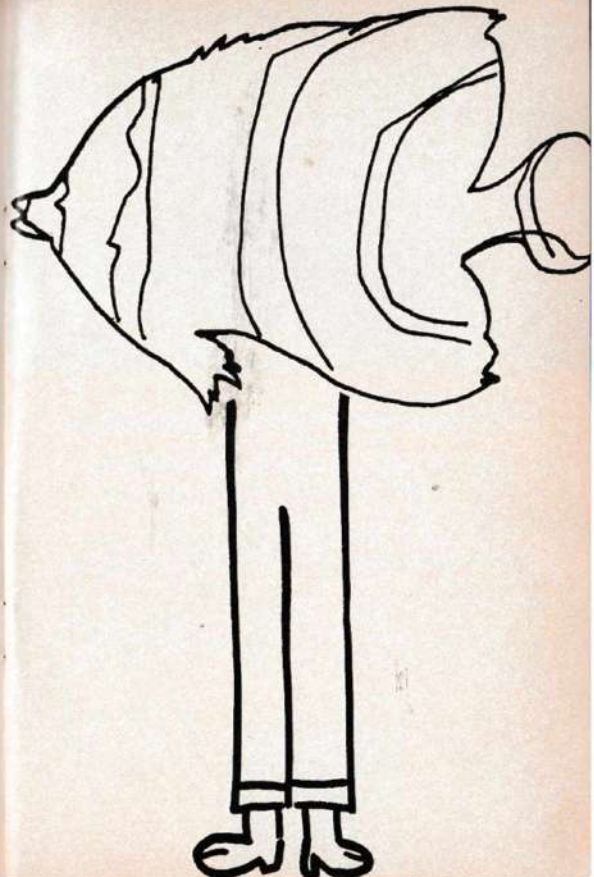
Meet the Hobbyist!

TFH Meets JMB

in front of a distinguished looking restaurant. Then, one of the soldiers, Joseph M. Bellanca said, "What do you think guys? If we're going to have to sit out the rain anyway, why don't we do it inside this restaurant where we can enjoy a good meal at the same time."

Little did anyone, especially J. M. Bellanca himself, that his innocent suggestion to enter that Japanese restaurant in the year 1952 would actually be his entrance into the world of the aquarium hobby, for part of the fabulous decor of that exciting Japanese restaurant was an enormous marine show tank built right into the walls. The image of this truly gorgeous oriental marine set-up was a thrilling moment, and the image of this aquarium lingered with JMB, inspiring him, to want to study and research the aquaristic sciences and arts. In fact, he was determined that upon completion of his 3 years of military service that he would devote a major portion of his time to the aquarium world and all its related arts and sciences.

This, JMB, definitely did, for as you know in 1968 he became Managing Editor and Designer of Tropical Fish Hobbyist magazine. Not only has JMB been a successful, knowledgeable aquarist, maintaining and breeding through the years, many difficult freshwater-species, he has also been an accomplished professional writer-designer-photographer, having worked as a journalist and editor for magazines including Life, Esquire, Vogue, Pageant. His photography has been exhibited several times in New York's Museum of Modern Art, and Esquire magazine selected his photography as being one of the 8 best of photographers in the U.S. working with color. But JMB is really more interested in writing, spending more time with this medium. In fact, his recent published writings on the analysis of the philosophical-psychological prem-





American soldiers get their first glimpse of the Orient through their troop-train window. This scene was photographed on the outskirts of Yokohama in Japan where the local citizens gathered to greet the Americans.

ises inherent in contemporary visual arts and media have earned him a reputation as a man of words and ideas. In 1962 JMB's writing began to concentrate more and more upon the scientific world; presently, he is working on a paper on Semantics and Evolutionary Biology.

J. M. Bellanca's professional, lively writing ability, his effective, daring sense of design and color (besides his writing responsibilities, he selects photos and designs all editorial page layouts when working with TFH) plus his scientific knowledge and love of the world of aquatic vertebrate and invertebrate enables him to produce an informative, interesting fish magazine. JMB and TFH have had good days, good work, and good ideas ever since. The future of the fish world looks brighter!



Tropical Fish Hobbyist

did everything but spawn. Where were they supposed to place their eggs, though?

Today even this fact no longer constitutes a problem, for modern domestic tank-raised pairs of breeders, which have already spawned repeatedly, sometimes simply get rid of their eggs in a corner of the tank, close to the surface, if proper leaves are lacking. The fish with which attempts at reproduction were made in the old days, however, were imported wild specimens without exception, and as such, much more demanding.

Reproducing the harlequin today is no more a headache: the tanks best suited for spawning are smallish containers of three to eight gallons capacity, which after painstaking scrubbing are filled with clean water, the hardness of which should not surpass 6 degrees DH if possible. The pH value of the water should preferably be on the acid side, but this is not an absolute "must." The eggs will develop within pH limits of 5.5 to 8. But the hatchlings frequently turn out better in acid water, which is probably due only to the fact that acid water prevents the development of many microorganisms which might become dangerous to the young fry. A simple Cryptocoryne is a useful spawning plant, and its roots should be anchored down with a glass rod. Superfluous root tips may be pared off. The most favorable breeding temperatures are to be found between 78 and 84 degrees F. As soon as the water is heated up to this degree, place the pair of fish in it.

Even half-grown specimens are easy to sex. The females are a little fuller in body than the males. The wedge-shaped design extends the lower angle of the triangle down to the edge of the belly on the male, while that of the female ends a couple of millimeters higher up. Harlequins are sexually mature at the age of seven to eight months, but the best breeding results are obtained with fishes aged one to two years.

Now we have to hurdle the next obstacle: Not every pair thrown together willy-nilly will mate with each other. If after the fourth day of setting them up the fish have not yet mated, you will have to exchange the partners. The fish should not be fed in the mating tank in order not to spoil the water.

If a pair releases only a few eggs, or if they stop spawning prematurely, this too means that a better suited male or female is in order. It happens frequently among harlequins that a pair does not harmonize too well. Many of the fish show an unfavorable feature which is known by the technical name "side specialization." A given male embraces the female from the right only, or only from the left. And a female will show visible irritation when a male attempts mating with her "from the wrong side." Such two pronounced side specialists will hardly be in a position to mate successfully.

Continued on Page 80

September, 1969

THE AQUARIUM CLUB OF AMERICA

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East
Africa



The colors of this wild strain of the *Nothobranchius rachovi* appear more brilliant than the coloring of the domestic individuals, but if you purchase any of the domestic variety you won't be disappointed for they are still some of the most colorful prices in the freshwater fish-kingdom. As you see in the photo the male *N. rachovi* is large mouthed—in fact, all members of the *Nothobranchius* genus are large-mouthed and strongly toothed, making their somewhat pugnacious attitude toward other fishes even more troublesome. But surprisingly, these same fishes, do not tear their females apart during pre-mating play or during any of the other stages in their spawning behavior. Photo by Dr. Herbert Axelrod.

strains (species?) by American aquarists, and these may not correlate with the names used by Scheel in his monumental *Rivulins of the Old World*. Finally, the taxonomic criteria of *Nothobranchius* are discussed by Scheel, and I will gear this article to the average-level, interested aquarist.

Nothos are generally robust fish, with large dorsal, anal, and caudal fins. These fins are usually brightly colored, and the color may extend from the fins onto the body adjacent. The anal fin may be slightly fringed. The scales of the body are frequently iridescent, and blues and reds are the colors most often encountered. Females are usually unmarked, except for *N. melanospilus*, in which females may have dots, streaks, and blotches of a dirty brown or black color.

Nothobranchius guentheri is the most common notho. The body is bluish green with yellow below. The tail fin and caudal peduncle are bright red, and the tail usually has a black margin. Dorsal and anal fins are marked with concentric red broken lines, and red vertical lines may occur on the rear of the flanks, prior to the red caudal peduncle.

Nothobranchius palmquisti is very similar, although usually not as intensely colored (less green and yellow), and the pure red rear portion of the body lacks the black edge on the tail fin. There are several aquarium strains, including the regular, the elongate, and the Tanzania strains. The red lines on the body form a cross-hatching which extends rather far forward, giving the body a rosy tint rather than an iridescent green-blue tint as the dominant color.

A new species, as yet unnamed, is called the redbelly notho, or notho U-1. This fish comes from the swamps near Lake Chiwa. Its body coloration is similar to that of *N. palmquisti*, but the anal and ventrals are almost solid fire-engine red-orange. The caudal fin shares this coloration and is edged in black. The belly region of this fish is also red-orange, hence the name "redbelly notho" for the species. This fish is due to be named at any time by a professional ichthyologist.

A very beautiful species, only rarely seen, is the notho species going under the name *N. neumanni*. We do know that the name is not correct, although we do not know the valid name for this species. So we are just calling it the blue notho. The fins are very large, and the body color is mainly light blue. The red of the tail fin occupies the center of the fin only, and a broad blue band occurs on the outer margin of this fin. This is one of the larger nothos, slower-growing, and rather difficult because the males are rough on the females, frequently killing them with "over-affection."

Always popular, and not difficult to handle, is the rachovi, *Nothobranchius rachovi*. Here we have something quite different in coloration from the other nothos. There is no red. Instead, while blue on the body and fins still plays an important role, the red is replaced by a rich yellow-orange. This is

Tropical Fish Hobbyist

seen most strikingly on the tail, but extends onto the body as well in an undertone of gold, well-developed on the bottom of the fish but coming through elsewhere as well. The black margin of the tail fin is very striking on this species.

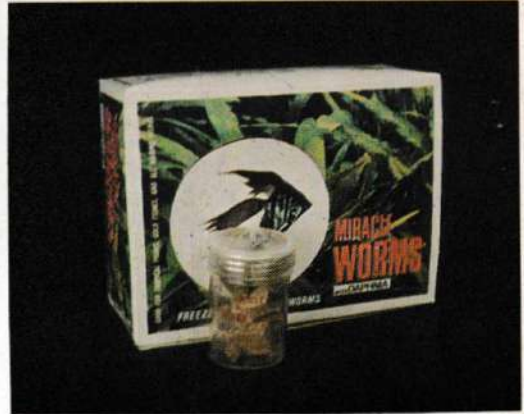
Unlike the closely related *Aphyosemion* and *Roloffia* species, which are creatures of the rain forests, nothos are beauties of the open savanna—swampland open to the sky, something like our own Florida Everglades. In these shallow waters in open country, they are exposed to the searing heat of the equatorial sun during the day and colder temperatures at night. Because the waters of the savanna are shallow, temperature fluctuations are great, but these fluctuations are tolerated by these remarkable fishes. Carnivores, they feed on insect larvae and small fishes not quick enough to get out of the way of the rapid head flick of a hungry notho.

Active creatures, the males are constantly dancing around females, trying to entice them to spawn, and constantly fluttering their beautiful fins like jerky butterflies.

In the aquarium, these fishes do not require subdued light (as other killies may), and the ideal set-up consists of a gallon jar or two-gallon tank (or a divided five) with aeration, fluorescent light, and water sprite on the surface. Water sprite does two things; first, it cuts down on glare while preserving the rich hues of the males where the light beams pass through openings in the plant canopy, and secondly it is an excellent indicator of water conditions. If the water sprite looks good, so usually do the fish. Guppy people have known this for years: Nothos are not jumpers, and a cover is not necessary (unless you are a nervous aquarist). The water should be very clean, and this means giving your fish live food only (if possible); otherwise, stick to frozen brine shrimp. As a matter of fact, if live mosquito larvae, live daphnia, or live worms are not available (as in the middle of winter), you should feed the fish live baby brine shrimp, in quantity. Live foods leave little or no residue, and residue creates the problem of velvet, a dinoflagellate parasite technically called *Oodinium limneticum*. Velvet is also known as rust disease and may be easily diagnosed using a bright flashlight. It appears as dust on the head and fins, and the fish frequently show clamped fins, shimmies, lack of feeding, lack of spawning, etc. Velvet is so bad in some areas (e.g., Chicago), that many people have given up trying to keep nothos. It can be cured by dipping the fish in concentrated malachite green briefly, or using a copper cure. To summarize this section, we use live foods in order to keep the water clean and help prevent velvet.

The next important aspect is to use soft water. In some areas (e.g., here in Atlanta), tap water is very soft. In other areas (e.g., Dallas-Fort Worth) the tap water is very hard, and one must use either deionized water or rain

Continued on Page 53



Tubifex and daphnia are two of the most important foods in the natural diet of any fish. It is almost safe to say that most egg-laying fishes cannot breed unless they are fed crustaceans, like daphnia, and worms, like tubifex. So it was only natural that Miracle would mix them together and prepare them by freeze-drying them by their patented process (U.S. patents 3,361,114 and 3,361,566) which not only makes them stick to the glass, but makes them more palatable and nutritious.

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September, 1969



The physical exuberance of the East African killifish even during their short life span is well known among aquarists. Their marvelous spawning rituals almost seem to express the very passions of life itself. Their actions are quick and high pitched — the female *Nothobranchius guentheri*, as all Notho females, even expel their eggs during spawning, at a more accelerated pace, than that of other annuals. But the East African annuals are said not to dive as deeply into the mud to lay their eggs as their South American relatives. The male *Nothobranchius* has in fact been likened to a male guppy in that he is supposedly non-discriminatory in his choice of mate, attempting to spawn with anyone, and anywhere. So it is best to give the female *N. guentheri*, on the bottom in this photo, as you should to all Notho females, at least ten days of rest after the first initial spawning.

The hour glass of time is set for a short duration on the lives of the *Nothobranchius* genus since they are members of the short lived annual species. As a compensatory device these fishes including *Nothobranchius palmquisti* in this photo leave behind many eggs in the mud during the dry season, to hatch later at the start of the rainy season. The eggs of all *Nothobranchius* are somewhat different from other Cyprinodonts in that their surface is not sticky; the shape of the *Nothobranchius* egg is an oval one.



Continued from Page 40

water. Wherever you are, rain water is the water of choice, but it should be collected toward the end of a heavy rain, when the atmosphere has been rather well washed or dust. If you prefer not to have this bother, then I suggest you buy a deionizer; they are not expensive. Soft water is essential to normal egg development.

Nothos, like most other killies, spawn a few eggs every day, and do not have to be brought into "condition" or placed in "conditioning tanks." If healthy, any notho will spawn from the time it is sexually mature (usually less than two months old). If females are not around, they will drive catfish crazy! Male nothos are sex maniacs. They will try to breed with dead, bloated fish. All this humor is not merely for entertainment. I am trying to emphasize that a male notho is not very particular, and you should *never* keep adults (or young) of more than one species in a tank. You are bound to get hybrids, and the identification and classification of aquarium strains of nothos are already sufficiently fouled up without each of us adding to the confusion by sloppy fishkeeping. The space they require is so small that there is no excuse for any negligence on this point.

Nothos are bottom spawners. You can use bare aquaria (they will not eat their eggs), but most aquarists prefer to use peat moss or sand. Peat moss is hard to keep clean under the best conditions, and the eggs cannot tolerate any fouling of the environment. Also, it may be a little difficult to find all the eggs in peat moss. For these reasons, I prefer to use pre-sifted sand. Buy some fine white sand and run it through a new nylon net. Throw away the larger grains (those that don't go through), and use only the sifted material for the bottom of the aquarium. Set up the tank with your breeders. Every week or so, run your new net through the sand, and sift. The sand will go through, but the tiny clear eggs will be retained.

Place the eggs in shallow dishes of soft water for awhile, with or without a slight amount of acriflavine or malachite green. Examine the eggs daily or more often. If any develop a white spot, turn white, or turn fuzzy with *Saprolegnia* or *Aechlya* fungus, discard them; use an eyedropper to remove affected eggs. Don't waste time. Dead eggs are hatcheries for bacteria and fungi. When the eggs show good black embryonation, take them out and place them in a jar with slightly damp, clean, pre-boiled and washed peat moss. Seal the jar. Keep a count on how many eggs you are putting into the jar. Don't use plastic bags, as these will indeed lose moisture over an extended period.

When you have put in enough eggs for a good one-time hatch (say, about 100-150), wait from two weeks (*N. guentheri*) to six months (*N. rachovi*). Or, you can check the eggs periodically with a hand lens. When almost all the eggs are ready to hatch (you can see their little eyes turning around), place the whole thing into a plastic show box or other shallow container with

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Tropical Fish Hobbyist

no more than an inch of soft water. Use either rain water or distilled water (sold in supermarkets for steam irons). If the eggs don't hatch within 24 hours, add a pinch of dried skim milk or some old microworm culture. Remove the fry with an eyedropper while they still swim weakly, and place them in shallow, soft water in a clean aquarium or similar safe container.

The fry should be given green water the first day or two, and microworms for the first few days. You can omit the microworms if you prefer, but on the second day you must begin feeding them *newly hatched* brine shrimp. Pour the brine shrimp to them as frequently as you can, and siphon out the dead, uneaten food. You can use the eyedropper for this job. A few grains of aquarium salt won't hurt the fish, and will help to keep the shrimp living longer. To summarize this section—use soft water, cleanliness, and live foods.

The fry grow quickly, and most species will be mature and spawning in six to eight weeks. The males fight, so don't keep two together. You can keep a large group together, but if you keep just two, the smaller is likely to be bullied to death. Grow your large hatch in a properly sized aquarium (not less than 10 gallons for 50 fry), and this will give you rapid, even growth of the stock. And a large tank is easier to keep clean. How did we go from a small hatching aquarium to a 10-gallon tank? That is up to you. You will have to use your judgment as to when to make the change into larger quarters. A good rule of thumb is to move the fry when they are very strong, at about 6 to 12 days of age.

What do you do with all these fish? Your friends will be glad to take them off your hands! But so will your dealer. He usually cannot get any nothos, and most dealers who know what they look like will take all you've got. The price is between you and him. But offer him only grown fish, not young, improperly colored stock. The difference is seldom more than three weeks, so be a nice guy for everyone's benefit.

If you are in the American Killifish Association, you can dispose of your excess stock through the mails. Members are always trading nothos and other types of killies among themselves. Write me, and I'll put you in contact with the organization.

One more point will wrap this up. Don't bother with heaters. Nothos and other killies are quite at home in cool water, and velvet is the only disease you need be concerned with. So put your heaters away. You can set up a closet shelf with a row of gallon jars for nothos and other killies, and crank out *beaucoup* eggs. Many killie people are people with limited space; frequently they are apartment dwellers. Killies offer the possibility of large-scale breeding of the most exotic fishes in the smallest possible area. Rarity, beauty, disease resistance, temperature tolerance, small space. What more could you ask? Except, "Where can I get them?"

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Three Males of the East African *Nothobranchius* Genus

A juvenile form of *Nothobranchius palmquisti*.An elongate *Nothobranchius palmquisti*.A domestic variety of *Nothobranchius rachovi*.



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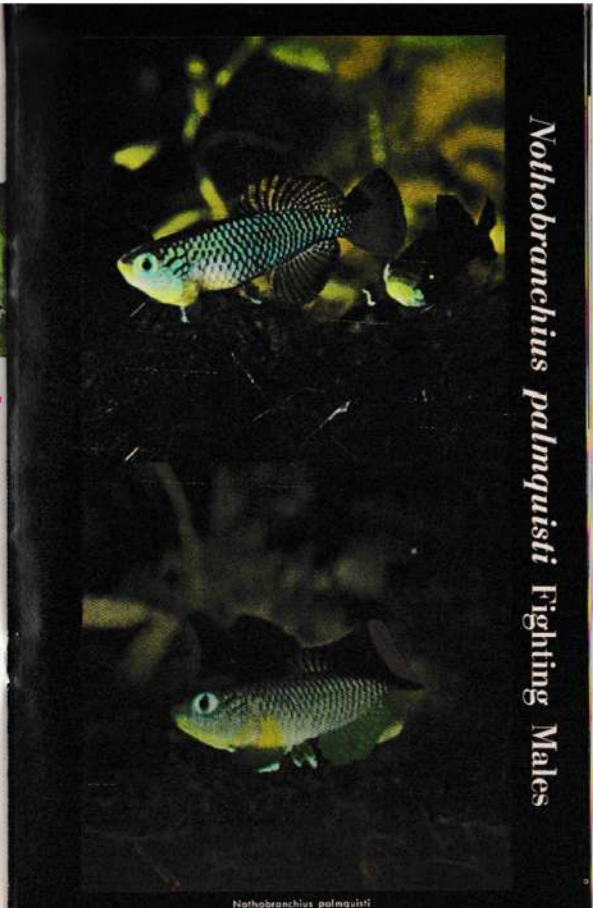
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Nothobranchius palmuisti Fighting Males

Nothobranchius palmuisti



by paul hahnel

GUPPY corner

Bent-Spine

Q. In one of my aquariums I have a baby guppy with a case of bent-spine. He was born about a month ago. But he just recently developed the case of bent-spine. None of the other fish in the tank have bent-spines.

- 1) Is there any cure for this disease?
- 2) Will this disease spread easily to others?

Tom R. Weed
Massena, New York

A. This condition of bent-spine as you call it is not a contagious pathology; it is a birth defect which you were not able to discern in the newly born guppies because of their diminutive proportions but as the fish grew larger the deformity became recognizable. Of course birth defects are not contagious

but it would be wise to select females for breeding purposes whose history did not include throwing off such babies. Many aquarists report a few of these bent-spine babies within the broods they are raising. Birth deformities

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are still under investigation by fish-scientists. The knowledge as to the nature and causes of these deformities are still in question.

Guppy Value

Q. I have a male guppy which seems to me to be quite extraordinary. It is approximately 3/4 of an inch long plus a 1/2 inch tail and is 2/3 black. It has a yellow lyretail streaked with black and an iridescent shading at the beginning of the tail. Also the tail is not a regular lyretail, as it has another point between the lyre (somewhat smaller though). He has a small orange spot at the base of the tail. He has a white dorsal, which is 3/4 of an inch and is twisted.

- 1) Please tell me if it is worthwhile breeding this fish and if it is valuable.

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- 2) I think your column is great and should have more space.

Jordan Yasgur

Whitestone, New York

A. 1) You say that the fish seems extraordinary to you. That should be sufficient of an answer; if it's beautiful to you then that's what counts. As to whether it would sell on the market would depend on many factors including its uniqueness and appeal to the general

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Q. How can I clean my discolored coral?

Sally Klinger

San Francisco, California

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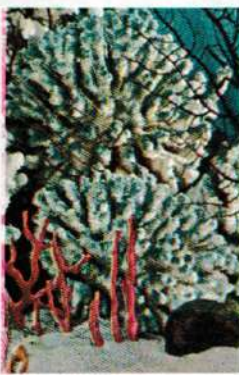
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Tropical Fish Hobbyist



Coral Cleanliness

step is to cure the coral in an extra strong solution of salty water. Q. What is the salt content of natural sea-water?

Bob Morris
Akron, Ohio

A. Natural ocean waters average about 35 parts per thousand of salt or stated in percentage terms—a 3.5% salt content.

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Tropical Fish Hobbyist

Q. Do marine tropical fish require artificial aeration?

Nelson LeGrange
New York, New York
A. Most marine fish love it; their colors are vibrant when artificial aeration is employed in a marine tank. In fact certain species such as Microspathodon chrysurus, the marine jewelfish really glow in the presence of artificial aeration. Without the addition of this artificial aeration many marine species remain uncomfortable and their drab colors and unlovely behavior expresses this discomfort.

Q. I bought 2 damselfish *Dasyllas trimaculatus* but they're always fighting. Might I control this situation?

Richard Messina
Detroit, Michigan
A. A larger tank would keep them farther apart besides additionally satisfying more of their territorial instincts. Also, if you happen to be feeding on a schedule of small but frequent offerings, possibly this is increasing their competitiveness. But, sometimes as a precautionary measure against pollution this small but frequent feeding method is really necessary, so that only

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Lamprologus Fulleborni?

Q. I would appreciate any information you can give me concerning the Trewavasae fish (*Lamprologus fulleborni*).

Jimmy M. Stevens
Charleston AFB, South Carolina



Labeotropheus fulleborni

A. I know of no fish named *Lamprologus fulleborni*. You are probably referring to *Labeotropheus fulleborni*, but the common name might indicate that you

mean *Labeotropheus trewavasae*. In either case we are dealing with a Lake Nyasa cichlid which is adapted for scraping algae from rocks. In the aquarium they have proven to be scrappy and hardy. While they come from relatively hard alkaline water, they can live and breed in soft slightly acid water as well. They are mouthbreeders.

Prochilodus Taeniurus

Q. Recently I purchased a *Prochilodus taeniurus*. He was apparently very young as his size was less than one inch. Though he eats well, having doubled his size in three weeks, he refuses all food larger than guppy size flakes. All other food is rejected. Why is this?

John Merritt
Encino, California

A. I once received a tiny *Prochilodus* in a shipment of head and tail light tetras. Although he lacked a head light, he did

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have a tail light and apparently had gotten by the sorters. Like yours he grew at a fantastic rate and at the end of a year was six inches long. By the way, he lost the tail light when quite small. Most aquarists do not realize that the lips of the prochlorodius are developed very much like the lips of the kissing gourami. They are expanded discs adapted to the removal of algae from plants and other objects. This gives you a clue for diet. If algae is not available, give him cooked spinach and watch him grow.

Discus Disease

Q. I have been keeping discus for about six months, but I seem to be plagued with the so-called discus disease. The affliction takes the form of spasms, contortions and loss of equilibrium. This seems to abate for a few hours and then starts again, resulting in the death of the fish in a day or so. There are no external lesions. I have tried tri-sulfa, tri-sulfa with salt, and terramycin. None of these have worked. I am now trying

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high temperatures of about 90 degrees with and without medications. Can you offer any suggestions?

H. G. Kelley

Little Rock, Arkansas
 A. About 40% of all imported discus are infected with the discus protozoan disease. Various treatments have been suggested, but their effectiveness is questionable.

Symphysodon discus



Some German authors contend that raising the temperature to between 95 and 104 degrees is the best cure.

Undergravel Filters

Q. I have heard varying opinions on the undergravel filter. Some people say they work and others say they do not. Their reason for not liking them seems to be that they feel gas collects under the filter and eventually kills their fishes. Others say that they starve plants. What is your opinion of this?

Mrs. Hugh R. Williams

Naples, New York
 A. I feel both criticisms are invalid. If the filter is installed and operated correctly, there is no possible way that gas could form under the filter. It is just this gas that the filter prevents from forming in the gravel. The filter will starve many plants to death if the gravel is too shallow (there should be at least three inches in the back of the aquarium) or if the filter is run too rapidly. It should be possible to count the bubbles as they come from the stem.

Puffers

Q. I am interested in puffers.

1. What kind of fishes can they be kept with?
2. How big are they when they can be spawned?
3. What should their aquarium setup be and what foods do they like?

Mark Clark,
 Rockwood, Michigan

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A. You mention no specific species of puffers. The following answers apply to the most generally satisfactory freshwater puffer, *Tetraodon somphongi*.

1. All puffers are fin nippers and should either be kept by themselves or with fast moving fishes like danios or barbs.

2. *Somphongi's* puffer reaches about 2 inches long. There have been no spawnings reported.

3. Any standard aquarium setup is fine. They are particularly fond of red ramban snails, but they will eat nearly anything.

Hi-Top Convict

Q. I have been quite successful with gold convicts. My pair has produced several batches of fry. While looking over one tank, I noticed one individual which was a little different than the others. It has an extension of the front

part of the dorsal fin much like that found in many species of *Aptogon*. In an article on mutations by Frederick J. Kerr he states "Before a breeder devotes time, space, and effort to such a project (developing a mutation into a true breeding strain), he must ask himself if such a mutation... is worth the effort needed to bring it to the marketplace." Do you think my mutation is worth developing?

Tom Sivak,
 North Riverside, Illinois

A. I would suggest that you breed this fish to one of its siblings to see if the trait appears in the next generation. If it does, you may have enough to test the public's reaction by selling them through a local pet shop. Good luck!

Lighting Problems

Q. I am having trouble with my lighting since I started using Gro-Lux lighting. My 10-gallon aquarium has one 14-watt, 15-inch bulb, and the 23-gallon has one 20-watt, 24-inch bulb. It appears to me that neither of these gives enough light for their respective tanks. I can't keep my plants alive, but green algae forms readily. Also, the manufacturer recommends two watts of fluorescent light per gallon of water. This would mean that my 50-gallon

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tank would require five 20-watt bulbs or three 30-watt bulbs. This seems ridiculous. Will you comment on this.

Tanya L. Phillips
 Berkeley, California

A. First, I do not believe that your lack of success with plants is due to the lighting. You must look for some other factor such as water conditions or an excessive number of fishes. Two watts per gallon is a poor rule for selecting bulb size. The important factor is not the capacity of the aquarium, but its depth. The farther the plants are from the bulb, the less light they receive. Therefore, a shallow aquarium requires a lower wattage bulb than a deep aquarium of the same capacity. Assuming that the lights are left on ten hours each day, the

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following depths and wattages are useful:
 9 inches, 14 watts; 12 inches, 20 watts;
 15 inches, 25 watts; 18 inches, 35 watts;
 21 inches, 40 watts; 24 inches, 50 watts.
 If the lights are to be left on longer, the wattage should be smaller; if the lights are not left on so long, stronger wattages may be employed. There is an excellent

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A. This is an old wife's tale. When cichlids aren't near the mate they love, they lose the mate they're near. You have an excellent chance to span your pair if you provide the proper conditions.

Clarias Batrachus
 Q. 1. Six months ago I bought a baby albino clarias catfish. Since then it has more than tripled its size. My problem is that many of my fishes have disappeared and nowhere can I find them. I have lost three neon tetras and many of my guppies. Is it possible that the clarias is eating my fishes?
 2. How big will the clarias grow in a 10-gallon aquarium?

Steve Tremacoli
 East Northport, New York
 A. 1. It is not only possible, but probable.
 2. They grow 18 inches long in nature. Figuring half that in a large aquarium and a fourth in a small one, your fish could reach four or five inches.

Crayfish
 Q. I captured two crayfish from a local creek. I am tempted to use them as scavengers in my 20-gallon community aquarium, but their pinners scare me. Would it be safe to put them in my aquarium?

Douglas Marin
 North Tonawanda, New York
 A. As long as the fish can see the crayfish

coming, there is little danger that the crayfish can catch them. At night, however, when many fishes are on the bottom, there is a chance that the crayfish will catch a fish now and then.

Tank Capacity
 Q. I am planning to make a tank. How can I find out how many gallons of water it will hold if the dimensions are 16 x 10 x 8 inches?

Leonard Olszewski
 Chicago, Illinois
 A. The capacity is found by finding the number of cubic inches the aquarium contains and dividing by 231. In this case it works out to about five and a half gallons.

Cat Whiskers
 Q. I just noticed that the barbels are missing from all my corydoras catfish.

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What caused them to disappear and will they ever grow back?

Carlo Zona
 Worcester, Massachusetts
 A. The barbels probably were lost as the result of an infection of either bacterial or fungal origin. I doubt that they will grow back.

Tank Sterilization
 Q. What is the best way to sterilize a large aquarium which has had sick fish in it?

Elizabeth Leighton
 New York, New York
 A. There are a number of ways. One is to scrub the aquarium with a saturated salt solution. Another is to do the same with a cloth dipped in rubbing alcohol.

Yellow Gravel
 Q. Is yellow aquarium gravel so light it makes some fishes' colors fade? If so, what color would be preferable?

Janis Letterman
 Port Arthur, Ontario



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A. A pale color will make some fishes contract their chromatophores so that they are paler. Those which do not do this look paler because of the light background. My personal preference is either a natural colored gravel or one of black or brown.

Ports and Acaras
 Q. While looking through a book I saw a picture of a fish which was called a green acara. In a pet shop I saw the same fish called a port. Which name is correct?

Janarius A. Abeita
 Colton, Oregon



Acara portalegrensis

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A. This shows what happens to common names. This fish is now known as *Aequidens portalegrensis*, but some years ago it was called *Acara portalegrensis*. Common names were derived from each of the parts of the scientific name resulting in two different, and correct, common names.

Newts
 Q. About 3 weeks ago I purchased a pair of red spotted newts from a local petshop. I put them into one of my smaller aquariums. They get along just fine with my other fish except for a few minor fights here and there. My problem is that they won't eat the meal worms that I give them. Maybe they are too large for them to eat. They won't even look at them. My female is pregnant. Could that be why she is not eating?
 2. Is there any other live food that they can eat that can be purchased from a petshop?

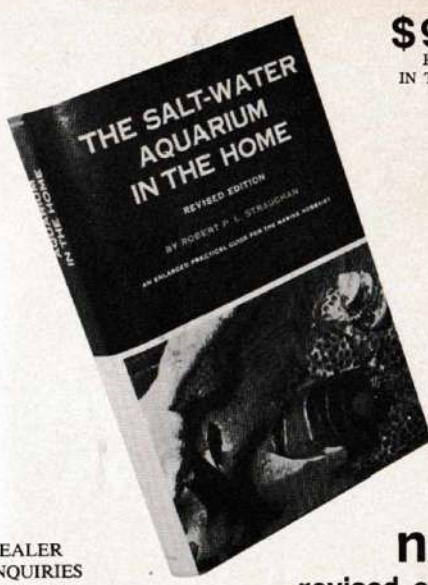
Jeff Larson
 Des Peres, Missouri

A. 1. Maybe the fish don't mind having around the red spotted newt *Triturus viridescens*, but do the newts like the setup you've put them in? A good idea for a newt setup with fakes is an aquarium with the tank only half filled with water, and a large rock protruding out of the water so that your newts won't drown if they are passing into their air-breathing stage while in your aquarium. The spawning-ready condition of your pair might explain their fussiness and anti-social behavior, so that you might have to set up a situation as I just explained that would be better suited to their liking and needs.

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Tropical Fish Hobbyist

If you want to breed *Rasbora hengeli* you will have to act very similarly in the manner used for *R. heteromorpha*. But in this case you should pay attention to the fact that isolated pairs reproduce only sporadically. This species likes to spawn in schools. It is less productive than the harlequin too—a full-grown female hardly produces more than 100 eggs.

The easiest way for breeding *R. hengeli* is to place them in a permanent setup. The tank should not be too small, and its bottom covered with dark gravel or eventually a layer of peat moss, and be stocked with *Cryptocoryne* or with *Ludwigia*. On the surface there should be some floating plants—Floating Fern or Crystal Wort. IMPORTANT: the tank must be absolutely free of all contamination including snails and planarian worms! Place several pairs of fish into this set-up and feed them cautiously on live food, but never on cyclops! Having such living conditions, the fish soon start to spawn with the hatching percentages generally being quite satisfactory. The parents pay little attention to their fry—from time to time a Pop, Mom, Uncle, or Aunt absentmindedly swallows one, but most of the babies survive and grow up. In such a permanent set-up feeding is a little problematic: besides the adult ones, also the young fish in their different stages of development have to be fed. Here is a simple method: Additionally to the usual diet for the adults, serve daily helpings of freshly hatched brine shrimp, and do this from the moment on, when the first fry are swimming. The permanent set-up is not as rational a method as separating individual pairs of breeders in special tanks, but in the special case of *Rasbora hengeli* it offers better chances of success.

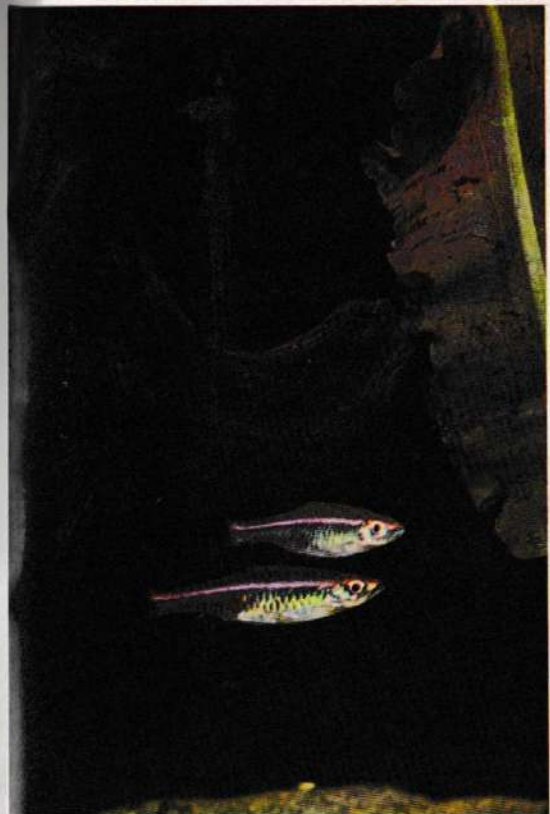
The novice aquarist could mistake *Rasbora hengeli* for *Rasbora heteromorpha* but upon closer examination one will note that *R. hengeli* is much more translucent, slimmer, and the violet coloring within its narrower wedge-design is not rich or vibrant. *Rasbora pauciperforata* in the brilliant color photograph on the opposite page has a longitudinal band which runs through the entire body of the fish gives off a pink electric glow. This is also a very peaceful species which unlike *R. heteromorpha* does not shy away from fishes of other species, unless of course you attempt to keep it with much larger fishes like cichlids, whose very presence would become a threatening situation. The *Rasbora hengeli* originates from Sumatra. Photo by S. Frank.

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YOUR FISHES' HEALTH

When fungus is mentioned in aquarium circles, it usually brings to mind the cottony growth of *Saprolegnia* so often seen on injured or dead fish. There is, however, another type of fungus which few aquarists would be able to recognize. It is *Ichthyophonus hoferi*, also referred to as *Ichthyosporidium*.

Many classify this fungus in the Phycmycetae, but it does not really have the characteristics of any described class. Perhaps it would be better to consider it one of the Fungi Imperfecti, a group of strange, probably unrelated, fungi.

Ichthyophonus does not form long filaments in tropical fish, such as are seen with *Saprolegnia* infections. The mature organism is oval to spherical, with a diameter up to 2 millimeters. The immature stage, called a plasmodium, is the more common stage seen in the fish's tissues. These are found enclosed in thin-walled cysts in any of the organs. The heart, body muscle, liver, and kidney are most frequently attacked.

In the common guppy, infections of the ovary have unusual results. Cases have been reported in which the hormone balance was upset to the point that female guppies became males (sex reversal). *Ichthyophonus* infections of the ovary have also been associated with parthenogenesis (virgin birth) and the development of teratomas (tumors which could be considered as malformed embryos).

The symptoms of *Ichthyophonus*

infections are very similar to those of mycobacteriosis (fish tuberculosis). White nodules are found on and in the various organs. Ulcers may appear on the skin, or the fins may fray or even completely disappear. With infection of the brain (not uncommon), there may be loss of balance coupled with erratic swimming and exophthalmus (protrusion of the eyes). Color changes may also be associated with this nervous tissue infection. Emaciation is common. Inflammation caused by the parasite may progress to the point of producing tumor-like growths.

The similarity between the symptoms of *Ichthyophonus* and *Mycobacterium* infections has caused confusion of the two even by professionals. However, it seems safe to say that *Ichthyophonus* is widespread among fish. It has been stated that 35 marine and 48 freshwater fishes are known to be susceptible.

In the aquarium, the infection is probably acquired by eating food, debris, or dead fish contaminated with the fungus. The fish's digestive juices free the organism from the cyst formed by the previous host. It then penetrates the lining of the gut of the new host. The organism may develop there or may penetrate a blood vessel and be carried to any of the other organs where it develops into a plasmodium. The plasmodia may divide to form several more plasmodia. Infective stages

September, 1969

may be released with the feces during the early stages when the fish is still eating or from the ulcers which sometimes form.

It has been reported that phenoxethol and parachlorophenoxethol may be useful in the treatment of this infection. The recommended dosage is 200ml of a 0.1% stock solution per gallon added over one to two days. The water must be

changed after the fish recover.

This treatment is not completely successful. It is best to prevent the infection. Suspect fish should be isolated or destroyed and the community tank disinfected with bleach. The disease has been introduced into the trout industry by feeding raw fish products made from infected fish. Feeding raw fish should be given careful consideration.

By Roger Lee Herman



"Madam, let me put your mind at ease. I can definitely say, as a doctor, your fishes do not have the measles."

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BOLD BIZARRE



BEAUTIFUL

The oceans of the world are inhabited by creatures who are some of the most marvelous and mysterious on this planet. The extraordinary diversity of forms and behavior exhibited by marine fishes stuns the imagination. In fact, the origins, development and present status of these aquatic organisms help constitute the basis for various investigative disciplines including marine biogeography, marine biology. And the



- 1 *Ptereleotris splendidum* collected at Moorea.
- 2 *Myripristis violaceus* collected at Eniwetok.
- 3 *Macropharyngodon pardalis* collected at Eniwetok.
- 4 *Mirolabrichthys tuka* collected at West Samoa.
- 5 *Melacanthus atrodorsalis* collected at Eniwetok.

Photographs by Dr. John Randall

marine aquarium hobby not only enjoys the opportunity of maintaining such incredibly beautiful fishes but is also in the enviable historic position of being able to contribute important observations on these marine species, many of which whose behavior has never been observed and recorded.

There are thousands of *bizarre* and *beautiful* marine species the aquarist would like to maintain within his home aquariums but, naturally, not all these species would be suitable for aquarium life; you wouldn't be able to maintain and observe a requiem shark such as the dangerous tiger shark *Galeocerdo cuvieri* or one of the fascinating light-producing lantern fishes such as *Photoblepharon palpebratus* but there are equally interesting and much more beautiful species to challenge the marine aquarist's ability. And a challenge it is! For marine aquarium management poses many formidable problem-solving situations. Feeding and nutritional requirements for marine fishes are still being researched since so little is factually known about the biology of many of the marine species. The sexing of these species is very often difficult if not completely impossible. The spawning behavior of a great number of the salt-water species has never been observed, and if there have been observations, quite often, important details have been missed, or there are the problems of conflicting observations. Finally, the successful rearing to maturity of marine fry from domestic spawnings is an accomplishment yet to be achieved in domestic marine aquaria.

The fitting adjective to describe today's marine aquarist must be "bold". The marine fishes are *bizarre* and *beautiful*, but the marine aquarist must be *bold* enough to accept the challenge of an uncharted journey. They'll be many questions and problems he will have to solve with only his own intelligence and experiences. I don't mean to make the marine hobby sound a hopeless task—to the contrary. What I am trying to say is that the rewards are greater even though the work might be harder and more demanding of the individual's perception, ingenuity and time. No cry babies in this game. You either love it or you don't.

There are some developments though that will make the sailing a little smoother: the availability of excellent artificial sea-salt mixtures; recent successful experiments in chemical ridding of some disease caus-

ing organisms which have been the bane of marine-keeping; the development of aquariums from new kinds of materials; and, even experiments in transitions of marine species from maintenance in salt-water to comfortable living in fresh water. There are exciting vistas yet to be seen and reached. Many of the discoveries, I am sure, will be made by marine hobbyists reading this article. And I believe that one of the first



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major changes in the marine hobby will be the kinds of marine fishes the *new marine aquarist* will attempt to maintain. The new marine aquarist will be more selective and diversified in his choice of species for his tanks. Clownfish are great—a delight, but the new marine aquarist is more adventuresome. He is an explorer in his own rights . . . a person ready to utilize the knowledge of the past but also keenly desiring to contribute and further the hobby through effort of his own. Some of the marine species illustrated here may be the kind of species the new aquarist will one day soon with more knowledge and discipline, be able to maintain.

BY GREGORY PITORSKY