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COVER
The fish on our cover this month are found in the swamps. The top fish is a male. The general background in this picture recalls also the general appearance for the unusual length of this mouthbreeder in the male photographed. Another unusual thing about the fish is that the female's tail fin extensions that are almost as long as those of the male. The female's distinctive markings but is not the same as the double-lined characteristically marked or few cross bars in this species. A photo of the double-lined mouthbreeder, with red cross bars and should be compared with the fish on our cover. From the facts of these two females and from the information we are getting about them from local breeders, it looks like this variety is defined for general availability and kept separately while the cover. For more about the female M.S. available, turn to the entry beginning on page 47. Photos by Oliver V. Tschaplinski.

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EDITORIALLY . . .

The laziest of all fishes and probably among the laziest of all living creatures are some of the anglerfishes found in marine waters all over the world. The female has a fat, round body that is largely head, with an immense mouth and long teeth that enable her to hold onto her prey once she has grabbed it. She expends very little energy getting something to eat, however, merely lying on the bottom with her huge mouth wide open, waving the elongated first ray of her dorsal fin in front of her like a fishing pole and engulfing any fish that might be foolish enough to swim up to see what the darn thing is. The species that inhabit deep waters where little or no light penetrates are armed with a luminous tab at the end of their "fishing pole." Anglerfishes are incapable of any amount of swimming, and are usually content to waddle along the bottom by "walking" with their ventral fins.

So much for the female. Now we come to the real prize specimen, the male. This fellow really takes the prize in the laziness contest. He is only a small fraction of the female in size, and when he spots the lady of his dreams, he latches on to her, biting into her loose, flabby skin. He becomes permanently attached to her, leading a parasitic existence by subsisting on her body fluids. The only real service he does for her is to fertilize her eggs when she lays them. Females have been caught with as many as six males attached to them. These particular ladies, I suppose, might be called the glamorous sexpots of the fish world!

William Vorderwinkler



The male dwarf Egyptian mouthbreeder is beautifully colored at spawning time. Photo by Hansen.

Spawning the Dwarf Egyptian Mouthbreeder, *Hemihaplochromis multicolor*

BY RUDOLF ZUKAL
BRNO, CZECHOSLOVAKIA
Black and white photos by the author

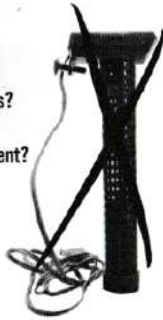
The dwarf Egyptian mouthbreeder is native to North and East Africa from Alexandria along the entire Nile to Lake Albert, Lake Victoria, and Bahrel-Gebel, and the Semiliki River. They were imported as far back as 1902 and from this time on were greatly liked and often kept in the aquaria of



Two not-often-seen mouthbreeders of the genus *Haplochromis*: above is *H. philander*, below, *H. kirki*. Photos by Hansen.



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The male dwarf Egyptian mouthbreeder takes great pains to make the depression where spawning is to take place exactly as he wants it.

hobbyists. These mouthbreeders belong to the smaller cichlids, attaining a length of about 3 inches. They can be identified easily by their body structure.

Their basic color is yellowish which becomes a golden yellow in places.

The male (left) performs a courtship dance for the female's benefit.



A pair of dwarf Egyptian mouthbreeders in spawning colors. Photo by Pinter.

The male is wonderfully colored at spawning time, his scales and fins glittering in a variety of colors. The female is less intensely colored, and even the basic color is not as rich as that of the male. This short description could not possibly do justice to such a fish, which must be seen alive.

I must honestly admit that I have not been one of the truly ardent admirers of this fish, and I kept them only because of their unusual breeding habits. In a long, well-lighted, densely planted tank with several hiding places of roots and rocks, I kept 11 of them at a temperature of 72° F. I could detect no signs of any fighting, just spawning and threatening actions. I am of the opinion that these fish are of a peaceful nature and can be kept with other fishes in a heavily planted tank. They require living foods.

In order to photograph their courtship and spawning, I prepared a tank of about 6 gallons in capacity. The fine gravel in the tank was washed thoroughly and planted with cryptocoryne plants. A flowerpot should be provided as a hiding place, making the fish feel surer of themselves and more willing to spawn. I did not do this, to make the fish easier to observe and photograph.

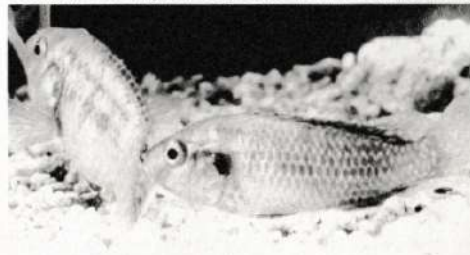
Both the male and the ripe female were put in the tank on the same evening. Normal tap water (pH 7.0, DH 12) was used, and the temperature was set at 78° F. After the fish had become accustomed to their surroundings, the male began preparing a depression in the gravel. When he came within sight of the female, he immediately went into his courtship dance.



At first, the male guards the depression, driving the female away should she approach.

She turned her body upward and spread her gills, her entire body trembling while the male shone in his most brilliant colors. The male does not tolerate the female in his presence at first, and threatens imposingly when she gets too close to suit him.

Gradually, his mood changes and he begins to coax the female toward the depression.



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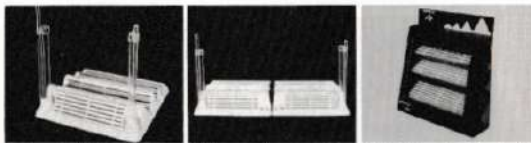
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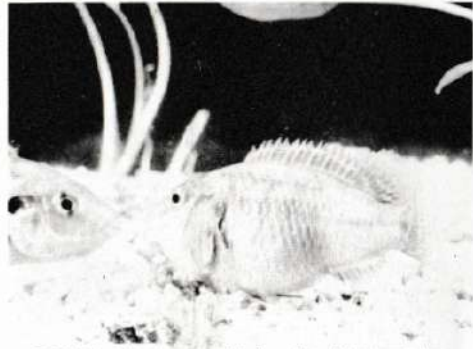


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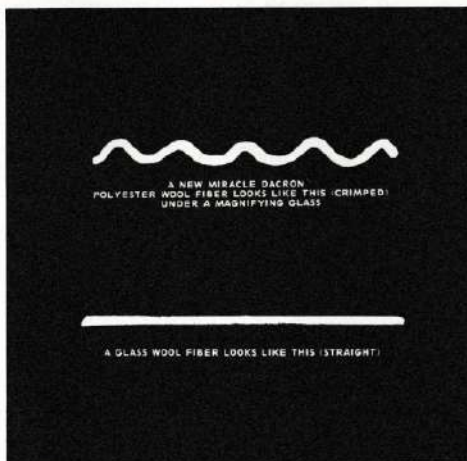
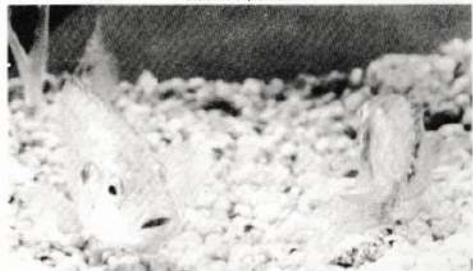


Cichlid fashion, the pair sometimes locks lips and tugs. But no harm is done.

After the depression is finished, he begins to lure the female. He becomes more obtrusive and punctuates his courtship with prods, and sometimes even bites.

The preliminaries to a spawning are varied. If the female is ripe and

Slowly they begin to realize what Nature has intended that they do, and they begin to circle the depression.



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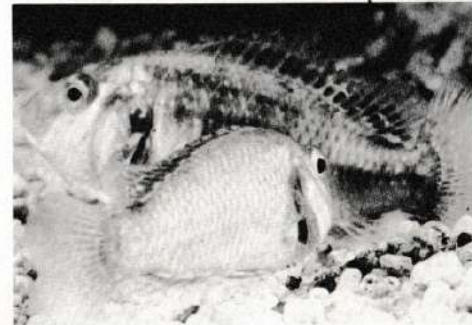
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The false mating begins.

willing to spawn, the act takes place quietly. Sometimes there is some lip-pulling, or fighting, as is observed with other cichlids. At such times, an understanding is reached gradually, and the two meet and swim around each other over the completed depression in the gravel. This depression is

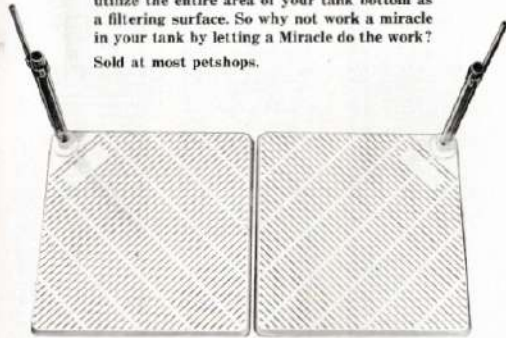
The male butts the female in the side to help her begin to release her eggs.



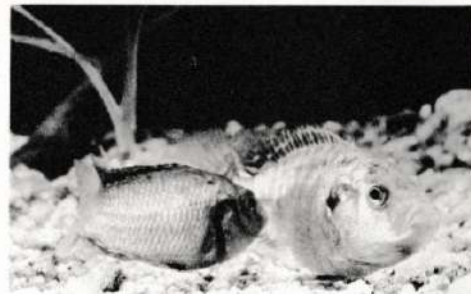
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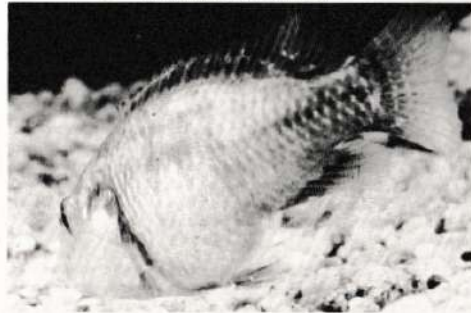
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Finally the eggs begin to arrive.

repaired or enlarged at times, and even the female helps to move the larger stones. Then both fish swim in circles and poke each other lightly in the sides. After a few false matings, at last eggs are laid. While the male fertilizes the eggs, the female pokes him, and when he swims away, she

The female picks up the fertile eggs.



The male stands by patiently as the female continues gathering up the fertile eggs.

immediately gathers the eggs in her mouth. Each time she gathers the eggs, the male waits above or nearby, and the spawnings are repeated again and again.

After about 3 hours, I noted that the female had become unwilling to continue and saw that her gill pouch was becoming full. More and more, I noticed that she swam into a corner of the tank. Looking at her from the side, I could see the little eggs in her mouth. To prevent her from being molested any further, I removed the male.

At a temperature of 78° F., the brood was able to leave their mother's mouth after 10 days. During the time the fry are in her mouth, it is not advisable to attempt feeding the female, because she takes no nourishment. On about the ninth day after spawning, small quantities of tiny live foods should be introduced into the tank to provide nourishment for the newly hatched youngsters. There should not be too much, because the brood is usually small (30 to 100).

The freeswimming ability of the youngsters is greatly dependent on the water temperature, and the colder the water, the longer the female carries them in her mouth.

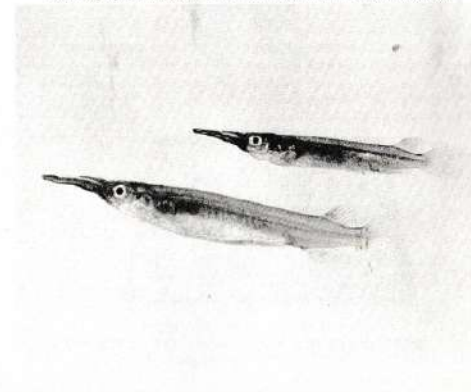
Breeding the Malayan Halfbeak, *Dermogenys pusillus*

BY IVAN PETROVICKY
Prague, Czechoslovakia

The Malayan halfbeak belongs to the subfamily Hemirhamphidae of which some species are livebearers. Most of the fishes in this subfamily live in marine and brackish waters in tropical and sub-tropical countries. A few live in fresh water. To this latter group belongs *Dermogenys pusillus*.

Dermogenys pusillus is native to Thailand, on the Malayan Archipelago and the islands there. The female attains a length of up to 2½ inches while the male grows to just under 2½ inches. These lengths are seldom attained in the aquarium, especially by the males, who are more likely to reach an average of 1½ inches. The elongated body of this halfbeak is pike-like, mildly compressed laterally. The lower jaw is very long, almost twice the length of the moveable upper jaw. As to color, the descriptions of many authors show marked differences. The fish bred by me do not match any of the descriptions

A *Dermogenys pusillus* pair. The male is the upper fish. Photo by M. Chvojká.

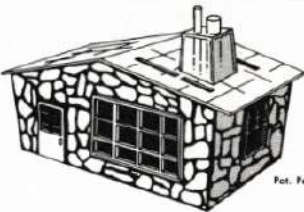


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fore, a good idea to keep another fish species in the same tank, so that they can take advantage of this food.

The fish are livebearers, and their courtship is very interesting. The male takes a position where he is motionless below the female, as though he were looking up at her. Sometimes he swims about her with vigorous movements and widely spread gill covers. During the copulative act the male presses close to the female.

Males frequently stage battles with each other that sometimes lead to damage of their beaks, but seldom are the battles so bad that their beaks are broken off. More frequently it is just part of the skin that is scraped off, and this type of damage heals quickly. During these battles, the males have their gill covers open and their bodies in a curve. They attack one another until one is driven into flight.

Pregnancy lasts 5 to 8 weeks. Feeding vegetable substances during pregnancy, as is recommended in some literature, strikes me as a bit odd; at least my fish do not touch such food. An addition of salt to the water can do no harm when one takes into consideration that these fish are also found in river mouths where brackish water occurs. But this salt addition is not necessary and in no way influences the vigor of the youngsters any more than feeding vegetable substances. If in spite of everything there are stillbirths, it is necessary to add Vitamin D. I give it by spraying the flies or larvae of *Chironomus* with a few drops of Vitamin D in an oil suspension. Of course the spraying must be very light to prevent oil spots from forming on the water's surface.

The gravid females are put in small, shallow tanks, about 2 inches deep and containing about 2 gallons of water. The bottom is left bare, but a clump of aquatic plants is left floating where the young can hide. (I do this despite the fact that I have never observed any cannibalism.) The fish are not too particular in their requirements as to water chemistry. I do not, however, consider water that is soft and acid as usable. When switching ripe females from one tank to another, temperature is highly important, however. Even a 1° F. higher temperature in the tank into which they go can lead to premature stillbirths.

Trying to pick out ripe females, especially when they are looked at from the side, can be very difficult. We can only use as a guide the color of the "gravid spot." This spot is very much different than in the other livebearing tropical fishes. It does not lie at the anal opening, but rather near the middle of the belly profile, near the ventral fins. On the right as well as the left side of the belly, the spot forms a sort of right angle. When these spots show a black color, we can take it for granted that the time for the young to be born is very close. If we want to observe the belly profile from another angle, it is better to look down on the fish from above or still better to observe it

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from the front. Here one can easily see the belly dimensions, and with practice the ripeness of the female may be judged. (When I first began breeding these fish, I observed their dimensions from above, and the females appeared slender to me. This caused me to miss the proper time, and the females dropped their young in the community tank.) After the young are born I take the females out of the breeding tanks.

The fry are about a quarter of an inch long and have no beaks. The number of young delivered varies, depending on the age and size of the female. One-year-old females deliver an average of between 30 and 40 youngsters. I have never observed more. The fry become freewimming immediately at the water's surface. Specimens which remain lying on the bottom or must struggle to attain the surface are doomed to death. Sometimes it happens that the youngsters still have a large yolk sac after they are born. In such a case it is best to leave them alone and not begin feeding them until the next day. Like the grownups, the young ones are capable of swallowing proportionately large chunks, and for this reason they can be fed from the beginning on coarse cyclops. In about 10 days, the lower jaw begins to become longer, and small daphnia can be taken. At an age of 3 weeks, the little fellows are already eating the same foods as the grownups. A well-fed youngster grows quickly. At an age of 2 to 3 months, the males become sexually mature; the females take a little bit longer.

This fish must be handled carefully, as the beaks are easily damaged. I have frequently seen specimens after transporting that had their beaks broken off completely. To conclude, these rules should be followed for successful keeping and propagating of this species:

1. Large, shallow tanks with a large water surface.
2. The temperature should never sink below 75° F., and low pH values must be avoided.
3. At least once a week they should be fed with insects (*Drosophila* and the like).
4. If there are stillbirths, food should be sprayed with Vitamin D.
5. Before introducing the female into another tank, equalize the temperature until there is less than 1° difference between the two tanks. (Failure to do this is probably the cause of many stillbirths.)

I am convinced that if these rules are followed, keeping and breeding this fish is not at all difficult.

CAPTURING INSECTS AND BREEDING DROSOPHILA FOR DERMOGENYS PUSILLUS

Catching insects in a net is practical only if there are a limited number of fish to be fed. Insects are best caught in a net of fine mesh, and it is best

done on mowed fields or by beating through shrubs. The captured insects are shaken into a jar, where they are anesthetized on the spot with a little ether, which then permits you to sort out the bits of plants and the larger beetles. If one lives out in the country, this is an excellent food that can be gathered all summer.

If a larger number of fish are kept, it is more advantageous to culture fruit flies (*Drosophila*) because the culture can be controlled as it is needed. The fruit fly is a two-winged insect of the family Drosophilidae. They appear everywhere that there is fermentation producing alcohol or vinegar, for instance on decaying fruit, where the grown insects feed and their larvae grow. Both winged and wingless forms are bred in laboratories, usually for experiments in genetics. These flies multiply rapidly, and the culture, especially of the wingless form, is simple.

The winged form is bred in various insectariums. For this I use a simple setup. In a 1-gallon jar, I put in a nourishing bottom layer of sweetened farina paste, sometimes with some bits of fruit added. Then I put in some flies. The open jars are then placed in a frame which is covered with a fine nylon net material. The temperature here must be kept above 68° F. and below 82° F. In an insectarium like this, one needs only to change the jars with the food in the bottom. When some flies are needed for food, a clean jar with the same size opening is placed atop the one with the flies. By rapping on the bottom jar, you cause the flies to fly up into the upper one. Then a stiff piece of paper or a pane of glass is inserted between the two jars and the upper one removed from the insectarium. The original jar with the food in it remains in its original place. The captured flies are then anesthetized by putting a bit of cotton which has been moistened with ether in the jar. The sleeping flies are then shaken out on a sheet of paper, from which they are transferred to the water's surface.

I breed wingless fruit flies in jars which have been covered with netting. On the food on the bottom, I place a sheet of crumpled paper on which the flies can crawl. These flies are easy to handle, because they cannot fly. When I feed these to my fish, I carefully shake out the living flies from the jar to the water surface in the aquarium. One must be careful not to get any of the culture medium into the aquarium as well.

If the flies begin to multiply sparsely, it is time for a change of culture medium. It is advantageous to have a couple of jars waiting in which a few flies can be shaken and the old culture thus perpetuated. If both wingless and winged forms are bred, be very careful never to mix the two. If they become mixed, in a very short time the wingless ones revert to the normal winged form once more.

Marine Tropicals in India

BY RODNEY JONKLAAS
CEYLON

Of all the countries exporting tropical fishes, India has the least reputation for colorful tropical marines. A very small percentage of the exports from Bombay consist of marines, and, as far as I know, only one exporter, my old friend Sané handles them. Thousands of fresh and brackish water fishes are shipped out of both Bombay and Calcutta, but Calcutta cannot boast a marine fish output of any importance.

From Bombay, most of the marines are collected by local fishermen in tidepools, and the bulk of the worthwhile catch consists of small juvenile and very beautiful *Pomacanthus annularis* and *Chaetodon collaris*. The others are juvenile pomacanthids, fairly attractive but not very popular because of their aggressiveness. At any rate, they are not available in any quantity.

One of my most challenging assignments of recent years was the exploration and experimental collection of tropical marines in India. This took place in January. I worked at first for the University of Kerala Public Aquarium at Trivandrum and then for the Taraporevala Aquarium,

The Trivandrum Aquarium. In the foreground is a large ornamental pond in which there are *Etreplus* and *Tilapia*. Photo by Rodney Jonklaas.



GET ACQUAINTED



The ENCYCLOPEDIA OF TROPICAL FISHES by Axelrod and Vorderwinkler is the largest, most complete book on aquarium fishes ever published in any language. It has more than 760 pages with about 600 monochrome photographs and 300 color photographs. Every phase of the aquarium hobby is completely covered and there is special emphasis on how to breed aquarium fishes. Chapters on Commercial Breeding, Aquarium Plants, How to Feed your Fishes, Diseases, Snails and Scavengers, plus many others, covers points never before considered by other books. More ENCYCLOPEDIAS have been sold since its publication than any other book on tropical fishes. Due to the large printings its cost is amazingly low . . . only \$8.95 at your petshop or bookstore.

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245 Conelison Avenue, Jersey City, N. J. 07102

Bombay, administered by Maharashtra Fisheries. In 1965, I had demonstrated before a delighted Aquarium staff at Kovalam beach (a few miles out of Trivandrum, the capital of Kerala State) that there were easily collected and colorful marine fishes available for the Aquarium and that they need not depend entirely on the seine and throw-net leftovers of professional fishermen for their exhibits. This started off an interesting chain reaction which ended in my being assigned to collect, demonstrate, train, and advise in marine tropicals for the Trivandrum Aquarium.

I touched down at Trivandrum airport, to be greeted by my friend Mr. Padmanabhan, curator of the Trivandrum Aquarium, and Mr. Antony, the superintendent. I was whisked off in a station wagon to a clean little hotel in the town and ended the day by seeing a movie, "Pirates of the Mississippi" starring an all-German cast and shot in Spain!

The next morning I started work, commencing with a preliminary program of what I intended to do. I also went to the Aquarium, which, though small, is remarkably efficient in that the mortality rate is low and the exhibits are in splendid condition.

I was astonished to see a tank of several huge *Caranx* species (jacks) which were not there last year. These 12 to 15 pound beauties had been raised from the fingerling stage, after having been caught in a plankton net, in less than 8 months! The turtles were, as usual, splendid and clean, and the morays were as fat and civil looking as ever. One tank housed a huge number of restless nurse sharks which were evidently very easily obtained. One remarkable exhibit was of a tankful of *Heterostichus* (the sargassum fish), the largest and most active I had ever seen. Padmanabhan informed me that they were very commonly caught and brought in by little boys who sold them for a few cents each. There was also a fine tank of crabs. In the crab tank were also several delighted octopuses which dined on the crabs whenever they felt like it, which was often, judging from the miscellaneous remains of crabs.

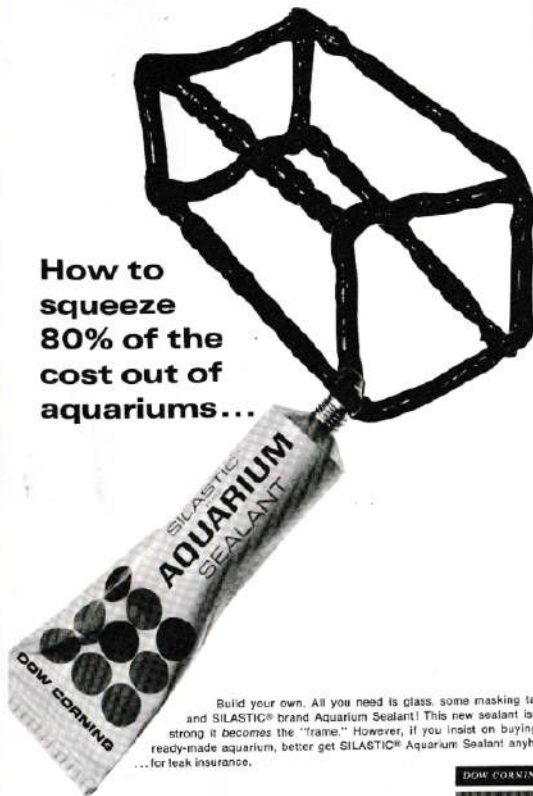
The freshwater section was equally interesting; one tank of many large *Puntius filamentosus* was a glorious sight, for the adults had lovely filamented dorsals and gleaming reddish bellies, and their caudal extremities were tipped richly with blood-red. As usual, there were the huge silver ox-cyc herring (*Megalops cyprinoides*), the tarpon of the East and one of the hardest fishes imaginable.

But the most noticeable thing was that there were no colorful exotic marines like the chaetodonts and moorish idols which I knew were abundant in nearby waters; this is what I had been asked to rectify. The sea was clear

Continued on Page 37

Continued from Page 31

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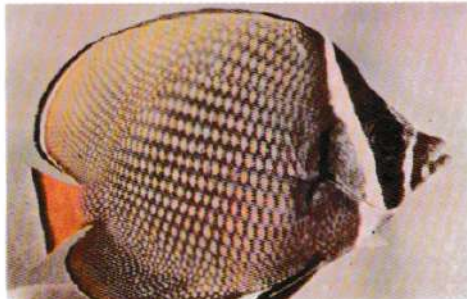
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Tropical Fish Hobbyist



In a lagoon off Quilon, the author collected many *Chaetodon collaris*. Photo by Dr. Herbert E. Axelrod.

harbor, where there was shelter and even clearer water than in Kovalam, I collected many huge scats (*Scatophagus argus*), *Acanthurus lineatus* and *A. trigostus*, as well as some immense dark tangs (*A. nigricans*). I was also able to outwit the wily mangrove snapper (*Lutjanus argentimaculatus*) and get some nice-sized ones for exhibition.

One day we traveled to Quilon to inspect some reefs there, and found that the physical nature of the reefs provided so much refuge for the angelfish and butterflyfish that abounded there that it was a waste of time and energy trying to collect them. In a nearby lagoon subject to tidal influence, I saw many fine *Hemiochus acuminatus*, *Chaetodon collaris*, and *Lutjanus argentimaculatus* and earmarked them for a future date. I dived around stone jetties which sheltered prawn trawlers. Ashore, hundreds of women helped sort and clean the prawn and shrimp catches; a great deal of refuse of all kinds found its way into the lagoon and Mr. Nair firmly refused to dive in with me. I could hardly blame him!

One day Sané, my friend from Bombay, turned up, and we took him to Kovalam, where, in spite of not being able to swim, he acquitted himself nobly by collecting several blue damselfish and some other tiny pomacentrids in the shallows after a great deal of puffing and snorting. That night he developed an interesting heat radiation from his back (sunburn) and was forced to sleep on his stomach, groaning dismally for hours.

On another day, I dived around Trivandrum jetty, where there was clear

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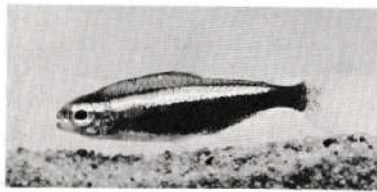


Acanthurus lineatus (above). Photo by Fayson. *Pomacentrus annularis* (below). Charlottefund Aquarium photo. Both these fishes were collected by the author.



39

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September, 1966



Two nice live specimens of *Diodon* and *Tetraodon* just before the author put them in plastic bags. Photo by Rodney Jonkloot.

tank had a new addition—a colorful *Muraena teselata* which I had caught in a lively encounter off Kovalam. Several large porcupines and puffers were on display and the seasnake exhibit had a shoal of blue damselfish on which the reptile fed at his leisure, a welcome change from his former diet of dead filets of sardine.

The feeding methods had been altered on my recommendation. Instead of the monotonous chopped fish, the specimens now enjoyed crushed mussels, live small fishes, cabbage leaves (for the angelfish and tangs), and other marine delicacies. They looked all the better for it.

Finally I bade my friends goodbye and flew to Madras, from where I would leave for Ceylon and home; but on my very first night in Madras (actually it was around 3 a.m. the next morning), I had a telephone call from Sané in Bombay, and at precisely the same time, a cable, which summoned me to tackle the same sort of job for the Taraporevala Aquarium. Of course, I flew there in 2 days, and the story of my adventures in Bombay and thereabouts will probably appear in another issue of TFH soon.

45



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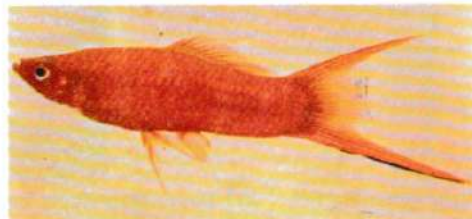
**The
 Lyretail
 Hi-Fin Swordtail**

BY GLENN Y. TAKESHITA
 HONOLULU, HAWAII

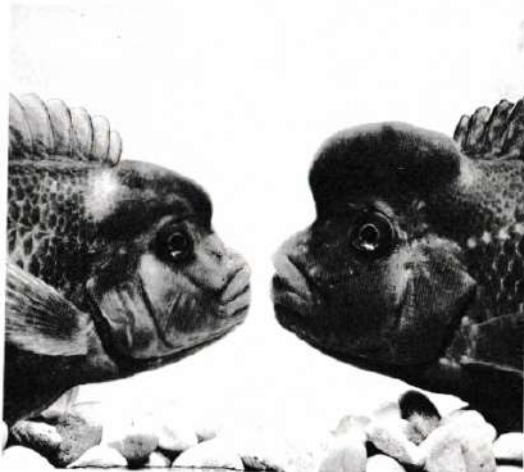
In mid-February 1966, a new and exciting livebearer was introduced to Hawaii. This new livebearer was a unique strain of hi-fin sword called the lyretail hi-fin swordtail by its developers. Evidently, these new swords were the products of a fertile mutant used in very careful selective breeding.

At first, only seven pairs arrived. These were followed closely by another shipment of ten pairs (in mid-March). Information as to who the developers or shippers were was kept a mystery to Hawaiian hobbyists. Evidently, as with the red devil cichlids, the secret of the source was withheld to control distribution. Nevertheless, the few pairs that were sold to hobbyists caused much excitement on the islands. In the weeks following the initial introduction, the new swords became the talk of the finny set in Hawaii. Already hybridization experiments for color improvement had been

This double-sword swordtail sport turned up a few years ago. There is a chance that it or a sport much like it was used to develop lyretail swords. The fish discussed in this article were photographed in Hawaii (see cover). A future issue of TFH will feature lyretail swords from the United States. Photo by Dr. Herbert R. Axelrod.



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Does this fish eat TetraMin?

These humpheaded cichlids (*Steatocrenus casuarus*) make their home in the vicinity of the Congo Falls, away from the fast water. They usually live in caves which they dig below stones. The male has the larger humphead. These fish thrive on live food. Adults, reportedly, chew the food for their young fry.



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initiated. But before going off on the deep end with visions of the future possibilities of this new strain, may I first describe it as it is now?

At first glance, the most prominent anatomical feature to be seen is the beautiful lyre-shaped caudal fin. This, coupled with the modified dorsal, pectoral, and anal fins, makes this swordtail a beautiful sight to behold. Both the males and females of this strain possess this much accentuated lyre-shaped tail, and although they are called hi-fin swords, the fish seem to be neither the hi-fin nor the low-fin swords that we know; the dorsal is not as long and wide as that of the usual hi-fin sword, but is an intermediate between low- and hi-fin. It is usually just a little longer than low-fin counterparts but has many accentuated rays. These accentuated rays give a very unique appearance to the dorsal fin, an appearance found neither in the usual low- or hi-fin swords.

In the male, the gonopodium is extremely long, sometimes reaching 1 1/4 to 1 1/2 inches in length. Because of this very long and modified gonopodium, many breeders in Hawaii feel that the males might be sterile. Close observation of the males have shown that they are active sexually, for they pursue the females constantly. Breedings to normal hi-fin sword females will in time answer the question about the fertility of these males. The pectoral fins of the males are very long when compared to those of their normal hi-fin counterparts. The lyre-shaped tail is also well developed with the top tip being approximately the same length as the lower sword. The color of the individuals that were sent to Hawaii was poor when judged by Hawaiian standards. They were brick-orange, far from the scarlet red that is preferred here.

As for the females, they also possess a well developed, lyre-shaped tail. Their dorsal, pectoral, and anal fins are also highly modified. Like the males', their color is very poor. At this writing, it could be stated that some of the females are definitely fertile, for a few friends and I have already obtained our first batches of fry from them. What remains to be seen is the percentage of the fry that will inherit the lyretail. If we get many lyretail offspring in these first batches of fry, we will know that this lyretail strain is one that has been worked on for quite some time; but if the lyretail offspring are small in number, breeders may expect many years of hard work in order to fix the strain and improve its color. If the lyretail is capable of being transmitted to lyretail parents' offspring, color improvement by careful selective breeding will definitely result in due time. And in the hands of gifted breeders, this strain will eventually be skillfully manipulated and reworked into many new color variations.

It is quite evident that these new lyretail hi-fin swords will be a big hit anywhere in the world, for it is unique in appearance, strong in body, active in temperament, and graceful in movement. So, on your next trip to your pet dealer be on the lookout for this new introduction to our hobby.

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MAIL CALL

By William Vorderwinkler

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

Livebearer embryos

Q. I am terribly confused concerning the development of embryos in live-bearing fish. I have read in the book, *CAROLINE LIVEBEARERS*, by W. L. Whitern, F.Z.S., that: "The mother does not provide any nourishment during the incubation period, and the young fry are delivered perfectly formed and able to swim almost immediately." This was fine until in *HOW TO KEEP AND BREED TROPICAL FISH*, by Dr. C. W. Emmens, I read: "During development, the young fishes are nourished by their mother. They do not simply lie in her body protected from harm and dependent on the yolk in the egg; instead, there are various devices in different species by which they receive nourishment just as do the young of a mammal." In another part of the book it says: "In most of the Poeciliids the young receive nourishment before birth, contrary to common belief

In the guppy, for instance, a connection is formed between the heart membranes of the young and the ovary of the mother fish, through which the blood-borne food is diffused." Why are they contrary to each other? Please, this is

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most important. Which statement is true?

James Van Kollenberg, Chicago, Ill.

A. There are several schools of thought on this, and so far nobody seems to know for sure which is right. A mammal, of course, feeds its young before birth through the placenta. This is a direct process. However, the egg of a livebearing fish has no connection like this, and there is a great deal of theorizing as to whether the egg carries its own nourishment with it, or whether the young grow within the egg by means of nourishment supplied by the mother from her own body. I can only add my own unscientific opinion, which sort of goes between the two: The young are in the mother's body, each encased in its own egg and cushioned from harm by the mother's fluids. There is a possibility that these fluids contain some nourishing substances which the fry absorb while inside the egg, and I think that this happens to some extent. How great this extent is I do not know.

Pantodon buchholzi

Q. I have been getting T.F.H. for some time and have never seen anything on the butterfly fish, *Pantodon buchholzi*. I would like to know the following:

1. How can you tell the male from the female?
2. How do you go about breeding the butterfly fish, if such a thing can be done?
3. Can you keep two or three to-

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gether in a 20-gallon tank with other fishes?

Paul Greider, Jr., Racine, Wis.

A. 1. Look at them from above. The males have slightly larger pectoral fins, which look like "tongues." The females are a little wider in the body.

Pantodon buchholzi.



2. Insectivorous fishes like these are difficult to feed properly in the cold months. I have heard of some hobbyists who net small insects by going out in a field and stitching a net through the grass. In the winter months, a fruit fly culture will carry them over. Unless you are in a position to feed them insects, don't expect to keep them in good health or eventually breed them. They lay floating eggs, which take about a week to hatch.

3. Yes, but don't keep them with small species, which they are very apt to swallow. Also, keep their tank covered; they are excellent jumpers.

Dwarf cichlids

Q. 1. I have a 51-gallon aquarium setup. How many dwarf cichlids could it hold? Also what varieties should I have so the tank is peaceful?

2. Can you keep barb in a dwarf cichlid tank?

3. Do dwarf cichlids uproot plants? If so what can I do to stop this tendency?

4. Is slate rock needed on the bottom of a cichlid tank if you want to breed them?

5. What water temperature do dwarf cichlids need? What type of water do they need, acid or alkaline? What type of food do they need?

Paul Kessler, New City, N.Y.

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A. 1. You have a 51-gallon tank. Forget about how many dwarf cichlids you can put in there, especially if you want them to breed for you. One pair will make the tank look sort of empty, but

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your fish will quickly make themselves at home.

2. Yes, but not in a 51-gallon tank.

3. Dwarf cichlids never show the tendency to uproot plants. Of course, any fish might uproot one accidentally once in a while, but they do not do it deliberately like their bigger brethren.

4. What they seem to prefer to a slab of slate is an old flowerpot resting on its side on the bottom.

5. Most dwarf cichlid species are not too fussy as to water conditions; near neutral is close enough. Temperature for keeping them should be about 78° F., raised to 80° F. to get them interested in spawning. Like the larger cichlids they are carnivorous, and for this reason should get live foods. A second choice when live foods are not available is the use of frozen foods.

Artificial plants

Q. I have just started to keep tetras. Someone I know has kept them for some time and uses artificial plants. Could you please tell me if this will hurt the fish or if there are advantages to it. I have regular plants now.

Virginia L. Ross, Whitestone, N.Y.

A. The tetra family is a huge one, and you do not give me any idea as to what species you are considering. Generally speaking, some of the larger tetras are largely vegetarian, and will frequently nibble on plants. Using plastic plants will give the fish the same sensation that a person would

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get if he bit into one of the papier-maché steaks one might see on display in a restaurant. As for appearance, they are fine if they closely approximate the natural looks of an aquatic plant. In my own private opinion, a terrestrial plant like a Lily-of-the-valley might look very pretty

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in plastic, but it has no place on the bottom of a fish tank, where the natural plants would never grow. Tastes worse, and a plastic plant is a lot less trouble, as would be an artificial flower in a vase on your dining room table.

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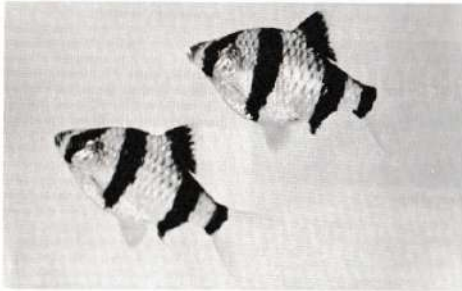
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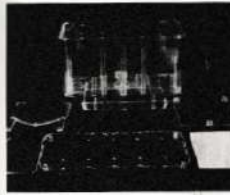
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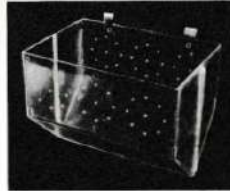
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and there are no babies, when they should have dropped through the trap. 5. Is it normal for angelfish to have minute red dots along the back at the base of the dorsal fin?

Richard Peabody, Bethesda, Md.

A. 1. You have to be sure of one thing if

you trust a genuine hybrid. If the female has been mated before to a gold tag male, she may have as many as 8 broods from this mating. You may think you are getting hybrids with the sunset father, and all of the time they are still from the original gold moon father. Look for signs of the different fins and markings in the youngsters before you call them genuine crosses.

2. This is part of the mating ritual, and the male seems to swim in a semicircle before the female, preventing her from swimming away. Usually the gonopodium thrust follows this ritual.

3. You do not say what species of fish the baby is, but he seems to be a lone male.

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Giving him a female of his own species will often keep him so engrossed that he is too busy to bully the platies any more. If he persists, he will have to get his own tank. In any case, get him a female if you can.

4. If you use a breeding trap, put the female in it when she looks as if she is about to burst. The flat-bottomed breeding trap, it should go without saying, goes into an empty tank. When the female is finished delivering her babies, put her back in the tank she came from, and begin feeding the babies.

5. This is one of the differences between Pterophyllum eimekei and the original angelfish, Pterophyllum scalare, which we still see occasionally in imports—and can identify by the red marks you mention.

Alkaline water

Q. I receive TFH regularly here in

Belgium and always read it with a great deal of pleasure. The following three questions are given in the hope that you can provide an answer in your magazine. Here are my troubles:

1. About 2 months ago I made a new tank (about 85 gallons), and in it I placed an undergravel filter that I made myself from corrugated plastic into which I bored numerous holes. At that time the hardness of my water was 5 degrees and the pH 6.9. The water and bottom of the tank are wonderful and very clear, and the plants grow very well. Now, 2 months later, the hardness of my water is still 5 degrees but the pH is 7.7. Can you tell me the reason why? The gravel, silica stones, and water in the tank all come from the same river.

2. Do you think things will become stable with a pH of 7.7, or will it increase to 8.1 or 8.2 in a few months?

3. How can I regain a neutral pH

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again without endangering my fishes or plants?

Jules Volon,
Ans-Lez-Liege, Belgium

A. 1. Your question is difficult to answer, because you made your own tank, and of course I do not know what components materials you used. Usually there is a tendency for the water to drift toward an acid pH reaction because of the increasing accumulation of fish wastes, but here you seem to have something which is turning the water alkaline. The gravel came from the same river-bed that provided your water, so we will forget about that. I do not know if you used a slate bottom for your tank, and if you did, it could also be doing this. The plastic you used for your undergravel filter could also be the culprit.

2. Where your situation will become stable depends on how alkaline whatever causes the condition is.

3. Your water can be brought back to neutral by the addition of sodium bicarbonate or a peat moss brew made by boiling peat moss in water and then letting it stand until cool.

Loss of color
Q. I own a 10-gallon tank with guppies, angelfish, and tetras. One Sunday, we went out for the day, and when we returned the fishes had completely lost

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their color. The filter was on, and the temperature was 76°. When I turned on the aquarium light, the fishes began looking livelier, and within 45 minutes they were completely recovered. The following Sunday I again went out for the day, and when I returned the same thing happened. I immediately turned on the lights, and they were fine within a half hour except for one guppy which was dead.

1. What is the cause of this condition?
2. Is it harmful to the fish, and if so, what measures can I take to prevent it?

**Lenore Billante,
San Francisco**

A. 1. The color cells in a fish's body regulate themselves to compensate for the background against which he finds himself. With the lights out there was little need for any color, and the body colors became pale. Turning on the aquarium lights had the effect of suddenly providing a background once more, and your fish "turned on" their colors again. What caused your guppy to die I could not say.

2. This is a natural and normal condition, and does no harm whatsoever.

Do fish sleep?

- Q. 1. Do all fish sleep? And how is this done?

2. I raise Siamese fighting fish, and have raised approximately 30 babies to nearly full growth. Is this considered a tremendous feat with baby bettas?

**Larry Fein,
Scarsdale, N.Y.**

A. 1. Fish do not sleep in the same sense that we humans do, but undergo periods of rest. During these they become quite lethargic, and their life processes sink to a low point, but never as low as what we humans would attain in sleep.

2. Of course not; 300 would be pretty good, but never 30!

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Daphnia

Q. I would like to know how to raise daphnia as food for my tropicals. I wish to know such things as the type of container, the kind of food, the water conditions, means of reproduction, etc. I would also like to know if it would be safe to gather daphnia from a farm pond. Would there be much danger of getting something that would harm my fish? Is there any way this can be avoided? Also, what is meant by "sifted" daphnia? The term is used in such T.F.H. publications as BREEDING LIVEBEARERS and BREEDING EGGLAYERS. How is this sifting done?

**Randy Kirkpatrick,
Oswego, Kansas**

A. Daphnia may be kept in such containers as refrigerator liners. It is not easy to produce enough daphnia to feed a considerable amount of fish regularly, but if you want to try it, you could feed them with something like powdered milk, using enough to saturate the culture without fouling the water. Sifting daphnia is done by pouring them into a net and thereby separating the small ones (they pass through the net) from the big coarse ones (they remain in the net). Some farm ponds are very rich in daphnia and are excellent sources. Yes, you can pick up some enemies with daphnia, the quickest way is to "sift" them out. I recommend you read LIVE FOODS by Robert Gannon, available from your petshop or from us at 35 cents.

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AN OPEN LETTER

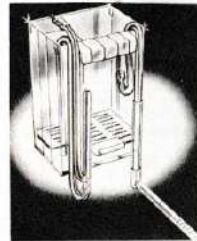
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By Paul Hahnel

Split tails

Q. I have just started raising veiltail guppies. I have three males, four females, and also two neon tetras in a 10-gallon tank. The reflector is on about 8 hours a day. The tank is well planted with aquatic plants. The filter and pump are on all of the time, and the temperature ranges from 76° to 80° F. But I have one problem: my guppies have splits in their tails. When I bought them at the petshop, their tails were nearly perfect. Later the splits appeared.

1. What can be done to cure this?
2. How can I prevent it from happening again?

**David Bennett,
Anniston, Ala.**

A. The setup you have I would recommend, but I would not keep neon tetras together

with guppies; they require very different water conditions. Tail-splitting is quite a common occurrence with male guppies. Many reasons are given, but nobody knows for sure what is the real cause. In my experience, it is mostly due to bad water conditions. A good, healthy, well-fed, well cared for fish will very seldom have a split tail.

White worms

Q. I am 16 years old and have been raising veiltail guppies for 2 years now. I know quite a bit about them, and some day I hope to become a famous breeder like you. I try to follow your procedures for raising guppies as closely

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as possible from the books I have read about you. I have four 20-gallon aquaria. They are filtered and aerated. My pH is 7.0 and DH is 9. The temperature is between 77 and 80° F. I use water spritz and Amazon swordplants. I do not feed any drugs or hormones to my fish. I feed live brine shrimp twice a day (morning and night) and frozen brine shrimp in the afternoons. I also use tubifex worms when I can get them. I am thinking of starting to feed my guppies white worms. Could you please tell me your opinion of them as a food for guppies?

**Gary Sudler,
Detroit, Mich.**

A. Glad to hear you are doing well with your guppies. All the conditions you are giving them meet with my approval, but if you intend to feed white worms, let me warn you that once or twice a week is sufficient, because although they are rich and highly nourishing food, they put too much fat on fishes which get too many of them.

Guppy-swordtail hybrids

Q. I have written to you before and told you about my guppy mating with a swordtail, and about the offspring she had. Well, my babies are about 6 weeks old now, and look more and more like genuine hybrids. But I would like professional advice. The males have beautiful tails like their father (the swordtail), and the females look a lot like their mother (a common guppy). These fish have some very strange colors like green, pink, yellow, bluish silver, etc.

2. I would also like you to give me a name, address, and information on a guppy club I could join.

**Alice Keyes,
Morristown, N.J.**

A. 1. It is not uncommon for guppies and swordtails, also platies and mollies, to interbreed. It stands to reason that by mixing, or crossbreeding, two different species

you will end up with different color combinations. Let us know how the young ones look in about 8 months time, and we let us know if the hybrids are fertile.

2. For information about joining a guppy club, write to Frank Alger, 186 Poor Street, Hackensack, N.J. He might be able to advise you.

Feeding guppies

Q. I am a boy 13 years of age and started with fish some months ago. I have bought the book FANCY GUPPIES and have read the article about you. What kind of food do you feed your fish and how much do you feed them? I would appreciate your answer.

**Billy Brandt,
Detroit, Mich.**

A. 5 to 6 kinds of dry foods, all frozen foods available in your pet store, and, of course, live foods (for instance tubifex worms, white worms, daphnia, and live baby brine shrimp). Guppies are gluttons, eating as many times as they are fed. But a word of caution: never feed them more than they will eat in 5 minutes, as left-over food will pollute the tank water. As you can see, the amount of times you feed your guppies depends on how much time your guppy has.

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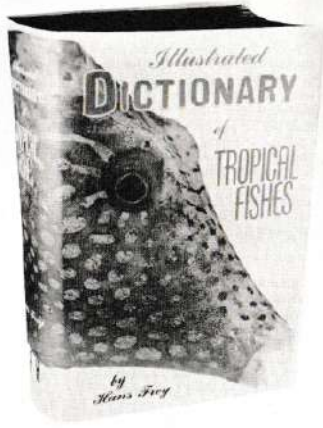
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By Alfred A. Schultz

Q. I am going to start a marine aquarium using small fishes and animal life I can find in the beaches and pools here in the Ketchikan District of south-eastern Alaska. Our waters are quite cool, so would room temperature be too warm?

**Rowanna Amundson,
Ward Cove, Alaska**

A. Room-temperature water would probably be too warm for the fishes you catch. However, I would try keeping them anyway. By using lots of aeration you may be successful.

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Q. Is it true that saltwater fishes must have live food to exist?

**T. Shevlin,
Kansas City, Mo.**

A. False. Most of my fishes are fed frozen brine shrimp, dry foods, and pieces of cooked meat (usually left over from supper). Vary their diet. Even humans get tired of eating the same food all the time.

Q. What are the basic differences in taking care of marine fishes versus my regular freshwater tropical fishes?

**Dennis Richie,
Livonia, Mich.**

A. Basically, the big difference is the water. Also, feeding should be much more precise with saltwater fishes, and cleanliness is very important. The high mortality rate sometimes encountered is invariably due to overfeeding and contamination of the water.

Tropical Fish Hobbyist

Q. I have purchased my second pair of dwarf sea horses. I don't have much success in keeping them alive. The food that I feed remains uneaten on the bottom of the tank. Can you help me?

**Molly Dylar,
Roselle, Ill.**

A. Your problem seems to be that you are feeding the wrong foods. Dwarf sea horses require live food—and lots of it. This is no problem, since the best food for these small sea creatures is newly hatched baby brine shrimp. They require a great amount of this food, so do not be too afraid to over-feed. The little shrimp will live a long time in your saltwater tank.

Q. Does coral have any beneficial use in a marine tank aside from decoration?

**Fred Penzner,
Elyria, Ohio**

A. Indeed it has. First, it provides places for your fishes to hide, and in addition, coral tends to keep the water from turning acid.

Q. I have a beau gregory in my tank and it constantly chases and picks on the other fishes. Is there anything I can do—maybe, buying bigger fishes or getting a species that he won't bother?

**John Moorcroft,
Harrisburg, Penna.**

A. The beau gregory is an aggressive species and molests fishes of all sizes. They even fight with each other. The best solution is to put yours in a tank by itself.

Q. I've collected a number of fishes recently and found what looks like a

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turtle except that it has no head or feet. In turning it over, the inside of the shell looks like a snail. Can you tell me what this is?

**Mark Shen,
Port Murray, N.J.**

A. What you are describing is called a "chiton." It makes a fine addition for your tank, as it is a very good algae eater.



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YOUR FISHES' HEALTH

BY MIKE REED

Temperature

Most freshwater tropical fishes should be kept in water that is at a temperature no lower than 72 and no higher than 80°F. The ideal temperature is 76 to 78°F. (I prefer 78°F, for I find that at this temperature my fishes are somewhat more active and a bit more colorful.) Of course there are several exceptions to these rules. Discus and angelfish, for example, do best at temperatures between 80 and 85°F. On the other hand, danios, white clouds, common guppies, and a number of killies do very well at temperatures below 72°F. Nevertheless, all the exceptions mentioned above and most others as well can adapt quite readily and live long lives in the 72 to 80°F. range, and unless they are in single-species tanks, they should be kept within this range for the comfort and health of the rest of the community.

To understand just why water temperature is so important, the hobbyist need grasp only one biological concept . . . the difference between warm-blooded and cold-blooded animals. Dogs, horses, or, for that matter, human beings are warm blooded. The temperatures of their bodies are not determined by the temperature of their environment. Your body temperature will be the same whether the temperature of the air is 75 or 90°F. This keeps your metabolism going at an even keel. Fishes, on the other hand, are cold blooded. The temperatures of their bodies and, therefore, their metabolic rates are determined by the temperature of the water in which they live. Thus, keeping a fish that requires water temperatures around 77 in water that is at about 90°F. is comparable to keeping a human being running a very, very high temperature. Considering this, it is remarkable how tough our fishes must be to survive in aquariums during the warmer months in many parts of the world.

Remembering the effect of water temperature on fishes, it becomes easier to see why sudden temperature changes can weaken them tremendously. If the temperature in the tank is allowed to fall 5 degrees at a rapid rate, the temperature of the fishes must fall along with it. There is almost equal danger in fast rises in temperature. The fishes just cannot adjust in either direction quickly. The chemical reactions that give them energy and keep them alive are thrown out of kilter, and if they do not die, they are weakened to the point that they may not be able to resist disease organisms that

are in the water and that under ordinary conditions could never have gotten a foothold. So, keep this in mind . . . a sudden drop or rise in temperature of more than 1 or 2 degrees EVEN WITHIN THE SAFETY ZONE FOR FISHES (72 to 80°F.) can do more damage than temperatures above or below the safety-zone limits that have been arrived at gradually. (This, of course, is not to say that the latter situation is harmless.)

In areas that have cold winters, a thermostatically controlled heater is essential. Don't rely on your home's central heating or your aquarium light bulbs to do the job. All too often both these "heating methods" have been proven to be totally unreliable, and you only have to have one failure to lose all your fishes. Buy the best heater you can afford; this is no place to economize. A good heater can be your best friend, but a bad one can stick in the on position and "boil" your fishes. In a home kept at average temperatures, buy a heater rated at 5 watts for each gallon of water in the tank in which you will use it. For example, get a 50-watt heater for a 10-gallon tank, a 100-watt heater for a 20-gallon tank.

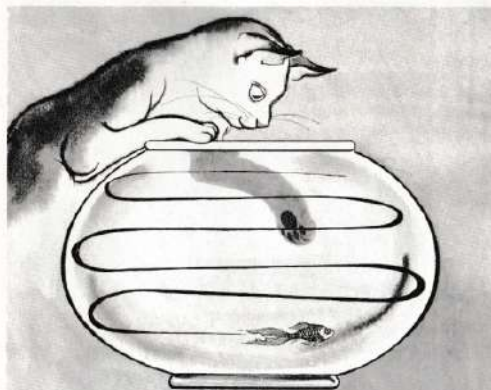
Summer is the worst time of year for controlling aquarium temperature in areas where this season brings extended periods of time in which the mercury stays above 80°F. Unless the aquarium is in an air-conditioned room, it's a constant fight to keep the temperature down within reasonable limits. This is complicated by the fact that you can't drop the temperature down quickly (for instance, with several trays of ice cubes) without damaging your fishes. Turning down the heater does absolutely no good. (The thermostat would keep it from going on at high water temperatures anyway.) The only thing it accomplishes is to mess up the thermostat setting so that you will have to readjust it come winter. Unplugging and removing the heater entirely is a good idea, however, so that it can dry out completely should there be a small amount of moisture in the glass tube that protects the component parts. There are a few things that help keep the water temperature fairly well down during hot weather. One thing that you can do is keep sunlight from hitting the tank. Also, cut down on overhead lighting for the heat from the bulbs can drive the temperature up well above the temperature of the room. In addition, more profuse aeration helps as does the use of a screen top, which increases water evaporation and the resultant cooling effect. Playing the air stream of an electric fan across the water's surface is another good method of keeping tank temperature down. If things get really desperate, put ice cubes in a plastic bag and drop the sealed bag and cubes in



Discus live most comfortably at temperatures somewhat higher than those that are best for most other tropicals. Photo by Helmut Finler.

the tank. (If you use an outside filter for your aquarium and it will hold the bag and cubes, put them in the filter rather than the tank.) Never use too many cubes. The water temperature should not be lowered any more than 2°F. every 3 or 4 hours.

Above all, winter or summer, check your thermometer every day. Check it in the morning, after the lights have been out all night. This avoids reading-in the effects of the heat caused by your bulbs. Also remember that in deep tanks without sufficient water movement through aeration, filtration, or active fishes, the top levels of the aquarium may be a few degrees warmer than the bottom levels. This is not a good situation and should be remedied by using an air stone or some other device that will keep the water layers mixing.



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The fish shown in full side view is a male *Rivulus holmiae*. Note particularly the light upper and lower edges of the caudal fin.

A *Rivulus* worth having.

Rivulus holmiae

BY JOHANNES FRANZ
Dresden, Germany
Photos by H. Schöpfel

Because *Rivulus holmiae* is largely unknown to many hobbyists and also because this name has been applied to other *Rivulus* species as well, I would like to go into a closer description of this fish.

Besides the misidentifications, I have found an illustration which appeared in a German magazine in 1959 and purported to be a male *Rivulus holmiae* but was actually that of a young female. Older specimens of this same sex have a definite black zone in the caudal fin. The typical posture of the other *Rivulus* species was never evident in the fish I have had. *Rivulus holmiae*, native to the Guianas, attained a size of 3¼ to 4 inches in both sexes with the fish I possessed.

The basic color is brown, becoming lighter on the sides. The belly color is white, reaching to the underside of the mouth. There are five rows of red dots which form horizontal lines on the sides, extending from the base of the pectoral fins to the root of the caudal fin. Above the rows of dots there is a

gleaming light green color which becomes bluish toward the tail, depending on how the light hits it. The pectoral fins have a hint of reddish brown, but the dorsal fin is clear, with a dark reticulated marking. The anal fin is also reddish brown in the males, while in the females it gets lighter toward the base. A narrow black edge surrounds it.

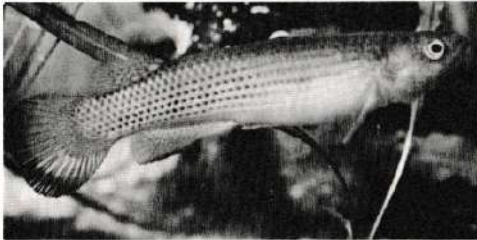
Sexual differences are most pronounced in the caudal fin. This is dark in the females and becomes lighter toward the base, where the fin-rays show brownish red. The males have a bluish-black tail which has a yellow stripe above and below. In older specimens the yellow becomes orange. The expressive eyes with the black pupil and golden iris are also worthy of mention. This *Rivulus* species is very much compressed in build. Young specimens give no hint of their sex by body characteristics. The black spot at the caudal fin base which is typical for the females of the various *Rivulus* species is present in the young of both sexes but disappears completely when the fish become full-grown.

In order to give *Rivulus holbrooki* a living space which is in proportion to its size, I kept them in a 30-gallon tank which was well-planted. Much as they liked to sun themselves on the broad leaves of *Cryptocoryne griffithii* at the water's surface, they were also found at the bottom and middle levels.

This *Rivulus* species can also stand low temperatures, but seems to feel better and is more lively at temperatures between 72 and 77° F. and in water which is not too hard. If fed liberally with *Daphnia*, water-insects, etc., they are also peacefully inclined toward their young, and therefore they can be put with other fishes without any qualms.

Even if experience with other *Rivulus* species has taught that only a few hours are required for a breeding, this is not so with *Rivulus holbrooki*. They must first accustom themselves to the changed surroundings of their breeding aquarium, and until they do so they will hide among the plants or in the

A *Rivulus holbrooki* female. Note the dark ring in the rear of the caudal fin.



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spawning medium. When they believe themselves to be unobserved, a thing which may take more than 12 hours, both come out and the courtship begins.

I have watched their spawning both in the breeding tank and also in my big community aquarium. The prelude to spawning was accomplished much more completely in their accustomed surroundings. While in the breeding tank the male merely bent his body and then crowded the female into the plants, where they pressed their bodies closely together and quivered violently, the female releasing an egg while the male swam around her in their chosen site. The female who was thus excited also used these tactics with the male, swimming with him in this manner for more than a foot at times. They stopped on a hand-sized *Cryptocoryne griffithii* leaf, trembled violently, and then the egg was shaken from the female. This procedure was repeated, several times, sometimes at the surface and at times in the middle regions. They spawned on the thermometer in the same way as on the plant leaves. Each time only one egg was laid.

This *Rivulus* species is very productive. One female which was not previously separated from the male produced 94 eggs in 24 hours. In spite of this a reduction in the size of her girth could not be noticed.

The eggs, which have a diameter of 2 mm, are clear and have a sticky thread. Under the microscope this consists of tiny hairs which look as if they were tangled. After two days the development of the embryo can be observed. On the yolk, which has at this time become dark in color and opaque, the young fish begins to develop as a tiny, light-colored wedge. The spine can be plainly seen as a dark line. Now and then life is shown by a jerky motion of the tip of the tail. In seven days a third of the yolk is covered and the large, outstanding eyes seem to be fully developed. Fine streams of blood flow from the yolk to the young fish and back, and the heart may also be seen beating when observed from the proper angle. By the black pigmentation of the almost fully-developed fry and the brown flecks on the yolk the egg becomes darker from day to day, appearing almost black shortly before hatching. Depending on the temperature the egg hatches in 12 to 14 days and shortly afterwards the little *Rivulus* swims near the water's surface.

Nauplii are eaten from the very beginning, caught frequently with an odd bending of the tail. Their growth is so rapid that with good feeding, a size of 1½ inches can be attained in two months. The typical *Rivulus* spot at the caudal base is not evident at this size, but a black dividing line is visible at the anal fin. Four weeks later the males show the yellow stripes in the tail fin and little by little the black spot disappears in all specimens. The reddish-brown color of the fins and the gleaming body colors do not come until sexual maturity is attained.

Rivulus holbrooki is a fish which cannot help but be recommended. It attracts not only by its beauty and size but also by its ease of maintenance and the simplicity with which it is bred.

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Corydoras aeneus Spawns

BY LESLIE SPENCER

We observed a frisky pair of *Corydoras aeneus* in the white cloud aquarium during the evening. The next day they were engaged in very lively courting activity. The male would hover above the female as they swam back and forth across the 10-gallon tank, both of them scrubbing the sides of the glass on which they were to spawn.

They settled down to serious work about midday. They kept up the chase, but occasionally, while on the gravel, the female pressed her mouth to the male's vent to receive sperm. Then, instantly, she would curve her body slightly, and from eight to ten opalescent, pearly eggs would appear clasped between her ventral fins. She would then deposit the sperm on the glass that they had so thoroughly cleaned. Then the eggs were released on the glass

A pair of *Corydoras aeneus* in a pre-spawning dance.



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The eggs are clearly visible in this shot.

gently and with care. The eggs would stick there until hatching 3 days later. A careful count revealed 150 eggs. The water was hard, acidic, and clean.

After removing the parents and white clouds from a tempting meal of eggs, I added one drop of methylene blue per gallon of water. The temperature was held at a perfect 75° F. Three days later the eggs were empty shells, and a close examination showed nearly microscopic fry at the bottom of the heavily planted tank.

After their yolk sacs were absorbed, their first food was infusoria. Soon, however, I was feeding pea-sized balls of fine baby tropical fishfood, made by rolling the food in the palm of my hand with a drop of water to make it sink to the bottom. I fed these tiny specks of fishes about every 2 hours for about 2 weeks. Then gradually, as they became bigger I varied their diet with frozen baby brine shrimp and a paste of ground blended beef heart.

The main concern is not to overfeed the fry. It is impossible to see all the small fish so one must judge how many eggs successfully hatched. A count in my tank after 4 weeks revealed 125 baby catfish . . . almost a 100% hatch! At 6 weeks old, they were about an inch long.