Tropical Fish Hobbyist

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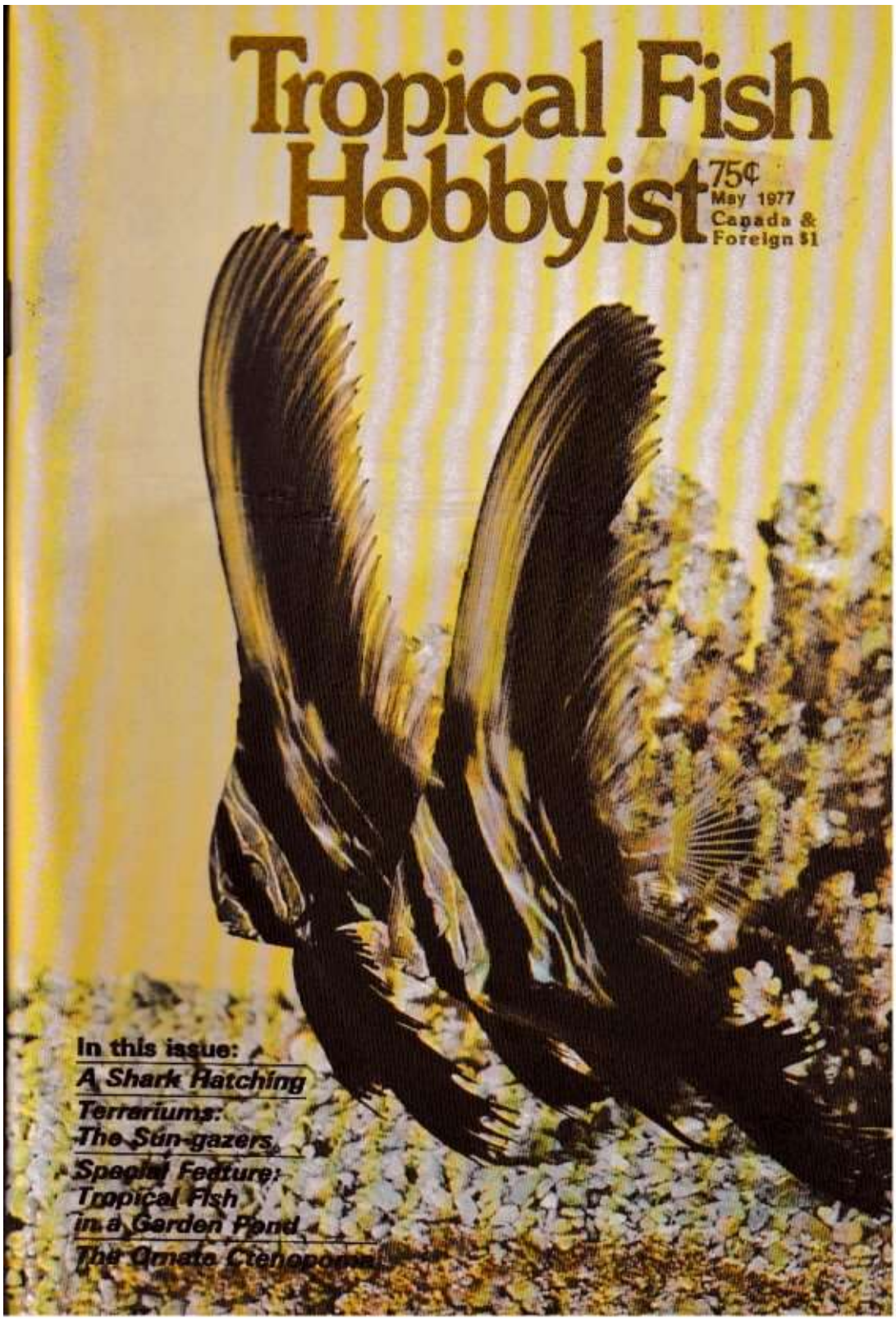

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Special Feature: Tropical Fish in a Garden Pond

The Genus Ctenopoma

Tropical Fish Hobbyist
VOL. XXV, May, 1977 (#255, No. 9)

Cover-
A pair of juvenile batfishes, *Platax teira*. Photo by Aaron Norman.

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Anabantoids

Ctenopoma ansorgei

The Ornate Ctenopoma

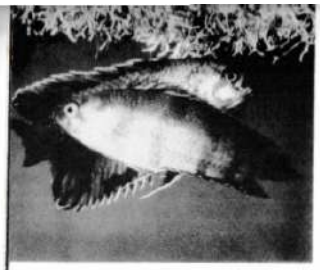
by Hans Joachim Richter, Leipzig, DDR. Photos by the Author

Above:
The male *C. ansorgei* gyrates his body as he spreads his fins in display to the female (rear).

Opposite page, top:
Ctenopoma ansorgei is the most colorful of the few African anabantoids that come onto the aquarium market.

Opposite page, bottom:
As the female emerges from her nearby hiding place, the male (foreground) spreads his fins in a colorful courting display.

Without a doubt, Africa has produced some of the world's most colorful aquarium fishes. . . the mbuna of Lake Malawi, the aphyosemions of the Niger River watershed, the nothos of Tanzania's seasonal waters and the Congo tetras of the Congo water system, to mention just a few. . . and most of the aforementioned are garishly bold in their coloration. But African labyrinth fishes, colorful or otherwise, have been conspicuous in their absence from the aquarium scene.



The female ornate ctenopoma (front) nudges the male's belly, then begins to slide up his side as he is stimulated into a spawning embrace.

This, of course, is because Africa has few anabantoid species to offer except for a few members of the genera *Ctenopoma* and *Sandelia*, and most of these are drab, inconspicuous little fishes. One *Ctenopoma* species, however, *C. ansorgei*, has broken away from the drab tradition of its congeners and joined the ranks of the more colorful African fishes mentioned above. *C. ansorgei* is unquestionably the most colorful member of this seldom seen group of fishes.

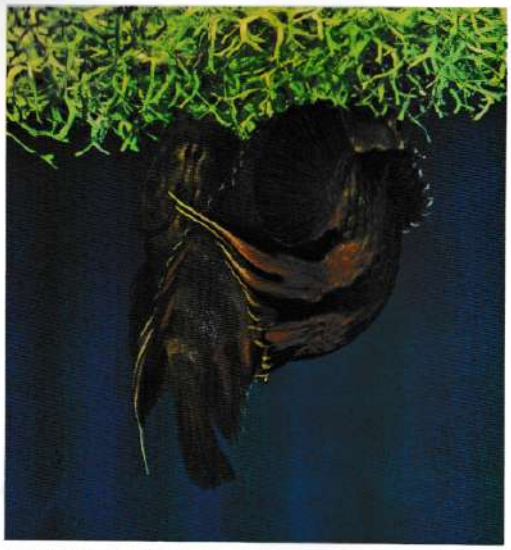
The name *Ctenopoma* literally means "comb-cover" and presumably refers to the comb-like serration of the posterior edge of the opercula. The specific name *ansorgei* is taken from the discoverer of this species, Dr. W.J. Ansorge.

The range of *C. ansorgei*, according to most of the literature, is the Congo region of Africa. If its aquarium behavior is at all a reflection of its behavior in the wild, the fish will most likely be found close to the shores of slow-flowing waters where overhanging vegetation and tree roots offer many good hiding places. In the aquarium it seeks shelter under roots or other objects by briskly wagging its body to form hollows where it can hide from would-be enemies or simply rest undisturbed. It is possible that this fish does the same thing in its natural habitat but we have no records on this. The earth-brown coloration assumed by the fish during the day provides further camouflage. So it is not difficult to understand why the ornate ctenopoma is only rarely imported. Just to detect nocturnal fishes is difficult, and catching them is not much easier.

Towards evening, when most aquarists come home from work and are then more likely to see the fish, a remarkable transition occurs. It is then that this fish begins to come to life, emerging from its daytime retreat, spreading its fins and showing its colors. At this time the female brightens up a little, but the male puts on a most spectacular evening garb. His body takes on a reddish-orange coloration with bluish vertical bars that run from the head through the caudal peduncle, extending up through its long-based dorsal fin and down through its almost equally long-based anal fin.

The Dutch appear to have been the first to import *C. ansorgei*, and that was in 1958. Subsequent imports have been few and far between. Although my attempts to obtain a few of these fishes were crowned with success in

The male begins to wrap himself around the female.

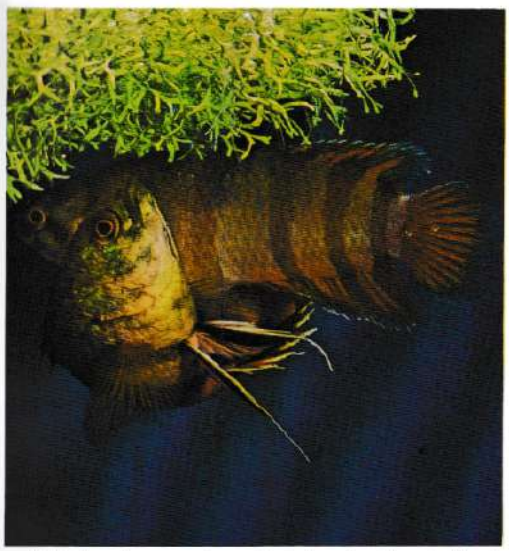


Finally the male is completely wrapped around the female in a typical anabantoid spawning embrace, except that in this species the female remains in an upright position.

1968, I was unlucky in that the specimens I obtained were old and no longer able to spawn. Anyone who has thumbed through the literature in an effort to find some information on the ornate ctenopoma will have noticed that nothing much has been published on this species. So my pleasure was all the greater when, in 1975, Mr. Horst Linke made my long-entertained dream come true by literally holding six young specimens under my nose! For this, once more, my thanks.

These young fish, measuring about five cm (two inches) in length, were immediately put into a 150-liter (40-gallon) tank where, at once, they each went off in search of a hiding place. To provide the refuges they sought, I provided them with a few pieces of PVC tubing. All the fish instantly vanished into the tubes, but within an hour they began to emerge and started courting one another.

By February, 1976, and much to



my delight, these six young specimens had grown into splendid adults, three males and three females. Earlier, when I was first able to determine their sex, each of the three pairs was separated by a plastic partition. Their water was kept at a hardness of 7 DH and a pH of 7.0.

At the beginning of March each pair was moved to its own 50-liter (13-gallon) tank. The tanks contained a bottom layer of fine gravel, a few stalks of *Bolbitis heudelotti* and a coconut shell for each pair to hide in. The water in these tanks was softened to a DH of about 2, and the pH was lowered to 5.0 by using peat-moss filtration. I believed this to be their most natural environmental condition, since in the wild they are found in water that is very low in dissolved minerals and rich in humic acid due to the great amount of decaying vegetation found on the bottom of this habitat-type. Their food consisted of cyclops, daphnia and white worms.

During the embrace the vents of the pair come into close apposition, which ensures that most of the eggs will be fertilized.

By the middle of March one of the

females was clearly gravid, as determined by the heavier light-colored abdominal region. The male engaged in a courtship display in front of the female night after night, but when the female finally became more active and came near the male, she was bitten and driven away. In addition, the male did not build a bubble-nest; small wonder, then, that I began to think that there was something wrong with the male. Suddenly, a few days later, the male began to build a nest of large bubbles and small pieces of floating vegetation. That night I waited until midnight, watching in the hope that the pair would spawn, but I finally gave up and went to bed. Naturally, the first thing I did in the morning was peer into the tank, but in vain. . . for nothing had happened. In the evening the game started all over again, and once more nothing happened. It was not until the third night, around 8:00 pm, that the female pursued the male so intensely as to stimulate him into spawning. After a few false starts the first of the tiny eggs were discharged. After the first successful embrace the female retreated to the coconut shell. In a minute or so she again emerged from her hiding place and approached the male. Simultaneously the male began to spread his fins in a colorful display. The female nudged the male on the belly. He remained motionless for a few seconds with his fins spread wide and then began to circle the female. Both fish circled each other a few times, and then the male assumed an oblique head-up posture. The female swam up along the side of the male in a belly-down position (unlike the anabantoid species in which the female turns upside down) and the male encircled the female so that their vents were in apposition. In this embrace the pair trembled as the eggs and sperm were released. All of this activity occurred under the nest, and the eggs slowly floated up to the nest. As the pair disengaged from their embrace the female made a hasty retreat to the coconut shell; she was closely followed by the male, then the whole sequence started again. After several such embraces, the male began to tend to the eggs that were floating near the nest by grabbing them in his mouth and blowing them into the nest. This gathering activity did not last very long though, for no sooner had he started gathering the eggs than the female was beside him again, coaxing him into another spawning embrace. The spawning activity continued until nearly midnight. The fish, unfortunately for them but fortunately for me, were disturbed during their spawning a number of times as I attempted to photograph the whole sequence.

By morning most of the 400 or so eggs produced the night before had fungused. I skimmed from the surface all those eggs that showed no signs of fungus and transferred them to a 10-liter (4-gallon) tank. By 8:00 pm that evening (just 24 hours after they were fertilized) I witnessed the hatching of the eggs. Three days later the fry were free-swimming, so I gave them their first food, which consisted of cultured rotifers. The distended little bellies of the fry told me that they had had a good meal. Each day a portion of their water was replaced with fresh tap-water. This helped my 53 fry to grow quickly. It is interesting to note that unlike the fry of most other anabantoids, which are either colorless or darkly colored, these young fish showed a reddish sheen right from the start. At the age of one week the fry had nearly doubled their size to almost a half-centimeter (about 3/16 of an inch). At this stage I began to feed them newly hatched brine shrimp nauplii, cyclops and micro-worms.

The temperature in the breeding and rearing tanks fluctuated between 21 and 23° C (70-72° F). While I'm sure that these fish could be kept and

Above:
After several spawning embraces the male tries to gather some eggs and add a few bubbles to the nest.

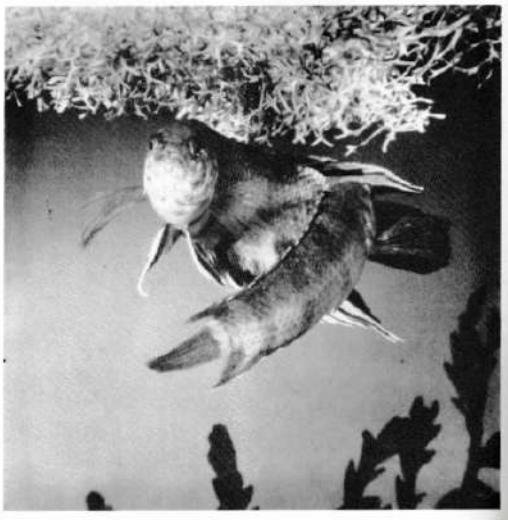
Below:
The male's nest-building activity is frequently interrupted by the anxious female (rear), whose presence immediately stimulates him into another courting display.

raised at higher temperatures, there is evidence that the lower temperature has a positive effect on them, making them less susceptible to diseases and helping them to live longer.

From the third week and onward, raising the fry presented little difficulty, since they had already grown to a length of 1 cm (just under ½-inch) and were able to take nearly any food. At the age of eight weeks the young were already showing signs of courting behavior, and most of them were sold to a nearby dealer. My breeders and those young that I kept in my possession ultimately grew to about 8 cm (about three inches), the males being slightly larger than the females.

Because of my strong desire to acquire this beautiful fish and my apparent success at breeding them, this whole experience has been most rewarding. It is my hope that when these rare beauties are seen in shops by other enthusiastic hobbyists they will be purchased and bred. This will eventually allow more hobbyists to enjoy this attractive species as much as I have.

Once again, the pair embrace and the sequence continues repetitively until as many as 400 eggs are produced.



Editorial

As I See it. . .

After learning of the disastrous effects of this past winter's frost on Florida's ornamental fish industry (a report on those effects appeared in the last issue of this magazine), I spent some time visiting dealers in the northeastern part of the country to find out first-hand how this catastrophe had affected them. Many of them did indeed confirm the bad news. Most dealers with whom I spoke said that livebearers, especially guppies and some of the more exotic strains of swordtails, platies and mollies, were becoming scarcer by the week. Some agreed that the quality of the stock now being shipped to them was inferior to what it had been before the frost. In addition to commenting on the temporarily poor quality of some of their domestically raised fishes, some dealers noted that livebearers and a few other species were being shipped to them at a smaller size than normal. The dealers pointed out, however, that these were not inferior fishes, just younger. The latter, of course, suggested that the farms were recovering but that it would take some time until recovery was complete.

When asked if they had seen any changes in wholesale prices, many dealers, depending upon their source of supply, confirmed that prices on the harder hit species were up about 25% over those of last December.

In light of these circumstances, the dealers were asked how they now felt about buying locally raised stock from hobbyists. Most of them agreed that they would be more willing than ever to do so, and in some cases would even consider buying some of those common species that are normally more practically purchased from fish wholesalers. The dealers' main concern seemed to be not so much getting the species, but getting a steady supply of *quality* fishes. They all agreed that few hobbyists have the facilities to produce a steady long-term supply of good stock of any species, but during the present temporary shortages the fish that hobbyists could supply would help bridge the gaps.

Maybe you've always wanted to breed those tiger barbs of yours, but for one reason or another just never got around to doing it. Now, more than ever, might be the time to quit procrastinating and start breeding your fishes.

Don't be misled, however, into seeing a get-rich-quick scheme at hand. Hobbyists seldom, if ever, get rich from selling their fishes. Most of us should be satisfied to be able to partially, or in a few rare cases totally, defray the costs of our hobby. Also remember that the current shortages are only temporary. By next winter, the industry will probably be back to normal and your products will no longer be needed.

So before you launch yourself headlong into a mass-breeding program, check with your dealer to find out what he wants and how many. Then pick one or two species and go to work on them. Don't try to be a fish farmer who can supply a dealer with most of what he needs, for doing so will undoubtedly cost you money and maybe even some good friends.

Marshall & Ostrow

TFH Fund Ichthyological Reprints

The Smithsonian Institution announces publication of the sixth in its series of TFH Fund Ichthyological Reprints:

***MARINE GAME FISHES OF THE PACIFIC COAST*—Alaska to Ecuador**
by Lionel A. Walford

In the original quarto format complete with 36 colored plates and a new introduction, additional records, and updating of the nomenclature by L.A. Walford.

This classic was originally published in a limited edition in 1937 and has long been out of print and considered a rarity, with copies selling for as much as $100.

***MARINE GAME FISHES OF THE PACIFIC COAST* is available for $15.00, postpaid, from the Smithsonian Institution Press, Washington, D.C. 20560. Payment must accompany orders.**

The following TFH Fund Reprints are also available:

***FISHES OF NORTH AND MIDDLE AMERICA*, by D.S. Jordan and B.W. Evermann, 4 volumes, $25.00. Comprises Bulletin 47 of the United States National Museum.**

***MONOGRAPHIC PUBLICATIONS ON FISHES FROM THE PHILIPPINE BUREAU OF SCIENCE*, 1 volume, 15 colored plates, $5.50.**

***SELECTED ICHTHYOLOGICAL PAPERS FROM THE PHILIPPINE JOURNAL OF SCIENCE*, 3 volumes, 55 colored plates. Originally priced at $30.00, now only $15.00 (no dealer discounts).**

***THE FISHES OF CHESAPEAKE BAY*, by S.F. Hildebrand and W.C. Schroeder, with a new introduction by R.S. Birdsong and J.A. Musick, 1 volume, $8.00. Comprises Part 1, Volume 43, Bulletin of the United States Bureau of Fisheries.**

NOTE: The second reprint in the TFH Fund Reprint series, *THE FISHES OF SIAM, OR THAILAND*, by Dr. Hugh M. Smith, currently is not available.

All volumes hard bound. Prices include postage. Payment must accompany orders.

For Beginners

Starting Fry Out Right

by Bud Welty

These blue gourami fry (*Trichogaster trichopterus*) have not completely absorbed their yolk and at this stage are not yet ready to feed. Even when they are ready to begin feeding they are very tiny and require an abundance of microscopic organisms in order to pass this first very critical stage in the life cycle. Photo by R. Zukal.

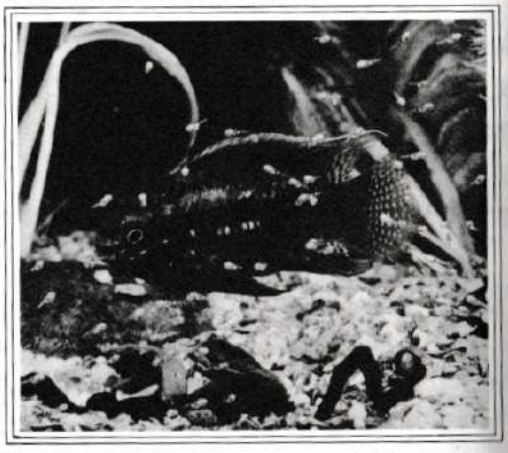
The difference between large healthy adult fishes and undersized runts often lies in how the fry are started out. All too often an aquarist experiences the excitement of seeing his fishes spawn, but when he realizes that the fry require a great deal more care and attention than adults, his initial enthusiasm wanes and the fry are only half-heartedly cared for. As a result, these young fishes never even come close to their full potential for growth and color. A lack of understanding of the needs of the fry may account for the aquarist's waning interest.

In nature most fishes are seasonal breeders—even tropical aquarium species. Although seasonal temperature differences in the tropics are not as great as they are in a temperate climate, there definitely are differences. The slight temperature difference between seasons in the tropics parallels the rainy and dry seasons; more often than not, it is the beginning of the rainy season that triggers spawning in most tropical species.

When heavy tropical rains begin, waters become rich in oxygen. There are several ways in which oxygen-rich

might otherwise be expended on hunting down food organisms and of rechanneling it for use in the growth process.

The fry of most aquarium species are large enough from the time they hatch to feed on newly hatched brine shrimp nauplii. Although this is not a natural food for freshwater species, it is an excellent choice because it seems to supply a great proportion of the nutrients that newly hatched fishes require. No food, however, is in itself totally adequate, for there is no food that can provide everything fishes need. Although brine shrimp should be used as the dietary base for your fry and fed to them at least twice a day, their diet should be supplemented with other foods. Several different varieties of commercially prepared foods are available in a powder-like form. These should be used between brine shrimp feedings and fed in small amounts as often as possible. Additionally, most flake foods can be crushed between your fingers to a fine particle size and also fed to your fry. For species that hatch at a smaller size, bettas for example, cultures of microorganisms should be started well ahead of the hatching time of the fry. These cultures should not be set up to provide only one species of infusorian. For instance, a culture of *Paramecium caudatum* should contain other organisms too. A normal infusoria culture usually provides such a variety.



The young of *Aequidens curviceps*, a typical substrate-spawning cichlid, are able to take newly hatched brine shrimp and powdered foods as soon as they become free-swimming. Photo by H.J. Richter.

Feeding is not the only important factor in raising healthy fry. To a great degree, water temperature influences metabolism and growth. Temperatures between 76 and 80° F (24-27° C) are safe and recommended for the fry of most tropical species. Temperatures below 76° F will slow down tropical fishes' metabolism and in turn decrease the amount of feeding activity. Temperatures above 80° F, if one could consider the effect of temperature alone on metabolism, would increase metabolic and growth rates. But temperatures cannot be considered alone—oxygen supply is equally important. The warmer the water, the less its oxygen holding capacity. In addition, there is an optimum growth rate for the greatest longevity. A fish that grows too fast will not live as long as one that grows normally. The optimum temperature range for most aquarium fishes is 76 to 80°F.

Living space is another important factor in raising healthy fry. Crowded conditions produce behavioral and hormonal abnormalities that have a direct influence on metabolism and growth rate. Crowded conditions also mean that wastes will accumulate in the water to a higher degree of concentration and at a faster rate. The accumulation of these poisons is also a deterrent to favorable growth. Even in an uncrowded aquarium, poisonous wastes can accumulate to lethal levels. Most young fishes are more sensitive to these poisons than are adults, so partial water changes should be made frequently. Changing 10% of the water daily will keep the accumulation of poisonous wastes to an acceptable minimum and will stimulate growth.

Even adult aquarium fishes would fare much better if they were cared for as I have recommended here, but without this kind of maintenance young fishes will not fare well at all. So if you intend to breed your fishes, don't be satisfied to enjoy only part of the process. Follow through with an adequate maintenance program, and the pleasure derived from watching young fishes grow into fine adult specimens will more than compensate you for all the extra effort needed to raise them properly.

Dr. Herbert R. Axelrod Honored by Smithsonian Institute

On March 10, 1977, at a reception held in his honor by the Smithsonian Institute in Washington D.C., Dr. Herbert R. Axelrod, President of T.F.H. Publications, Inc., received the James Smithson Medal in recognition of his contributions to science in the field of ichthyology through the establishment of the T.F.H. Fund.

S. Dillon Ripley, Secretary of the Smithsonian Institution, stated, "This fund has made possible 27 ichthyological expeditions which have greatly expanded our understanding in the field and, in the truest sense, promoted the increase and diffusion of knowledge among men."

More details on the T.F.H. fund and the award presentation will appear in a subsequent issue of *Tropical Fish Hobbyist*.

Idea of the Month

Pump Protector

by Eugene Gilbert

Many aquarium pump manufacturers warn their customers to place the pump above the water level of the aquarium to prevent water from siphoning back into the pump due to capillary action and gravity if the electricity should go out. Very often, though, in spite of the manufacturer's warning, the hobbyist places the pump on a nearby table that is below the water level of the aquarium or on a shelf below the aquarium in an effort to conceal it, especially if the tank is situated in the living room or family room. Placing the pump on the aquarium cover is not convenient either, because it is hard to conceal and often sets up disturbing vibrations.

The backflow problem can easily be solved so that the pump can be placed anywhere. Coil the airline that leads to each air outlet in the tank or the mainline that leads from the pump into two or three loops about three or four inches in diameter. Use several trash bag ties to secure the loops into a spring-like helical coil. This coil can be concealed on the cover behind the light fixture more easily than a pump, or the coil can be concealed behind the tank by taping it to the wall. As long as the airline coil is above the level of the aquarium's water surface water will not siphon out by itself, thus preventing a flood-out during a black-out.

Special News Item

Paradise Lost

The following letter was sent to Dr. Axelrod by the Secretary for Agriculture and Natural Resources of Malawi, Africa. It is printed here verbatim and Dr. Axelrod's answer to Mr. Mtawali follows verbatim as well.

Ref. no. 1/7/5A/XI/32

SECRETARY FOR AGRICULTURE AND NATURAL RESOURCES,
P.O. BOX 30134, CAPITAL CITY, LILONGWE 3, MALAWI,
CENTRAL AFRICA

7th February, 1977

Dr. H.R. Axelrod,
C/O TFH Publications, Incorporated,
211 West Sylvania Avenue,
Neptune,
NEW JERSEY 07753,
U.S.A.

Dear Sir,

I note with great concern that you have, on pages 45 and 46 of the October edition of "Tropical Fish Hobbyist," published a statement on the departure of Mr. & Mrs. Peter Davies from Malawi.

While it is correct that Mr. & Mrs. Davies left Malawi last year, the circumstances and reasons for their departure are not what you have decided to put in the paper.

In Malawi, we believe in straight and honest business dealings, and Government will not tolerate any businessman who tries to obtain anything by dubious means, even if he brings into the country all the foreign exchange. I wish, therefore, to inform you that before writing the article you should have checked with us on the circumstances surrounding the Davies' departure.

I am now informed that you have written to our Principal Fisheries Officer for permission to come to Malawi. I regret to say that, because of the misleading article you have published, we cannot support your visit.

Yours faithfully,
B.B. Mtawali
SECRETARY FOR AGRICULTURE
AND NATURAL RESOURCES

c.c. Principal Fisheries Officer,
P.O. Box 593,
LILONGWE.

Legislation

A Letter from the Pet Industry Association of Georgia

We of the Pet Industry Association of Georgia, Inc. feel very strongly about our importance and relationship with the State of Georgia. This association was established in response to a direct request from the Department of Natural Resources of the State of Georgia. It will be the input from our association to this state department that will help formulate regulations that will allow the pet industry in the State of Georgia to function more effectively in meeting the needs of its people.

During the past five years much legislation has been passed by the Federal Government as well as by the State of Georgia which has restricted the free enterprise system of the pet industry. We feel that our association will be able to keep elected officials, state employees and the public properly informed as to what should and should not be regulated. We further feel it is the right of the public to own animals. If the public is not kept properly informed there may be few if any animals that the public will have the right to buy and own.

It is through your medium that we most earnestly request your assistance in helping us to inform the people of our existence and our readiness to assist them in any problems they may encounter.

Thank you for your assistance in this matter.

Michael Cady
President
Pet Industry of Georgia, Inc.

Editor's Note: Any interested readers can correspond with the Pet Industry Association of Georgia, Inc., Box 95817, Atlanta, Georgia 30347, or phone 404-981-8542. Perhaps this group can offer some assistance in organizing similar groups in other states or cities.

Rhode Island Tropical Fish Society Show

This year, the Rhode Island Tropical Fish Society will hold their Tenth Annual All Trophy Tropical Fish Show and 6th Annual All New England Guppy Show at the new Lincoln Mall in Lincoln, Rhode Island. This year's show will be held on may 6th and 7th in the main entrance foyer of the mall. For information contact:
Edward G. Bogdan
146 Hendrick Street
Providence, R.I. 02908

Madison Aquarium Club Show

The Madison Aquarium Club is holding its Eleventh Annual Spring Tropical Fish Show at West Towne Mall on South Gammon Road in Madison, Wisconsin. The dates are May 14th through the 22nd during normal mall hours. There will be 25 classes in two divisions of regular open and commercial. Entries are open to all. For additional information contact Show Chairman JoAnne Croft, 2134 Winnebago St., Madison, WI 53704. Phone 608-241-4351.

Salts From the Seven Seas

Shrimp of Another Color

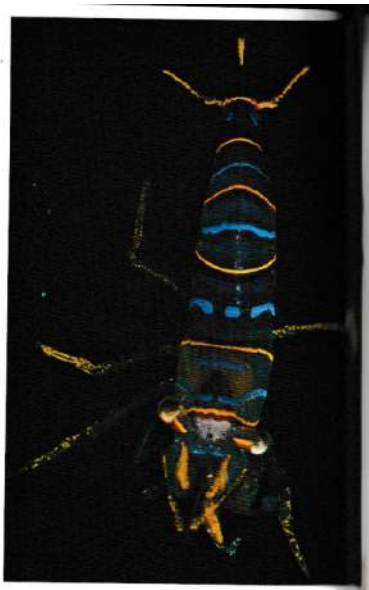
by Jerry G. Walls

As the magazine goes to press this month, Warren Burgess is still in Hawaii completing his academic studies. In his absence, Jerry Walls, our staff invertebrate biologist, has agreed to be our guest columnist for this issue. Warren will return in time for the next issue.

Probably every marine aquarist who dabbles in invertebrates has kept his usual quota of cleaning shrimp. *Stenopus, Lysmata* or *Periclimenes*. The few other shrimp normally seen in shops are drab by comparison and really have little to recommend them. However, there are dozens of other shrimp of several different types which could be adapted to the aquarium with a little effort. Their bright colors and sometimes bizarre habits would amply repay the determined aquarist.

The following four colorful shrimp serve as introductions to the possibilities. Many others can be found by collecting in tide-pools or shallow water on your next visit to the shore or by watching your dealer's tanks for the odds-and-ends thrown into Florida or Hawaii shipments by wholesalers. Most shrimp adapt easily and can stand some variation in water temperature and quality, although all require high oxygen levels. Shrimp cannot be crowded or they will turn cannibalistic if there is not enough other food. With unknown shrimp try a varied diet of small pieces of clams, shrimp, chopped algae, fish, chopped earthworms or broken sea urchins; usually at least one type of food will be acceptable. Shrimp require protection from enemies and bright lights, so give them crevices and corals to hide in and watch out for fish with large mouths. Many shrimp are only active in subdued or red light. Small shrimp usually have a life-expectancy of six months to two years under nearly natural conditions.

A Caribbean anemone serves as home for a conspicuously spotted *Gnathophyllum* sp. (top) and a nearly transparent *Periclimenes* sp. (bottom). Photo by R.P.L. Straughan.



One of the many brightly colored shrimp of the Pacific Northwest, *Lebbeus grandimanus*. Photo by T.E. Thompson.

Although small (about 12 mm), a group of bumblebee shrimp makes a fine addition to the marine aquarium. Certainly they are worth the sacrifice of a sea urchin or two! Photo by D.L. Savitt and R.B. Silver.

Saron is a small genus of common coral reef shrimp of the Indo-Pacific. It belongs to the family Hippolytidae, a large group recognized by the hump at the middle of the tail or abdomen. In *Saron* the overall color may vary from red to green, but on at least part of the body can be seen small irregular reddish circles; the legs and antennae are boldly banded with white. In the most common species, *Saron marmoratus*, the sexes are easily distinguished: males have extremely long and slender front legs bearing only a few tufts of bristles and there are only scattered tufts on the body; females have short front legs with large combs of bristles and the carapace and abdomen usually have numerous small but conspicuous tufts as well. This shrimp is a scavenger and often does well in the aquarium.

Hymenocera picta. Photo by H. Hansen, Aquarium Berlin.

Another hippolytid of very different appearance is *Lebbeus*, a genus found mostly in cooler waters of the northeastern and northwestern United States. Although some species are found only in deep water, others are common in tide-pools and just below low tide. In nature the shrimp are almost invisible against the greenish or brown seaweed background, but when removed to the aquarium they show their true beauty. Many species are translucent except for variable patterns of spots and lines of iridescent blue, red, yellow, or green; the colors are so bright that under the proper lighting they seem to glow from within. Since *Lebbeus* is found in cooler water, some experimentation with aquarium water temperature may be necessary. Remember that if you collect in California tide-pools a permit is necessary.

Very different at first glance are two members of the small and very specialized family Gnathophyllidae. These are the elegant coral shrimp and the bumblebee shrimp, both sometimes seen in dealers' tanks. These shrimp are seldom common, although both are widespread, the elegant coral shrimp being found throughout the Indo-Pacific and the bumblebee around the equator.

The bumblebee (also called zebra shrimp), *Gnathophyllum americanus*, is small (about 12mm), has a unique pattern of narrow black-and-white stripes, and has a slightly flattened carapace with a very short rostrum. To keep a "hive" of these shrimp alive in the aquarium requires the presence of one or two small sea urchins. Why—because the aquarist soon finds that bumblebees are not scavengers like most other shrimp, but instead feed on an almost exclusive diet of sea urchin tube-feet, the long translucent tubes that the urchin extends when it wants to move around. The shrimp clip small and large pieces from the tube-feet in a very relaxed fashion, munching as they move over the urchin.

Somewhat more commonly seen, but just as unique, is the elegant coral shrimp, *Hymenocera picta*. The distinctive polka-dot pattern seems to vary from bright red to pale blue but is always present. The palps (mouthparts used to hold and manipulate food into the mouth) and claws are both greatly flattened, extremely large, and very conspicuous. Like its small cousin the bumblebee, the elegant coral shrimp also has a very unusual diet: it eats the tube-feet of starfish. In this species the

This female *Saron marmoratus* displays the large combs of bristles on the short front legs. Note the numerous small circles of reddish-brown on the body. Photo by Aaron Norman.

The gigantic palps of this *Hymenocera* are conspicuous because the large claws have been lost. Regeneration of the claws will occur in a molt or two. Photo by Aaron Norman.

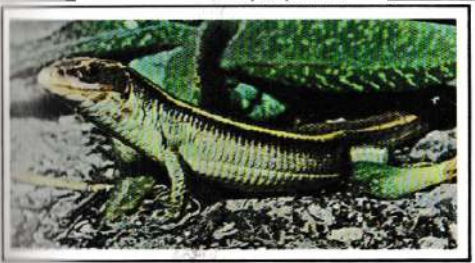
female is larger than the male and serves as the leader in a rather formalized courtship dance which is seldom seen in the aquarium. Some specimens can be made to eat anemones or other coelenterates in a pinch.

So next time you see that neglected little shrimp in the corner of your dealer's tank, take it home and take a close look. The variety of shapes, colors, and patterns is almost unlimited in the shrimp, and you might have found a truly worthwhile addition to your aquarium.

Terrariums

Sun-gazers

by Jerry G. Walls



Of the several types of lizards commonly offered in petshops, only a few are really suitable for the beginning terrarium keeper. Even the common green anole is often delicate with respect to temperature and humidity, and many specimens are not in the best condition when purchased. Horned lizards are extreme desert specialists which, in order to be at their best, require high temperatures and low humidity as well as a continuous diet of ants. One commonly seen group of lizards, however, contains large species that are not delicate, eat well in captivity on readily available foods and have terrarium requirements that are not difficult to meet. These are the sun-gazers of the family Cordylidae.

These often spectacular southern African lizards are known under many common names. Girdle-tail refers to the large bands of bony scales on the tail, as does the name zonure (the common genus *Cordylus* was once called *Zonurus* or zone-tailed). Armadillo lizard refers to the habit of wild specimens of coiling into a hoop with the tail in the mouth when frightened, a most unusual defensive behavior to say the least. The names crocodile lizard and alligator lizard require no explanation after you have seen a specimen of *Cordylus cataphractus*. Because the species of the genus *Cordylus* spend much of the day basking in the bright sun, the name sun-gazer is especially appropriate.

Except for the extremely spiny appearance of some species, sun-gazers are not very specialized lizards. The limbs are well developed for running and rock climbing, the head is broad and heavily plated and the eyes are large and alert. Commonly scales on the back and head are pointed and project like the scales of a pine cone, forming good defensive weapons and protection against the snakes and

A prominent basking surface is essential for the health of sun-gazers. Shown is *Cordylus cordylus*. Photo by H. Hansen, Aquarium Berlin.

monitor lizards which are their main enemies. The tail is long and relatively stout; in the genus *Cordylus* it is encircled by numerous rings of serrated bony scales. From the back of the head to the base of the tail are a variable number of rows of large to very large and partially fused scales. The number and size of these scales seem to be constant within a species. Few species of *Cordylus* are brightly colored, most being tan to reddish brown with vague blotches of darker or lighter brown, although some species have brightly colored bellies and throats, and a few even have bright yellow or blue spots on the sides. Lengths vary from the usual seven inches (175 mm, of which about four inches or 100 mm is tail) to the most common species to over 14 inches (350 mm) in the giant of the group, *Cordylus giganteus*. In species with heavy armor the tail is an effective weapon and is not easily lost; those species with weakly armored tails drop the tail much more easily but regenerate it rapidly.

Three or four dozen species of the principal genus, *Cordylus*, are typical of dry rocky habitats in southern

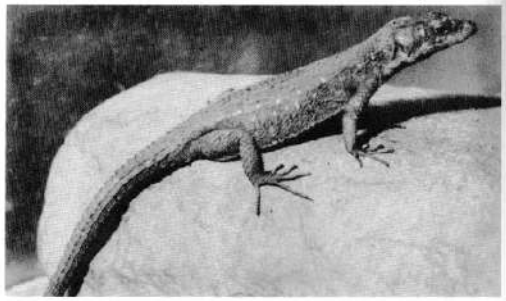
Platysaurus sp. In this genus of greatly flattened cordylids the males commonly have yellow stripes. Photo by H. Hansen, Aquarium Berlin.

Like most other lizards, *Cordylus giganteus* molts in patches. Colors are brightest in freshly molted animals. Photo by H. Hansen, Aquarium Berlin.

Africa. For this reason they require relatively low humidities and access to bright sunlight or artificial light for at least five or six hours each day. Because they are large active lizards that tend to run for cover when disturbed, the terrarium should be as large as possible. The bottom can be coarse sand, fine gravel, flat rocks or a mixture of whatever is available, but there must be several large rocks suitable for basking sites. These rocks should be fitted together carefully to provide cool dark crevices so the sun-gazer may retreat from the heat and light when necessary. Several lizards of about the same size can be kept together, as they seldom fight except over food; small lizards of other species are likely to be eaten by large sun-gazers.

Temperatures of 80 to 90° F (27 to 32° C) should be maintained all year in the terrarium through the use of one or two incandescent bulbs in bowl-shaped reflectors. Before placing the lizards in the finished terrarium, carefully check the temperature in the tank over a one- or two-day period; this check should include both the warmer basking sites (up to 100° F or 38° C is tolerable at

Cordylus coeruleopunctatus is undistinguished except for the bright blue spots in healthy specimens. This is one of the weakly armored species. Photo by G. Marcuse.



the hottest point) and the relatively cool crevices (not below 75° F or 24° C). Remember, you want the lizards to bask, not bake! Morning sunlight should be provided when available. Be careful of cool drafts or high humidity; both could lead to your lizards' death.

Keep the top of the terrarium tightly screened to prevent the entrance of other household pets, small children or flies. *Cordylus* do not jump or climb glass well, so they are unlikely to escape from the normal terrarium. A bowl of water no more than one inch (25 mm) deep should be provided and fresh water given daily.

Food for sun-gazers is no problem. The species are largely insectivorous and will accept crickets, grasshoppers, cockroaches, mealworms, moths, fly maggots and almost any other insect that doesn't have stinging hairs or produce noxious secretions. Many acceptable types of insects can be collected around lights during warm months, and crickets and mealworms can be cultured for winter feeding. Young specimens adapt well to most diets and can often be weaned to a diet of finely chopped *lean* meat, although this should never be given in quantity. Caterpillars and tadpoles (presented out of water) are also acceptable foods. Specimens often become very tame after several months of good care and may take food from the fingers.

Cordylus species are ovoviviparous (the eggs are retained in the body of the female until fully developed and ready to hatch); the female gives birth to one or occasionally two young which are almost identical in profile and coloration to their parents except for size. In smaller *Cordylus* species the young are about one to two inches (25-50 mm) long; in *Cordylus giganteus* they may be five inches (125 mm) at birth. The young are active and can

(*Continued on page 58*)

(Sun-Gazers, continued from page 48)

usually be kept with the parents; they eat the same insect diet as the adults, just smaller pieces. It might be mentioned that most sun-gazers will occasionally accept fresh greens or flowers (try chopped dandelions, but stay away from lettuce) for a change.

Four species of *Cordylus* are often seen in petshops, all usually from South Africa. They are easily distinguished by size, number of rows of scales from the back of the head to the tail and amount of armor on the tail. *Cordylus giganteus* is a very large species, commonly between 10 and 14 inches (250 to 350 mm) total length, with strongly developed head scales. *Cordylus cataphractus* is also very heavily armored, especially the tail, but is smaller than *C. giganteus*. *Cordylus polyzonus* and *C. cordylus* are similar in size to *C. cataphractus* but have more tapered and weakly armored tails. *C. polyzonus* has about 38-40 rows of scales and often has a well developed pattern of paired dark blotches on each side of the back. *C. cordylus* has only 25-30 rows of scales and usually lacks a distinctive pattern. There are many other species in this genus, but most have restricted ranges and are rarely imported. In some the body may be solid red, solid black or black with blue spots.

Several other genera of Cordylidae occur in southern Africa and Madagascar, but none is commonly seen. *Pseudocordylus* has numerous rows of small scales on the back, the tail has heavy rings of bony scales around it and the head is relatively smooth. *Platysaurus* is, as the name implies, greatly flattened and has weak tail armor, small body scales and commonly a pattern of three yellow stripes or rows of spots down the back. *Platysaurus* lays eggs and, next to *Cordylus*, is the most commonly available genus.

Because these imported lizards are of good size and have a rather unique appearance, they cannot usually be purchased cheaply. But if you want a species that stands at least an even chance of surviving the mistakes you may make with your first sophisticated terrarium, a sun-gazer is a good choice.

Although not brilliant, the bright reddish brown of *Cordylus warreni* is attractive in a subdued way. Photo by H. Hansen, Aquarium Berlin.

Readers React

Results of Hole-in-the-Head Treatment

by Dr. Mark P. Dulin

I devoted my December *Your Fishes' Health* column to hole-in-the-head disease of discus fish. In this article, I recommended both oral treatments and long-duration baths with metronidazole (Flagyl®) to destroy the flagellated protozoan *Hexamita*. As you may recall, I mentioned that certain discus breeders reported success when Flagyl® was used to treat hole-in-the-head, but we really didn't have any information as to how this drug would work for the hobbyist in individual aquariums.

So far, twelve aquarists have responded to my request for both successful and unsuccessful reports using Flagyl® therapy. Although certainly not statistically significant, all twelve aquarists reported a remission of signs when Flagyl® was used. *BUT* these aquarists reported the experimental medicated food formulation to be unpalatable to the discus. Instead of feeding my recommended formulation, they used their ingenuity and "tricked" their sick discus into eating pulverized Flagyl® granules within various discus delicacies such as shrimp or beef heart. The drug was disguised by rolling it in fine slivers of meat "enchilada style."

These aquarists reported signs of improvement within three to seven days. One aquarist (William Lytch of Lakeland, Florida) even went so far as to conduct daily microscopic fecal examinations during the Flagyl® therapy and noticed rapidly decreasing populations of the parasites, until no more *Hexamita* could be found at the end of five feedings of the drug.

Aside from the unpalatability of the suggested medicated food, the only other complaint stemmed from a temporary cloudiness of the aquarium after pulverized Flagyl® (250 mg/5 gal water) was placed into the aquarium. Unfortunately, this is a common complaint of many aquarists after crushed pills are placed into their aquariums. My only explanation is that many pills contain sugars (such as lactose) as binding agents for the active ingredient. Depending on the particular bacterial flora in the aquarium at the time of drug administration, a bacterial bloom may or may not occur. This temporary food source for the bacteria is short-lived; the cloudiness usually subsides on its own within 48 hours.

I would like to take this opportunity to thank those aquarists who sent me their results. The information they sent will undoubtedly be of value to other aquarists, should they have to deal with hole-in-the-head disease (hexamitiasis) of discus.

By feeding Flagyl® and subjecting the fish to long-duration baths in solutions containing this drug, hole-in-the-head disease of discus can be cured. Photo by Meyburg.

Marine Fishes

A Horn is Born

by Jerry Levine

The newly hatched horn shark rests in front of the odd-shaped egg case from which it just emerged. Photo by Murray Wiener.

We were recently very fortunate to have an exciting happening at our shop. . . the hatching of a shark egg. The egg, enclosed in a leathery, spiral-shaped case approximately five inches long, was purchased in October, 1976 from a Florida wholesaler who had received it from a collector in California. This oddly shaped egg remained in one of our marine tanks for a full two months before it hatched.

Did you ever experience two months of constant frustration wondering whether you are aiding or hindering your anticipated results by what you were doing? We did—almost to the point of throwing the shark egg into the trash can. Speculatively, we watched the egg, but we had no way of knowing if this was just an empty case or if, in fact, it did contain a growing embryo. This was my first experience with a shark egg, and up until the time we acquired it I was under the impression that all sharks were livebearers. I had no idea how long the incubation period should have been. In fact, I wasn't very confident that this was really a shark egg. I was so uncertain about this thing that I never put a price on the egg, being fearful that one of my customers at Bay Pets would claim that I sold him an empty egg case.

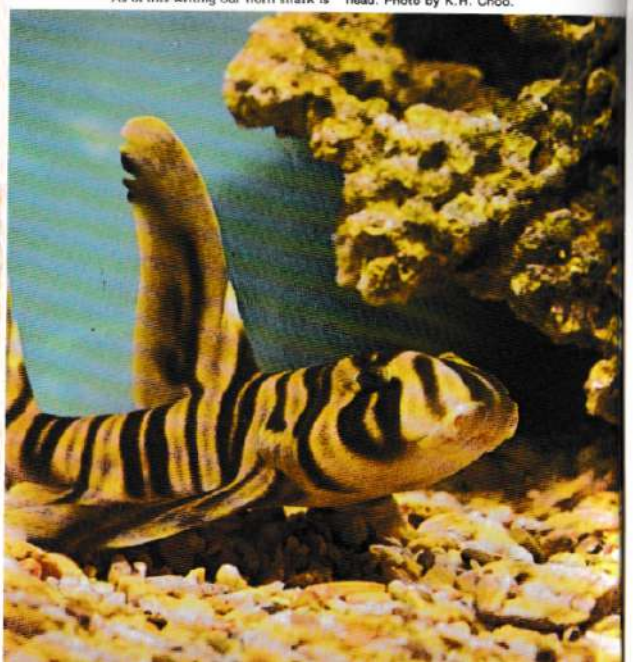
I am now rather delighted that we never sold the egg, because after about eight weeks of anxious anticipation, we had a new addition in our tank. One of my employees had gone over to the tank to do his daily housecleaning when he saw something quickly dart past a piece of coral. He hollered, "It hatched, it hatched!" I dropped what I was doing and ran over to witness the happening. There, right in front of our eyes, was a beautiful little shark. Its color was tan, and it was covered by a generous sprinkling of small brown spots. It was about five inches long, seemed to be breathing well and had what we thought was good color.

Frantically, I started making phone calls to wholesalers and a large public aquarium, but nobody I spoke with had much information on hatching shark eggs or feeding the young in captivity. I was unable to obtain any information as to what or how to feed it or what water conditions it preferred. Unsure as to how long the shark would stay alive in our tank, and wanting to have some record of the hatching of a horn shark, I called Murray Wiener, a well known aquarist and dealer in New Jersey, who was gracious enough to come up to New York to photograph this beautiful creature.

With a little research we were able to find out a few things about this shark. Our horn shark, *Heterodontus francisci*, belongs to the family Heterodontidae, the bullhead sharks, which are found in the warmer parts of the Pacific Ocean as far west as Japan and south to Australia. *H. francisci* is com-

monly found in shallow water off the coast of southern California. It ranges from the Gulf of California in the shallows around the Baja Peninsula northward to Monterey Bay. Like its well known cousin, *Heterodontus zebra*, which is found off the southern coasts of China and Japan, its posterior teeth are flat and molar-like, enabling it to crush the shells of the mollusks it feeds on. In nature, the species grows to about four feet in length.

As of this writing our horn shark is three months old, has reached a length of eight inches and is still growing. We have been feeding it pieces of clam, prawn and squid. Weekly water changes and a varied and nutritious diet are keeping it hale and hearty. As a matter of fact, if it could talk it would probably say, "Life here is easy and the food is great!".



The bullhead sharks, such as this *Heterodontus zebra*, derive their common name from the stout appearance of the head. Photo by K.H. Choo.

Adinia xenica

The Diamond Killifish

by Braz Walker

The brightly speckled high-held dorsal fin of this pert little killifish makes it easy to identify among the other killies that dwell in the same Texas habitat. Photo by Aaron Norman.

There is irony in the fact that attractive "new" fishes appear periodically on the scene which sell quite well initially on the basis of their attractiveness, only to soon return to oblivion because word gets around that they are native fishes and no one bothers to propagate them in marketable numbers. Among the most desirable of these, and ones which should have attracted more attention than they have over the years, are several handsome killies belonging to the genera *Fundulus*, *Cyprinodon* and *Adinia*. Best known is the genus *Cyprinodon*, to which the widely publicized pupfishes belong, fishes which have survived in isolated creeks and springs since the Ice Age, evolving into tiny, separate populations each of which is unique to the earth, and each of which is daily endangered by the presence and activities of man. Certainly not endangered, but deserving higher status than it has attained as an aquarium fish, is *Adinia xenica*, the diamond killifish, a close relative which is in some ways quite similar to the pupfishes.

The diamond killifish is deep-bodied and stocky, with a series of dark vertical bars on its rather iridescent grayish-green body. Males have 10 to 14 pearl-colored bands between the darker ones; the belly is yellow and the jaw is orange. The dorsal and anal are rather dark but are covered with small pale blue spots. The dorsal is rather large and at times almost sail-like.

This distinctive fish is found in brackish and sometimes fresh waters along the Gulf Coast from Florida to Texas. In some areas specimens are very abundant, especially in shallow brackish-water lagoons where they feed heavily on the myriads of small life found there as well as on certain types of algae and other vegetation. Fishes inhabiting such localities and feeding heavily on local animal life are enormously important in mosquito control. Anyone who has been assaulted and drilled by a Gulf Coast mosquito can well appreciate the value of fish that consume mosquito larvae by the millions. Quoting Jimmy Dean of singing and sausage fame, a Texas Gulf Coast mosquito can "stand flat-footed and kiss a turkey in the face."

The diamond killifish is easily kept in an aquarium which is not too crowded. Although these fish will live in fresh water there should be an addition of salt, since this is their preference in nature. To bring out the best in what can be an outstanding fish, one-fourth to one-half sea water or its equivalent can be used. This is easily done either by using one-fourth or one-half the ordinary amount of a good marine mix to the aquarium water or by conserving replacement water from a marine tank when you make your regular partial changes, diluting it to 25% or 50% strength. Even ordinary rock salt will serve, but marine mix or diluted marine water is best. Administration of salt to create a brackish environment will result in an immediate and striking change in the fish's activity and appearance.

Feeding *Adinia xenica* (*Adinia* = a coined name; *xenica* = strange), which at one time was known as "*Fundulus xenicus*" and later as "*Adinia multifasciata*," presents no difficulty, since almost any type of fish food will be quickly and eagerly consumed. Newly captured diamond killies will learn immediately to take flakes and other floating food as well as fresh and frozen foods. Algae or cooked spinach should be offered occasionally, or perhaps some of the recently available frozen products containing natural greenery, which should be excellent.

An aquarium containing diamond killies should have retreats available and should be roomy enough for individual fish to avoid too much aggression. Spawning drive is quite intense in males, so it is best to have more than one female present with which each male can share his affections. Sexing is not difficult, because of the fullness of egg-laden females plus the greater depth of their heads (not as sharply wedge-shaped in profile). As with many other killifishes, the females' colors and patterns are far less intense than the males'.

Diamond killifish will spawn at 72° F (22° C) although higher temperatures will stimulate them into faster and more intense spawning activity. They may spawn in or on clumps of fine-leaved plants or on the aquarium floor. If no suitable plants or substrate is available they sometimes will simply press their bodies together in a typical spawning "quiver" almost anywhere in the aquarium. Eggs are not difficult to hatch using the normal killifish technique, with hatching time depending upon temperature. Most babies can take freshly hatched brine shrimp as

first food, but it's not a bad idea to also provide some "green water" as a supplement.

Brackish water aquariums are becoming more popular for a number of reasons. For one thing, those who truly love and appreciate fishes and aquatic life are learning that creatures collected within traveling distance can be just as interesting and as beautiful as those from far-off exotic places. We are also beginning to respect the ecological requirements and adaptations of various aquatic fauna and to respect the requirements and limitations of given species. We are also discovering that not only can a brackish aquarium be a good training ground for marine fishkeeping, but that there are a large number of estuarine fishes which are at their very best in water which represents the mingling of the river and the sea.

To accompany diamond killifish in the brackish aquarium are such choice fishes as sailfin mollies; *Cyprinodon variegatus*, the common pupfish; scats; *Monodactylus*; archers and numerous coastal killies of the genus *Fundulus*. Procedure and principles should follow basic marine fishkeeping rules, although tolerances are far less critical than with marines.

Diamond killifish, as a matter of fact, do well in fresh water, although their colors may not reach quite the intensity brought out by the addition of some salt. For those who prefer to grow natural plants in their aquaria, one of the best possible choices to keep with diamond killifish is *Vallisneria americana*, a very durable and hardy plant which is often found in brackish water as well as fresh, so a small addition of salt would do no harm.

The growing acceptability of keeping native fishes, the attractive pattern and coloration of the fish and the relative ease with which it can be kept and bred should bring the diamond killifish to a level of respect and availability comparable with such other North American favorites as *Jordanella floridae*, the American flagfish, *Fundulus chrysotus*, the golden ear, and *Enneacanthus gloriosus*, the blue-spotted sunfish.

Cyprinodon macularius, one of the well-known desert pupfishes, has the upturned mouth of the more familiar African and South American killifishes. Photo by H.J. Richter.

Fish Behavior

Social Behavior, Growth & Health of Tropical Fishes

by Dr. Edward I. Pollak

Literally hundreds of products are currently available to help the hobbyist produce bigger, healthier, and more colorful fish. Few aquarists realize, however, that these same qualities can sometimes be obtained simply by understanding the importance of social relationships in a fish's life.

The Social Hierarchy

Let us start by considering a tank full of newly hatched blue gouramis (*Trichogaster trichopterus*). Within a few weeks the fry have set up a peck order or dominance hierarchy based on their relative sizes (the so-called "size hierarchy effect"). Those fish highest in the peck order will be the largest of the fry and may be seen chasing and harassing their smaller brethren. By the end of their first month of life, the dominant fish may be more than 10 times the size of the subordinate fish and cannibalism becomes a problem. Although it is easy to suggest that genetic differences among the fry determine these differences in growth rates, closer examination reveals that existence of the peck order is a more important factor.

If, for example, you remove the largest of the fry and transfer them into a tank containing even larger individuals, these previously dominant fish will now be at the bottom of their new peck order and their growth will slow down quite dramatically. With their overbearing siblings now removed, the previously stunted fry will begin to grow at a rapid rate. Given time, they will soon be as large, or even larger, than those fry that had started out growing so well. Clearly, there is an important relationship between a young fish's position in the peck order and his rate of growth. The hobbyist can put his knowledge to work by periodically sorting his fish and keeping only similarly sized fry in a given aquarium. Sorting by size has, of course, been recommended for years but usually only to make sure that cannibalism does not occur. It is rarely mentioned that growth itself can be speeded up by sorting fish into size classes.

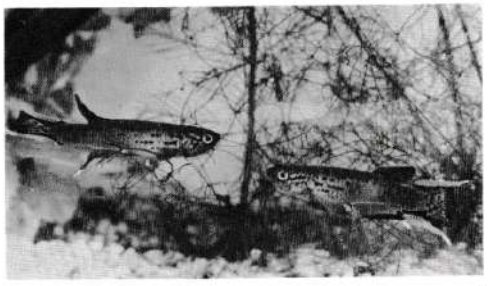
A Game of Leap Fish

Perhaps a more fascinating example of the effects of social behavior on growth can be seen among the Poeciliidae. Male swordtails, platies and guppies for all intents and purposes stop growing once they are sexually mature, thus most body growth occurs while the fish is still a juvenile. Furthermore, large adult males can often actually prevent juveniles from maturing. But remember, as long as the young are still sexually immature, they continue to get larger and larger while those that are already adults have stopped getting any bigger.

Consider five juvenile male swordtails kept in their own aquarium. They will soon set up a peck order in which the largest of the fish (#1 in the peck order) is dominant. The smallest of the fish (#5) will be at the bottom of the peck order. Without any adults around to hamper his progress, juvenile #1 reaches puberty at a relatively tender age and small size. Now the fun begins. Once #1 has matured, #2 is inhibited from maturing until he has grown even larger than #1. Only then does he start to mature. Now it is #3's turn and he keeps growing until he is larger than either numbers 1 or 2. This game of "leap fish" continues until all the fish have matured and all growth has stopped. The end result is that the fish who started out as the largest and most dominant juvenile (#1), winds up as the smallest and most subordinate of the adults. Little #5, who started out as the smallest of the group and low man on the totem pole, ends up as the largest of the adults and on top of the peck order. This peculiar system may have evolved to give each male a chance to be the dominant member of the peck order. Since the high-ranking fish do most of the mating, each male gets a chance to mate with as many females as he can for a brief period of time.

To produce male poecilids of as great a size as possible, you need only keep a few small and medium sized adults with your growing juveniles. The young will then put off sexual maturity until they are larger than any of the adults already present. It goes without saying that one should wait until the juveniles are too large to be eaten before introducing the adults into the aquarium. If you plan to try this trick with *Xiphophorus variatus* you may get an added bonus. The larger the adult, the more intense the yellow and red coloration of the dorsel and anal fins tends to become. This has been demonstrated both in wild-caught and laboratory-reared fish. I know of no one who has tried this trick specifically with guppies, but I see no obvious reason why it should not help to produce larger (if not more colorful) specimens. It should be borne in mind, however, that one cannot grow a five-pound guppy by manipulating its social milieu; that is, an upper limit seems to exist past which sexual maturation can no longer be inhibited.

Non-schooling fishes such as *Aphyosemion australe* form highly structured social orders in the aquarium. Since they are continuous daily spawners and their eggs take about 14 days to hatch, the aquarist usually has an assortment of different-size fry on his hands. The social order established among these fry strongly influences their growth and maturation rates. Here two males face off, with one on the right showing dominance over the other male. Photo by R. Zukal.



The two female platies (upper and right-hand fishes) shown here are about equal in size. In a large group of similar platies, these two females would probably occupy about the same position in pecking order. Photo by M.F. Roberts.

Stress and Diseases

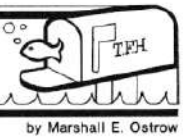
A few words of warning are in order at this point. Keeping fish at the bottom of a peck order for prolonged periods of time can make them more susceptible to disease. This point was brought home to me following a series of observations that I had been making on the social relationships among groups of blue gouramis, swordtails and guppies in one of my home aquariums. After I had finished determining each fish's position in its peck order (there seemed to be three separate dominance hierarchies, one for each species), a severe case of *Ichthyophthirius multifiliis* struck the tank. Closer inspection of the fish revealed that while the subordinate fish were virtually covered with the infective elements of this protozoan parasite, the dominant fish of each species was almost completely ich-free.

Just as a drastic temperature change or too much rough handling can stress a fish, being subjected to constant harassment by larger fish can also be stressful. But why should these subordinate fish be so susceptible to disease? It was not because the larger fish had stopped them from feeding. My previous observations had told me that the smaller fish were eating just as well as the larger ones. It turns out that just like humans and other mammals, fish respond to stressful situations by increasing the output of hormones from the adrenal gland. One of these hormones (cortisol) has the effect of decreasing a fish's growth rate and inhibiting its defenses against invading disease organisms. With their defenses lowered, even well fed and carefully maintained fish can become disease-prone.

One way to minimize the amount of social pressure placed on low ranking fish is to provide them with as much cover as possible. This will help reduce the number of aggressive encounters that they have with the larger, higher ranking individuals and provide them with a bit more "peace of mind." It also helps to make sure that plenty of food is provided and that the food is scattered more or less evenly throughout the aquarium. All kinds of fish from medakas to trout tend to become nastier if food is in short supply or if it is provided in one big chunk that permits the aquarium bully to keep it all for himself.

Even an elementary knowledge of the social relationships among your fish can help you to get so much more out of your hobby in terms of both fish and fascination.

Mail Call



by Marshall E. Ostrow

If you have an aquarium question that you would like to have answered, send it to MAIL CALL. Letters containing questions of course cannot be acknowledged or answered personally, but each month a number of the most interesting questions and their answers will be published in this column. Address all questions to: MAIL CALL, T.F.H. Publications, Inc., P.O. Box 27, Neptune City, New Jersey 07753. Please do not combine MAIL CALL questions with correspondence about subscriptions or book orders.

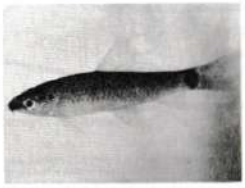
Apprehensive but Helpful

Q. I just read a letter in one of your recent "Mail Call" columns from Mr. Robert Barrett of Great Falls, Montana, who was seeking information on African cichlids. Living in Montana myself, I decided to call Mr. Barrett. Well, there was a Robert Barrett, but he raised only chickens! I'm now wondering what gives? Are the names and towns on your "Mail Call" letters fictitious? If not, I would appreciate having this man's address, as I have raised African cichlids and may be able to help him.

Don Goodhue
Acton, Montana

A. Letters that appear in this column are from the hobbyists indicated living in the places indicated. We have no way of knowing a letter writer's age unless he tells us. It is very possible that Mr. Barrett is a young man or a teenager residing in his parents' household, and therefore would not be listed in the telephone directory.

Though it was kind of you to offer free assistance to another fellow hobbyist, it is not the policy of Tropical Fish Hobbyist *to release addresses of the authors of books, articles or letters, without their expressed consent. Otherwise, many of them would be bombarded with mail from well-meaning hobbyists asking for or offering assistance or fish. To some authors, this might be an interesting experience for a while, but to most, it would eventually become quite harassing. We are obliged to protect our authors in this manner unless they instruct us otherwise.*



Labeo frenatus, like many of the other Labeo species, tends to be territorial, especially so during the breeding season, yet it is still a fairly peaceful fish. Photo by Dr. Herbert R. Axelrod.

Labeo Frenatus Does It Again

Q. As a follow-up to your article in the November, 1976 issue of *Tropical Fish Hobbyist*, "Spawning *Labeo frenatus*," by Anatoly Roznov, I have some additional information that may be of interest to your readers. I have successfully spawned this species, and the fry are now 14 days old. Eleven fry hatched and ranged in color from black to silvery-gray. They were about a quarter of an inch long when they hatched and are growing incredibly fast. The fry are being fed on newly hatched brine shrimp nauplii and tubifex.

The spawning occurred in a 120-gallon tank that contained large gravel and plenty of plants consisting of *Bacopa*, *Cabomba caroliniana* and *Vallisneria*. The water was kept at a pH of 7.8 and the temperature was 78°F. Other than the breeders, there were no other fish in the tank.

K.B. Sharkie
Surrey, England

A. *We are happy to know of your successful* L. frenatus *spawning, for we have had a number of inquiries since that article was published asking for more information on the spawning of this species. On behalf of our readers, we thank you.*

Commercial Fish Vaccine

In the October, 1976 issue of *Tropical Fish Hobbyist*, Dr. Mark P. Dulin, in his column, "Your Fishes' Health," mentioned the experimental use of vaccines in the prevention of fish diseases. We recently received news of the availability of the first commercially-produced fish vaccine. Although the vaccine was developed to immunize rainbow trout against enteric redmouth disease, its success does represent good news for aquarium hobbyists because its use will probably stimulate more research in the development of commerical vaccines for tropical fish species. Here's hoping!

Grandiose Gibbosity

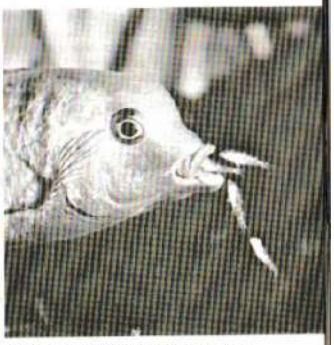
Q. I have four *Haplochromis moorii* in a 55-gallon tank along with several other Malawian species. I would like to know whether *H. moorii* will breed in this community situation or should they be isolated in a tank by themselves? After they have spawned should the female be further isolated? At what size will they begin to breed?

I have noticed that although they are all the same size, some develop the head hump before others. Is this an early sign of sexuality?

My water is hard and alkaline, having a pH of 7.5, and the temperature is kept at 78 to 80°F. The diet consists of freeze-dried tubifex, shrimp flakes, vegetable flakes and staple food. Is this a good diet for them and are the water conditions all right?

J. Pentangelo
Brooklyn, New York

A. *Although* H. moorii *is normally found over sandy areas of Lake Malawi*



A female *Haplochromis moorii* takes her young back into her mouth in order to protect them from predators. Photo by Dr. G. Schubert.

rather than rocky outcroppings, it still dwells in communities consisting of a number of different cichlid species. Accordingly, like the mbuna, if a pair were to be placed in an isolated aquarium they would be more likely to harm each other than if they were kept in a community tank with other cichlids. This community concept can also be applied to their breeding. An incubating female is less likely to be harassed in a community tank than she is with one male alone. Of course, ideally she should be totally isolated when brooding.

Although this species grows to eight or nine inches, it will spawn at four to five inches in length.

The time when the frontal gibbosity begins to develop on the fish is not necessarily related to sex, and the time of its appearance may be influenced in part by the fish's status in the pecking order. The timing could also be the result of individual differences between fish.

The ecological conditions and diet you have provided for your fishes are quite correct. Continuing such a maintenance program should bring you excellent results with your H. moorii.

Enjoy your fish? You'll enjoy them more in a bigger tank.

Although there are many attractive strains of angelfish available, a fine specimen such as this one, which very closely resembles its original wild ancestors, is still one of the handsomest of all. Photo by H.J. Richter.

Angelfluke

Q. About 18 months ago I purchased eight angelfish. After about three months one of them began to lie on its side and only occasionally rose to the surface to eat, and with great difficulty. While the other angelfish grew and prospered, this one did not. It is still alive today but is no larger than a nickle, which was about its size when I bought it. What could be wrong with it, and is there anything I can do to cure this malady? Also, can you tell me what the lifespan of an angelfish is?

Suzanne Addessi
City unknown

A. *Your ailing angelfish seems to be suffering from some sort of swim bladder dysfunction. This condition could have been brought on by an injury, by a disease or by a genetic abnormality. Since the fish has lived so long, our guess (in this case an educated guess is about the best we can do) is that the cause was not a disease per se. If it was, the fish surely would have shown other signs of the disease and probably would have died long ago.*

In nature, a fish showing such distress would be very quickly devoured by some hungry predator. In the controlled environment of an aquarium your fish is apparently able to get enough food to keep itself alive, but you are not doing it a favor by letting it live such an agonizing life. Cruel though it may seem at first, your best bet is to destroy the fish.

As far as the angelfish's lifespan is concerned, there is no reliable way of determining a tropical fish's life expectancy. We can only base our information on information given to us by hobbyists and scientists when they tell us how long their captive fish actually did live. It is not unusual for an angelfish to live eight years or more.

AFRICAN CICHLIDS

From Lakes Malawi and Tanganyika for both Hobbyists and Dealers

Haplochromis livingstonii Guenther, a large predacious cichlid, lives only in Lake Malawi where the African fishermen call it "Kaligono" (the sleeper) because of its peculiar feeding behavior: lying on the sandy bottom, displaying a blotched grey and white pattern, and looking like a very dead fish. When a small fish approaches to pick at this dead carcass, the *livingstonii* quickly strikes and eats it.

The photo below shows an 8" female *livingstonii* with some of her fry from a spawn of about 75. She protected them carefully for a couple of weeks before they were removed to an aquarium of their own. Our current list offers this species, priced from $4.50 each.

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We'll send any interested hobbyist or dealer a list with details about shipping and live delivery warranty. You'll also receive an illustrated brochure with more information about keeping and breeding African cichlids. Just send us a business size, self-addressed, stamped envelope.

NEVIN AND TOM BAILEY
5151 Santa Fe St Suite I, Dept. T-26
San Diego CA 92109 714/270-1182

Tropical Fish Fanciers of Merrimac Valley Inc.

The T.F.F.M.V., Inc. is hosting their 2nd annual all trophy show, to be held at the Rockingham Mall route 28 Salem, New Hampshire. The dates are May 28th thru 29th, 1977. For additional information contact:
John Conway (show chairman)
63 Lexington St.
Lawrence, Mass. 01841
(617) 687-1237

Like the Mormyridae, the fish navigates by surrounding itself with a weak electric field which results from impulses produced by electric organs on the posterior half of its body. This electrical system is very efficient and more than compensates for the fish's bad eyesight. The fish is a very successful nighttime predator.

In nature G. nilotieus reaches nearly three feet in length but will probably not reach this size in an aquarium. It feeds on small fishes and other living organisms. It will probably do well in any aquarium water in which extremes of temperature and pH are avoided. Because of its nocturnal habits it should be provided with plenty of shelter for daytime rest, and bright aquarium lights should be avoided.

Pool Liners

Q. I would like to put some of my tropical fish in an outdoor pool this summer. I know that all plasties are not safe for pool liners. Can you tell me what kind of plastic would be safe?

Marie Eberline
Oskaloosa, Iowa

A. *Your inquiry was quite timely since an article on rearing tropical fishes in outdoor pools was scheduled and did appear in this issue. We inquired with several fish research laboratories operated by the U.S. Department of the Interior for verification of safe plastics. Their experience confirmed our previous information that any linear polyethylene material is safe to use in freshwater aquariums. Nearly any commercially available trash bag or barrel liner is made of linear polyethylene and should be safe for such use. Non-linear polyethylene could release toxins, but this material is hardly ever used except for very special industrial applications and would be most difficult for an aquarist to come by.*

Nerve Damage

Q. I recently noticed that the head of one of my female guppies had developed a dark patch on the left side. The dark patch is mottled and seems to be just under the skin. It also covers the left eye, which is completely black. The right side of the fish is perfectly normal. This is very perplexing to me and any advice would be appreciated.

Mark Whitfield
(City unknown)

A. *Your guppy may have sustained some damage to the central nervous system. Black pigmentation arises from the spread of melanin granules in specialized cells called chromatophores. The spread or aggregation of these granules within the chromatophores is controlled by hormones and nerves. This is why a fish may show an over-all darkening or lightening during a stressful situation or during sexual activity. The darkening of your fish in a small localized area suggests that the fish has lost its ability to aggregate the melanin granules in the chromatophores of that area. This further suggests that the innervation to that area is no longer functioning, probably due to localized brain damage.*

As to the cause, we can only speculate. Perhaps the fish has sustained an injury to the area of the brain responsible for the activation of chromatophores in the area affected. Another possibility is that that area of the brain may have been damaged by a parasitic organism of some sort. There are many parasites that are known to invade fishes' brain tissue. If this were the case, only a post-mortem examination could identify the parasite.

As to cure, we know of none, for central nervous system tissue does not regenerate in vertebrates.

This paradise fish has lost its ability to control the pigment granule distribution in the melanophores of the posterior portion of its body; it therefore remains dark in this area. Photo by R. Zukal.

When writing to advertisers, please mention Tropical Fish Hobbyist.

Although the black angelfish is one of the most attractive of the many strains available today, many breeders feel that it is one of the most poorly fit. Photo by G. Wolfsheimer.

Over the Hill

Q. I have a pair of black angelfish that spawned regularly last summer, but when fall came they seemed to go into a decline, spawning sporadically. Many of the recently laid eggs seemed to have no mucilage and slid unfertilized into the gravel. None of the local shops could explain this sudden decline. I use well water in their tank to eliminate problems with chlorine and fluorine additives, and their food consists of frozen brine shrimp and a weekly feeding of live shrimp. Do I need to change their food, are they past spawning age or what else could be wrong?

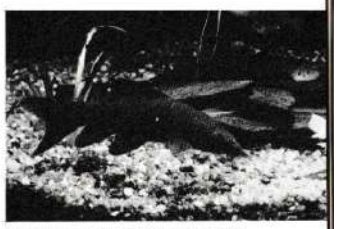
John Norten
Plano, Texas

A. *They could be past spawning age, but you didn't tell us how old they were so we couldn't even speculate on that issue. One thing that is obvious to us is that they are not receiving enough of a variety of foods, and they may be suffering from some sort of a nutritional deficiency that could affect the quality of their eggs. Their brine shrimp diet should be supplemented with other foods, even though this may not be the cause of the problem. A varied diet will produce better over-all health in any animal.*

There could have been a change in the composition of your water due to pollutants that may have percolated into your well. A change of your water source might help.

Another problem could be in their genetic constitution. Today's exotic strains of angelfish have been subject to many generations of inbreeding and, in addition to the many attractive varieties that this inbreeding has produced, a number of deleterious gene combinations have been produced in some. Black angels happen to be one of the weakest strains. It is entirely possible that a bad gene combination could produce a declining reproductive system.

Overbreeding has been known to produce a decline in reproductive ability in some fishes. Separating the breeders for a while might help, but we offer no guarantees. Reproductive systems are very complex biologically and are subject to many intrinsic as well as extrinsic stresses.



Although the black shark grows quite large even in an aquarium, it is a relatively peaceful cyprinid. Photo by John L. Martin.

A Gathering of Sharks

Q. Will a black shark, *Morulius chrysophekadion*, and a bala shark, *Balantiocheilos melanopterus*, get along together in a 125-gallon aquarium? Can any other "shark" species be kept together without trouble?

Sheila M. Chesley
Hanover, New Hampshire

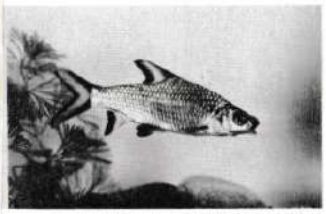
A. *Both are peaceful cyprinids that inhabit Thailand and some of the Indonesian islands. They both have similar ecological requirements, and we see no reason why they would not get along*

Northeastern Illinois Aquarium Society Show

The Northeastern Illinois Aquarium Society will hold its second annual show June 10, 11 and 12 at the Zion Leisure Center. For more information contact:
C.O. Chester, Jr.
1528 Carmel Blvd.
Zion, Illinois 60099

North American Native Fishes Association

The North American Native Fishes Association (NANFA) will hold its first annual convention on June 18th and 19th in Mobile, Alabama. The convention will feature slide shows, speakers, discussions, field trips and good old southern hospitality. For details write to:
Dick Stober
Route 2, Box 267
Semmes, Alabama 36575
or
Robert Rosen
Princeton Arms South #70
Cranbury, N.J. 08512



The bright silvery body contrasted by the black fin edges makes the bala shark one of the most attractive of the larger cyprinids. Photo by G. Timmerman.

together, especially in a tank as large as yours. Black sharks do tend to be a bit scrappy among themselves, but in a 125-gallon tank that should not be a problem if they are well fed and provided with adequate hiding places. The same applies to other "shark" species such as the labeos, many of which also are found in the same waters. You can further ensure tranquility by making sure that all of your "sharks" are about the same size.

Save your copies of Tropical Fish Hobbyist—they are valuable.

Problem Fry

Q. I have been spawning Siamese fighting fish and I seem to be able to save only about ten fry out of each spawn. I have them in water that is kept at 78-80°F. I feed them tube food. Can you give me any help so that I can raise more fry?

Chester Ray, Jr.
Mount Hill, Bermuda

A. *Although adult Siamese fighting fish are very hardy and somehow can survive a lot of abuse in their management, their fry are among the most delicate of all aquarium fishes, at least for the first month or so of their lives. There are two common problems in raising betta fry successfully. One is feeding, and on this there are two schools of thought. There are those aquarists who swear by infusoria (microorganisms such as paramecia or stentors); these people don't have problems with decaying uneaten food because these organisms survive in fresh water until they are eaten. The other school of thought is to feed newly hatched brine shrimp nauplii right from the start. The supporters of this idea feel that even though some of the smaller fry will perish because they can't eat brine shrimp, most of the new fry are large enough to eat, and stronger adults will be produced. If you use brine shrimp or tube food, great care must be taken to be sure all uneaten food is removed from the tank. Frequent, perhaps even daily, partial water changes will help reduce the concentration of toxins in the water that may result from uneaten bits of food that the aquarist might overlook.*

The other common problem has to

Exotic Aquarium Society Show

The Exotic Aquarium Society of N.J., Inc. will sponsor a tropical fish show and auction. This event will be held from May 13th thru May 15th at the West Belt Mall, Routes 23 and 46, Wayne, New Jersey. The show will feature the area's first tropical fish photography class which will be judged by Jack Anderson, chief photographer of the Herald News. For information call Steve Sokol at 201-843-8362.

MOVING?

If you are, you'll want your subscriber's copies of *Tropical Fish Hobbyist* to be mailed to your new address, so please inform us, as soon as possible, what your new address will be. Letting the Post Office know isn't enough, because they will forward your magazine only upon your payment of extra postage.

When writing to inform us of a change of address, please provide us with your old address, too; the best way is to send along an address label from a recent issue. You won't miss a single copy of your favorite hobbyist magazine if you inform us of your new address at least six weeks prior to your moving date. Write to:

Tropical Fish Hobbyist, P.O. Box 27, Neptune, NJ 07753

Waikiki Aquarium Hosts Fish Health Workshop

For those marine hobbyists who may be vacationing in Hawaii this coming summer and are interested in marine fish diseases and nutrition, the Waikiki Aquarium is hosting a three day seminar on management, disease and nutrition of tropical marine fishes. The seminar will be held on August 22-26, 1977. Participants will have the opportunity to visit coral reef collection sites as well as participating in the wet lab sessions. This comprehensive program is particularly designed for Mainland U.S. dealers who are handling tropical marine fishes. Registrants will be limited to twenty. For registration information write to: Dr. Leighton R. Taylor, Director, Waikiki Aquarium, 2777 Kalakaua Ave., Honolulu, Hawaii 96815.

A male betta gathers fertilized eggs in his mouth and blows them up into his bubble-nest. Photo by R. Zukal.

do with water and air temperature. In the wild, bettas are usually found in hot steamy swamps or rice paddies. In the aquarium these conditions should be duplicated as closely as possible, especially for the delicate fry. Cool dry air over the water will produce respiratory difficulties for the fry until their labyrinth organ is fully developed at about four weeks of age. This problem can easily be solved by keeping the water temperature at 80 or 82°F and keeping the aquarium tightly covered, which will help retain warm moist air over the water. As the fry grow, the cover can gradually be withdrawn until, at four or five weeks of age, the cover is no longer necessary; then the temperature can be dropped somewhat.

Au Naturel

Q. As an aquarium hobbyist I prefer to keep my fish in the most natural environment possible. Accordingly, I use small gravel, rocks, live plants, an outside filter and a fluorescent light. The tank has a capacity of 29 gallons and the gravel is 1½ to 2 inches deep.

My problem is that I can't seem to keep my plants alive and growing. After about a week in the tank the plants turn light brown at the base and break off, and the rest of the green plant floats to the surface. This is very distressing, since my fish tend to die of old age but the plants don't survive at all. What water conditions are necessary to maintain healthy green plants (pH, hardness, fertilizer, etc.)?

Kevin Lynch
Pascagoula, Mississippi

A. *You make no mention of what your chemical conditions are or the intensity of your light. You did not mention what plant species you are trying to grow either. There are some general rules, however, which could be helpful to you and other hobbyists in your situation.*

With respect to water chemistry, most of the plants commonly sold in aquarium shops require water that is neutral to slightly alkaline and not too soft. In soft acid water some of these plants will just barely hang on and many will die quickly. Many of the ferns, however, such as water sprite and Java fern, will do well in soft acidic water. Most of the cryptocorynes will also do well in this kind of water.

With respect to light intensity, cryptocorynes and some of the water ferns will do well in low light conditions. Most other common aquarium plants require fairly intense light. If you are trying to grow plant species such as Cabomba, Hygrophila, Myriophyllum, Vallisneria or Sagittaria, all of which require fairly intense light, you might try supplementing that emitted from your fluorescent light with some intense incandescent lighting.

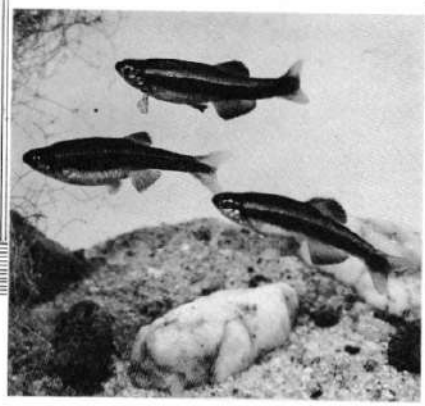
As to fertilizer, the waste products from your fishes should provide the plants with more than enough.

For more complete information on the specific requirements of your particular plants we suggest you see Encyclopedia of Water Plants *by Dr. Jiri Stodola, a book that is available in pet shops everywhere.*

Special Feature

Tropical Fish in a Garden Pond

by L. Zear



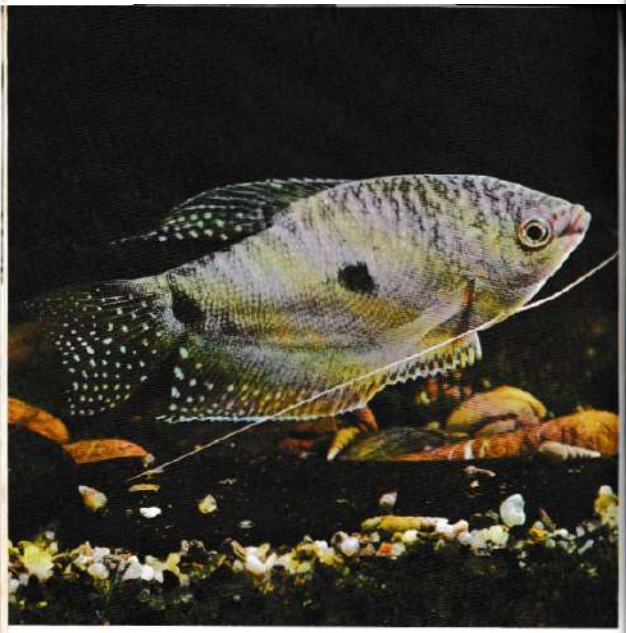
Above:
The paradise fish, *Macropodus opercularis*, is one of the few anabantoid fishes that can reproduce at cooler temperatures. Photo by R. Zukal.

Opposite:
The white cloud mountain fish, *Tanichthys albonubes*, as its name implies, comes from streams in the White Cloud Mountains of Canton Province, China. Accordingly, this colorful little fish does very well at cooler temperatures. Photo by M. Chvojka.

To most people a backyard pond represents a stagnant body of water teeming with mosquitoes and overgrown with algae or, at best, maybe a rundown little goldfish pool. Few hobbyists even consider raising their fishes in this allegedly uncontrollable environment, preferring instead to keep their pets within the confines of the traditional aquarium. Yet properly cared for, the pond can become one of the most beautiful and practical means of raising an endless variety of aquatic life available to the average hobbyist.

But why a pond? What are its advantages over an indoor aquarium? Here are a few:

1. *Increased Water Volume.* Even a small pond can support much more aquatic life than a relatively large number of indoor aquariums. In a hobby where space is somewhat limited, this is a big plus. More space means more fish.
2. *Natural Environment.* A fish in an outdoor pond is in a more natural



The new outdoor pool enthusiast might have a tendency to overdo the planting. Overcrowding a pond with water lilies results in aerial leaves like these. Photo by Charles O. Masters.

setting than one kept in the confines of an aquarium. Thus larger, healtheir and happier fish can be raised outside.

3. *Plants.* Many interesting and beautiful plants can be raised in and around a pond; plants such as water lilies and cattails. The culture of such plants indoors is beyond the scope of most hobbyists. This does not mean that there is a gap between indoor and outdoor plants; many plants intended for aquarium culture can be adapted to the pond environment.
4. *Landscape Addition.* A well-kept pond is a truly beautiful sight and a welcome addition to anyone's yard. Perhaps, if you get interested enough, you could add a waterfall, fountain and gently flowing stream, thus creating a minor spectacle!
5. *New Experience.* The new experience gained by raising fishes outside will enhance your feelings toward the hobby. Think of the pond as a new approach to the mechanics of fish raising; it will help you better appreciate and care for your indoor "ponds."

Trichogaster trichopterus, the blue gourami, will grow to a surprisingly large size when kept in a garden pond, even in a temperate climate. Photo by H.J. Richter.

So why have ponds been overlooked? The answer is simple. . . most hobbyists still regard ponds as the habitat only of goldfish and the like. Certainly one can't expect his tropicals to survive without artificial heat. This reasoning is very often fallacious. Many fish now kept in the 70° range in the average aquarium can do as well if not better in the 60° range. Popular fish fitting this description include white clouds, zebra danios, guppies and other hardy livebearers, paradise fish, blue gouramis, and bloodfins. During the hot summer months, even in the northern parts of the United

 (Continued on page 101)

Your Fishes' Health

CYANIDE POISONING

A Collecting Procedure that Must be Stopped!

by Dr. Mark P. Dulin

One of the most interesting cases I have encountered in some time involved a beautiful adult queen angelfish suffering from cyanide poisoning. I obtained this fish several weeks ago from Murray Wiener of Tropiquarium. No, Murray doesn't sell poisoned fish! Quite the contrary—I wish more dealers would be as conscientious in their policy of not offering sick fishes for sale. Murray's policy is simple—fishes that do not eat are not offered for sale.

Unfortunately, many beautiful imported marine fishes fail to adapt to captivity or may be afflicted with either an infectious or non-infectious disease. One of the non-infectious diseases we've seen all too much of in this country is cyanide poisoning. Generally Murray can spot these fish when he makes his selection from New York importers, but occasionally he gets burned and buys a "lemon." If these "sickies" fail to respond to conventional methods of treatment, they're donated to me for experimental therapy.

Experimental Treatment

The treatment for cyanide-reversal in fishes is based upon the antidotes used in human and veterinary medicine (3,4). There have not been any scientific experiments conducted to determine whether the drugs given intravenously to treat acute cyanide poisoning in warm-blooded animals are effective when used on fishes. As you can imagine, when treating fishes we face several obstacles. It is not practical to give fishes intravenous injections; furthermore, by the time the fishes arrive in the States, the poisoning is no longer in the acute stage.

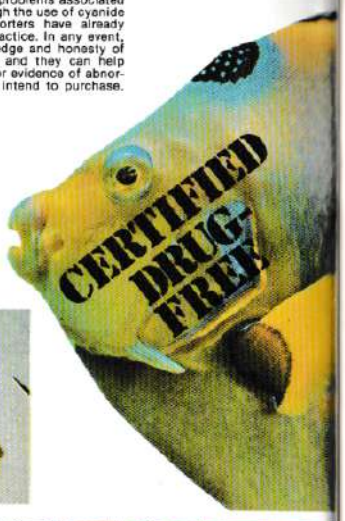
I want to briefly mention the method I used in attempting cyanide-reversal, even though I have no evidence to indicate the treatment is indeed therapeutic. The cyanide-reversal baths should be given in separate containers and not in the established aquarium. For each of these baths I filled containers with oxygenated salt water, of the same temperature and salinity as the aquarium. The first bath consisted of a sodium nitrite solution. This chemical has been used extensively as a meat preservative but may be difficult to obtain locally; it is still used in pickling brine solutions. In mammals, sterile sodium nitrite is administered intravenously to divert the cyanide from its toxic effect on the cellular enzymes and restore cytochrome oxidase. This leaves the body with another poison—cyanmethemoglobin. It then becomes the function of the second bath, sodium thiosulfate (chlorine remover), to convert cyanmethemoglobin to thiocyanate, leaving the body with methemoglobin.

Mr. Wiener soon realized the angelfish was sick, and donated it to me for experimental cyanide-reversal therapy. He siphoned out several gallons of water so the fish would have ample oxygen for the trip home. Photo by Ms. Melissa B. Freeman.

After equilibrating the temperature, I released the angelfish into a 55-gal. aquarium. I thought it might die any minute so I quickly set up a series of treatment tanks in hopes of saving this prized specimen. Photo by Dr. Mark P. Dulin.

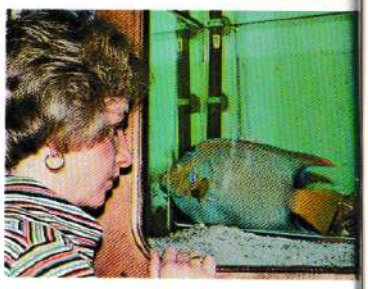
I had no problem netting the fish and transferring it to a series of baths in therapeutic solutions. Although the cyanide-reversal treatments are rather stressful, I figured there was little to lose as the fish was critically ill. Photo by Ms. Melissa B. Freeman.

Luckily for marine hobbyists, the problems associated with the collecting of fishes through the use of cyanide have been recognized, and exporters have already made progress in stopping the practice. In any event, aquarists can rely on the knowledge and honesty of ethical dealers to protect them, and they can help themselves by simply checking for evidence of abnormal behavior among fishes they intend to purchase. Photo by Dr. Mark P. Dulin.



Gill filaments are reported to be the most convenient material for cyanide analysis (8). The interval between death and cyanide analysis should be kept to a minimum. To avoid a decreasing concentration of cyanide in the tissues, freeze the fish until a cyanide analysis can be conducted. Photo by Dr. Mark P. Dulin.

There is good reason to be sad when a beautiful fish is dying and nothing further can be done to save its life. I had given the angelfish (*Holacanthus ciliaris*) a series of therapeutic baths for cyanide-reversal the week before this photo was taken. During its bath in the first solution (sodium nitrite) the fish vomited undigested food, adding further support to my tentative diagnosis of cyanide poisoning. Cyanide has a toxic effect on the cellular enzymes and digestion is often inhibited. With a bloated digestive tract, it continued to hang on for another week after all treatments were suspended. Photo by Dr. Mark P. Dulin.



Ms. Melissa B. Freeman helped me conduct the post-mortem examination. There was no evidence to indicate the fish died of an infectious disease—only a few enteric bacteria showed up on culture. The histopathological findings also supported a diagnosis of cyanide poisoning. Aside from some minor pathological changes associated with migrating trematodes and some fatty degeneration of the liver, there were no lesions (8). In acute cyanide poisoning you would expect to see evidence of anoxia-caused brain damage; however, in chronic cyanide poisoning, one sees only fatty changes in the liver—a pathological change associated with starvation. Photo by Dr. Mark P. Dulin.

another undesirable complex. The third bath functions to convert this methemoglobin back to hemoglobin. For this I used a methylene blue-ascorbic acid (Vitamin C) solution. If all this sounds confusing, you're right—it was! Additionally, it didn't work. Someone with a lot of time, equipment and money should perfect cyanide-reversal treatments for fishes. But then if collectors would stop using the poison to capture fishes, we wouldn't need to experiment with antidotal therapy.

The Problem

Some of you may be surprised to hear that fishes are collected by using the deadly poison cyanide. Most U.S. dealers associate cyanide poisoning with Philippine imports. I guess this reputation has had an impact in the marketplace, because Earl Kennedy, a prominent Philippine exporter, has issued news releases on his efforts to halt this ruthless practice. I applaud Mr. Kennedy for his intention to export only CERTIFIED DRUG-FREE fishes, but I remain somewhat skeptical of the drug-free status. Save doing a biopsy or collecting a blood sample from each individual fish, I know of no analytical methods sophisticated enough to detect cyanide residues in *living* fishes. It will take more than "CERTIFIED DRUG-FREE" stamped upon invoices or shipping cartons to convince me that all Philippine exports have been collected without the use of harmful chemicals.

After consulting with various American importers, I found that the number of cyanide-suspect mortalities has not yet diminished. This is reason for concern, because this makes American marine aquarists co-conspirators in the crime—it is largely our demand which reinforces this corrupt practice.

A Possible Solution

My intention is not to highlight the unscrupulous methods of a minority of collectors, only to hurt many collectors, legitimate and otherwise. Rather, I am expounding on this deceitful activity in hopes that pressure will be brought to bear upon illegal collection activities.

Certainly the United States, land of off-shore oil spills, toxic industrial effluents, ocean dumping, radioactive wastes and thermal discharges, is in no position to tell other countries not to damage the living resources of their coastal ocean. But I would like to suggest that tropical countries crack down on the selling of this poison and severely prosecute those found using cyanide to capture fishes.

To a certain extent, the aquarium market has already begun to purge itself from the insidious effects of selling cyanide-captured fishes. By displaying a reluctance to purchase cyanide-captured fishes regardless of their point of origin, marine wholesalers and other importers brought to bear economic pressure. This pressure, coupled with the good will and conservation-conscious collecting methods of sensible collectors, should rid the field of greedy, unethical collectors.

Let me say again that I do not believe that the Philippines are the only place where cyanide is used to capture fishes, but the government of the Philippines has recognized the problem and has taken steps to eliminate it through issuance of a presidential decree banning the use of dynamite and poisonous substances in fish-collecting operations. Although the ban is largely ignored by some collectors, it is supported and carefully observed by responsible collectors. Hobbyists concerned with decreasing the use of cyanide in fish collecting can encourage stricter enforcement of the law by writing to:

Jose J. Leido, Secretary
Department of Natural Resources
Diliman, Quezon City
Philippines

You can conduct a cyanide test yourself using the Steyn test consisting of picric acid test strips (1.4) or by using Cyantesmo® test strips (Gallard-Schlesinger Chem., Carle Place, N.Y.), *BUT* for medico-legal cases, these self-conducted tests are not adequate.

For absolute proof, you need to submit the freshly dead cyanide-suspect fish to a public or private laboratory. State crime labs only run these tests if some sort of maliciousness is associated with the case in question. Toxicology laboratories at veterinary or medical schools may be of service; if they cannot conduct the test themselves, they could refer you to a nearby private diagnostic laboratory. Many private laboratories across the country can perform a cyanide analysis; just be prepared to spend a little money. For example, the cost of having a complete cyanide analysis at one such private laboratory (National Medical Services, Willow Grove, PA 19090), is $18.00.

Most Philippine collectors avoid the use of poisonous chemicals like cyanide. It is the disgraceful tactics of a minority of collectors that have given Philippine exports a particularly bad reputation. Photo by Earl Kennedy.

The amount of cyanide detectable in tissues depends upon the cyanide concentration and duration of exposure to the poison, as well as the time interval between poisoning and analysis. Four hours after salmon were poisoned with 50 ppm of cyanide, only 2.5 ppm were found in the gill tissue analysis (6).

It would be foolish to assume that all recently acquired fishes that starve to death are suffering from cyanide poisoning. There are many other chemicals as well as adverse environmental conditions that could produce a similar non-infectious disease known as the starvation syndrome. Nevertheless, cyanide collecting is a shameful practice which must stop. I enjoy keeping exotic marine fishes in captivity, but not if my demand encourages polluting the ocean with deadly chemicals and destroying many beautiful fishes. By letting collectors know we despise cyanide collection tactics we can make a significant contribution to cleaning up the ocean and saving some of the world's most valuable fishery resources.

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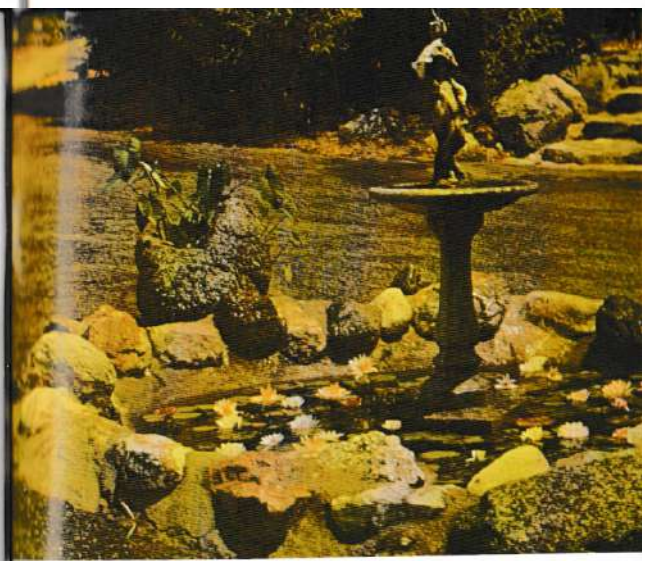

(*Ponds: Continued from page 93*)

A tastefully decorated pool will enhance the appearance of your yard as well as the size and color of the fishes you raise in it. Photo by Van Ness Water Gardens.

States, a pond's waters warm up to that nice 60 or 65° level. So why not put out your herdy fish? They will probably do better than you think, and when fall comes you will discover that they have grown very large and bred profusely.

Caring for fish in a pond is much easier than caring for fish in an aquarium. Feeding doesn't have to be done on a regular basis provided there is a healthy growth of aquatic plants. The fish will live off the plants and small animals that also proliferate in the pond water. The main job facing the outdoor aquarist is to prevent contaminants such as fertilizer runoff or plant spray from entering the pond.

A few final words of advice—not all aquarium fishes are suitable for outdoor cultivation. Only hardy species should be placed outside, so keep all sensitive fishes indoors where they belong. Sometimes a cold spell will wipe out one particular species of fish, so don't expect your pond to be a monetary investment. Still, the merits of a pond far outweigh its hazards—and the biggest headache a hobbyist is likely to encounter is where to put all the new fish over the winter.