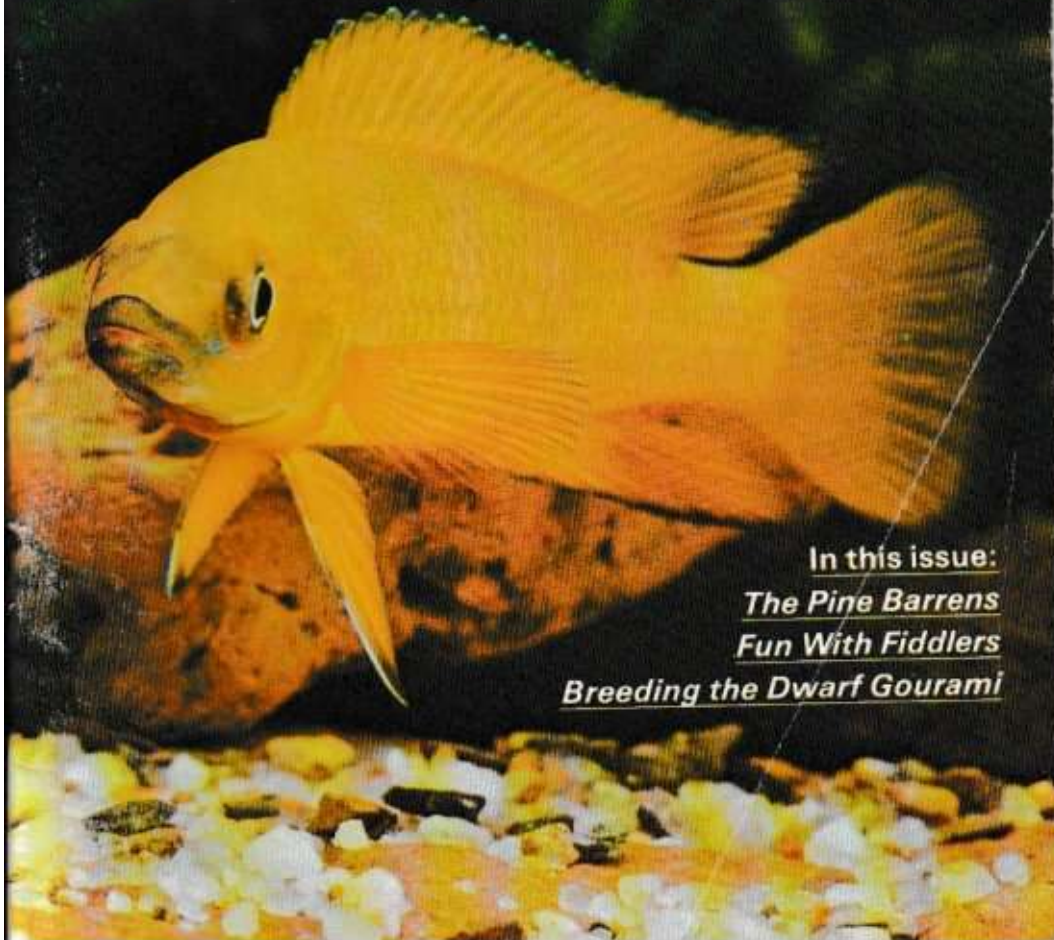


# Tropical Fish Hobbyist

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**In this issue:**  
**The Pine Barrens**  
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# Tropical Fish Hobbyist

Vol. XXVII, December, 1977 (#262, No. 4)



Cover  
*Lamplogus lineatus*  
Photo by  
H. J. Richter

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<b>TROPICAL FISH HOBBYIST Magazine</b> Dr. Herbert R. Axelrod President, Exec. Editor Marshall E. Ostrow Editor Dr. Leonard P. Schultz Advisory Editor Zola Streeby Art Director Betsy J. Galter Advertising Coordinator Peggy F. Chanocy Type Specialist Paul R. Paradise Typography Lois Pressley Production Manager June F. French Bulk Subscription Dept. Max Levine Individual Sub. Dept.	<b>T.F.H. PUBLICATIONS, INC.</b> Dr. Herbert R. Axelrod President, Exec. Editor Neil Frenkel Managing Editor Warren E. Burgess Senior Editor Jerry G. Watts Senior Editor Louise Burgess Biology Editor  <b>Western States Advertising Representative</b> J.E. Publishers' Representative 8732 Sunset Blvd. Los Angeles, CA 90068 1485 Kay Shore Blvd. San Francisco, CA 94124	<b>Rates:</b> \$ 75 per copy in the U.S., \$1.00 per copy in Canada or foreign, \$7.50 for 12 issue subscriptions in U.S. Add \$1.20 per year for foreign subscriptions. Issues available in every 12th issue. In England and the western European area, <i>Tropical Fish Hobbyist</i> magazine T.F.H. Publications (London) Ltd., 13 Parkway Lane, Heston, Surrey, England. In Australia and the South Pacific by Reef Imports Pty. Ltd., P.O. Box 148, Brookvale 2100, N.S.W., Australia. All subscriptions and inquiries should be sent directly to them. Second class postage paid at Neptune, New Jersey. Published monthly by T.F.H. Publications, Inc., 211 West Sylvan Ave., Neptune City, New Jersey 07753. <b>Exotic Tropical Fishes Supplements</b> Pages 17, 26, 85-88. These pages are perforated and punched for easy removal and insertion into the scale-free edition of <i>Exotic Tropical Fishes</i> , available in pet shops everywhere. 1977 by T.F.H. Publications, Inc.
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## The Pine Barrens— New Jersey's Own Paradise

by Dr. Herbert R. Axelrod  
Photos by the author



I let the phone ring a little longer than normal. I was annoyed at being interrupted while reading Andre Benoit's memoirs in manuscript form. Of course, you remember him; he played the piano when Heifetz made his debut in New York in 1917. He also played for Albert Spalding, Eugene Ysaye, Pablo Casals and Masha Elman. He was the best. The phone was incessant.

All of my friends knew I went to bed at 9:30. But the clock read 10:10... it couldn't be a friend... unless there was trouble! I grabbed the phone hoping that my intuition was wrong... it was.

"Hi, Uncle Herb!" was all I had to hear to know that Dr. Burt Frank (who is not my nephew) had just arrived at home from his busy Wednesday healing sick bodies and minds and wanted to relax by discussing plans for a further assault upon the unknown jungles of Brazil with its scaled gems swimming in unpolluted, crystal-clear water. But this time it was a bit different.

"Listen, Herb. You took me on a 10,000 mile trip to Rio de Janeiro, Manaus and other famous places to catch a glimpse of cardinal tetras, discus, angelfish and cichlids. Now it's my turn! I'm



Areas of burned-out forest in the Pine Barrens have been flooded, and most of these open areas now contain a profusion of aquatic plant life including several varieties of colorful water lilies.



picking you up at seven tomorrow morning and taking you to catch New Jersey's finest, only 30 miles from home. I'll have you in your office by noon—and if you don't agree that the fishes, scenery and water are just as beautiful as they are in Brazil, I'll let you do all the expedition leading from then on."

"Burt," I said, "you're a nut. There's too much industry and pollution. There's constant mosquito and tent caterpillar spraying. A few months ago there was an almost cataclysmic forest fire that destroyed most of the woods in that area. How can there be anything even slightly resembling the Brazilian jungle so close to home?"

"You just be ready at seven. I'll pick you up and even buy you breakfast! The New Jersey Pine Barrens are the most beautiful and relaxing of all the wild habitats I know. I go there regularly to relax and marvel at the beauties of Nature. Try it. . . I'll bet you'll like it!"

The next morning, Burt picked me up. He had his swimming trunks on and his hand-made one-man seine in hand. After a quick cup of coffee we headed south on the Garden State Parkway and soon entered Double Trouble



This *Orontium* species is an aquatic plant but here it was left exposed as the water level was a little below normal. The species reproduces by sending out runners which are seen here exposed on the shore. It reproduces by seed also.

State Park. There was a huge cranberry bog in the middle of the park and also a cemetery. The crystal-white sand contrasting with water having the same coffee color as that of the Rio Negro in Brazil made me

feel more secure, and I began to think that this wasn't going to be a wild goose chase after all. "Okay, out of the car and follow me," Burt said. I did as I was told; this was his picnic. I stepped gingerly over the

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*Enneacanthus chaetodon* was one of two species of dwarf sunfishes caught by the author.

*Erimyzon sucetta*, commonly known as the chubsucker, is a bottom-dwelling fish found in Pine Barrens streams.



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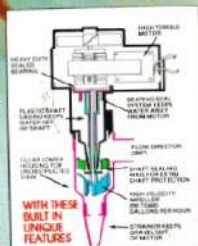


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mushy ground, fearing that my heavy rubber boots might sink, when a breathtaking sight appeared! There in front of me were hundreds of flowering water lilies gleaming mostly yellow and white against the black water. Burt quickly set his seine and waded into the shallow pond.

"I got some!"

"Got what?" I asked.

"Pickereel, blackbanded sunfish and a gorgeous male bluespotted sunfish."



The clarity of the brown-stained water can be seen here because Dr. Frank's feet are clearly visible under the water even from the distance that this photo was taken.

He brought the net in and we carefully transferred the fishes to our plastic bucket. I couldn't tell whether we were looking at *Enneacanthus obesus* or *E. gloriosus*—both are found in New Jersey and range from the Canadian border south into Florida. But whatever these dwarf sunfishes were, they certainly rivaled the most beautiful South American cichlids.

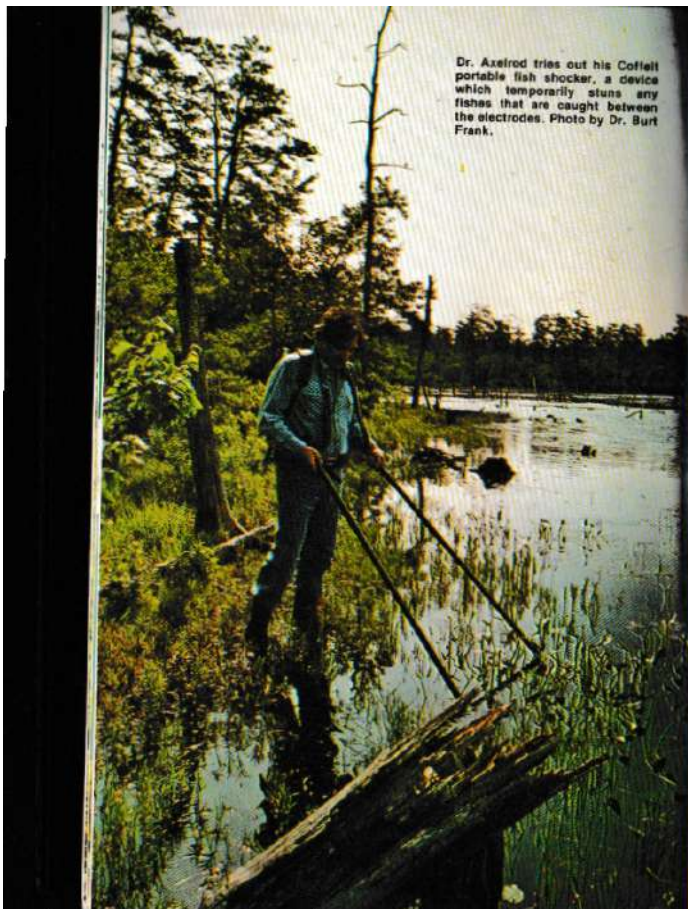
We fished there for a few minutes and then decided to try out my new Coffelt Portable Fish-Shocker. The only shock we got was that the darn thing didn't work! We couldn't find the switch to turn it on! Later that day I called Mr. Coffelt, who advised me that the switches are buried in the handles so all you have to do is squeeze both handles at the same time (a great safety feature), and

anything swimming between the electrodes would be temporarily stunned. You can hold the electrodes as far apart as five feet and they will still be effective.

But on we went, from one more beautiful spot to another. Gorgeous aquatic plants were found throughout the area. I have never seen so many different aquatic plants in one place in all my life! I brought home some magnificent flowering spatterdock (*Nuphar* species), pickerel weed (*Portulaca* species), anacharis (*Elodea* species), water lilies (*Nymphaea* species) and many lesser-known plant species.

We drove from habitat to habitat. A fast-

moving amber colored stream crossed by a rickety wooden foot bridge caught my eye, and I gingerly walked onto it. My trained eye picked up something silvery among the weeds in the stream below. I froze in my tracks and carefully lowered my obesity onto the deck of the already strained weatherbeaten bridge. It creaked ominously as I tried to get as close to the water as possible without falling in. I suppose my 20/20 vision disappeared with my fiftieth birthday, because I had to get within a meter of the water's surface to see a little cichlid-like fish partially hidden under a small leaf. But I didn't feel too badly when Burt (who is almost young



Dr. Axelrod tries out his Coffelt portable fish shocker, a device which temporarily stuns any fishes that are caught between the electrodes. Photo by Dr. Burt Frank.



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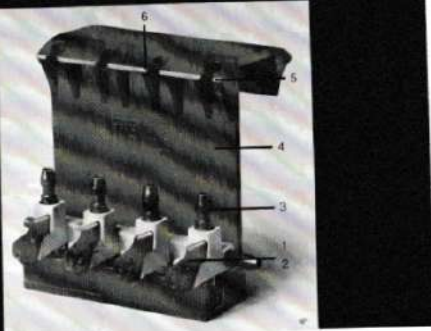
The beautiful native American black-banded sunfish, *Enneacanthus chaetodon*, commands a high price in European shops, especially in Germany and some Scandinavian countries. Photo by Milan Chvojka.

enough to really be my nephew) took a full three minutes before he was able to pick out the fish camouflaged against the plants. We worked nicely as a team. Burt lowered himself quietly into the water and slowly pushed his one-man seine under the resting fish. I used my hands to corral the fish as he darted into Burt's net in a frantic rush to escape from me. We had him! A beautiful breeding-size male bluespotted sunfish... and in such oxygenated fast-moving water, too.

A little farther downstream the water crossed a slip falls, maybe a meter in height, and the turbulence caused a sudsy streak in the water that concerned me. But we couldn't find any source of pollution. Moving on, we walked into a smaller creek almost completely covered by a canopy of pine and cedar trees (the roots of the latter accounting for the amber color of the water), and we found more beautiful water plants completely covering the banks and

bottom of the stream. I dug some up for my aquarium as Burt natted some more fish. Here it was so peaceful and beautiful. I could understand Burt's using the area as an escape from the turmoil of life as a modern medical practitioner... and Burt is the kind of doctor who can't turn a deaf ear on anyone who needs him. He's a sucker for a sob story. We headed back to the car and encountered a police patrol car. They had spotted our station

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*Esox niger*, the chain pickerel, is one of the smaller members of the family Esocidae. It lurks in the grassy areas of ponds and streams of the Pine Barrens as well as other areas where it preys on fishes that swim by.

The brightly colored *Enneacanthus obesus* is another species of dwarf sunfish that is found in the New Jersey Pine Barrens.



The Pine Barrens: Continued on page 89.

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**Editorial**

**As I See It . . .**

One of the things I've always liked about the tropical fish hobby is that most of the hobbyists I know keep the holiday spirit going throughout the year. They are proud to share their knowledge and their fishes with other hobbyists. It is indeed a rare occasion that I visit one of my hobbyist friends or they visit me that we don't depart from each other's homes with at least one bag of fishes in hand.

What better time of year than now could there be to extend that continuous holiday spirit to some non-hobbyists. Haven't Aunt Geri and Nephew Barry always admired your fishes? Now you can stop wondering what to buy them. Go on down to the local pet shop and buy them an aquarium to house the fishes you are going to give them from your excess stock. They'll be delighted by your gift and you'll be equally delighted to have the opportunity to expound upon your favorite subject as you help your benefactors set up their new tank.

But why limit this holiday spirit to individuals? How about your daughter's third-grade class? Wouldn't the children be excited to have some of your fishes in their classroom aquarium? If they don't have an aquarium and the school can't appropriate funds for one, then buy them one. They'll be just as happy with an inexpensive five- or ten-gallon tank as they would be with a large one, and the teacher will be overjoyed to have you come in and help set it up as well as talk to the children about how to maintain it.

How often have you walked through a children's ward in a hospital or through an old-age home and not seen an aquarium, or seen one that was in bad shape? What more appropriate time of year than now to offer your fishes and your expert knowledge. Such a contribution is guaranteed to give your own spirit a monumental lift.

*Marshall Etshaw*

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**For Beginners**

**An Easy Killie—*Rivulus mitlei***

On many occasions I have observed that different fishes are kept and propagated in different geographical regions. In some areas, for example, neon tetras as well as many other so-called problem fishes, especially characins, are about all the local hobbyists seem to breed. In another region one primarily finds magnificent cichlids, while in yet another region other species seem to be more popular. By this I am not implying that certain genera of fishes are found only in certain areas, it's just that some areas offer especially favorable conditions for certain fishes. For example, where I found characins to be the most popular fishes among aquarists, the tap water in the area was soft and acidic, which is probably why neon tetras and related species were propagated so successfully there.

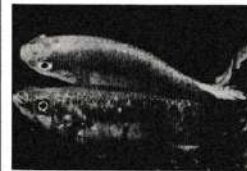
by Rudolf Zukal

The male *Rivulus mitlei* (rear) courts the female by spreading his fins and swimming around her until she submits to his overtures. Photo by R. Zukal.



On the other hand, my travels to different cities and different countries have made me realize that aquarists' tastes also tend to vary from one region or country to another. For whatever the reason, the varying popularity of species in different places is lucky for me, for wherever I go to give a lecture I come across species that have not been kept in my home area for years, if indeed ever. This is what happened to me in May, 1974 in a German city in which I had been giving a lecture. I was confronted with several *Rivulus* species which I had never owned before, and I was able to acquire a splendid pair of *Rivulus mitlei*.

In body shape *Rivulus mitlei* reminds me of the better known *R. cylindraceus* with the anterior portion of its body cylindrical in shape, the posterior portion laterally compressed and its rounded homocercal tail, but its coloration is much different. The male is greenish-brown with a green or blue to violet metallic sheen. Many irregularly distributed reddish-brown spots adorn the flanks. The opercula are a rich blue color and the belly is reddish. The unpaired fins are green at their bases, but unlike *R. cylindraceus*, which has very little color in its fins, the outer part of these fins is yellow to a bright golden color in *R. mitlei*. Also, in *R. mitlei* the dorsal and anal fins bear a dark edging, as do the dorsal and ventral edges of the caudal fin. The caudal fin also bears a bright orange distal margin; *R. cylindraceus* has no such coloration on its fins. The female *R. mitlei*, on the other hand, is colored very much like the female *R. cylindraceus* as well as many other *Rivulus* species, having a basically light brown body with an irregular row of darker brown spots along the flanks fanning out to a group of irregularly placed spots in the dorsal fin as well as in the caudal peduncle and base of the caudal fin. The female also bears a large dark spot on the upper edge of the caudal peduncle that is surrounded by lighter almost whitish pigment—this mark is very typical of most *Rivulus* females. The col-



The male forces the female down onto the spawning substrate, which can be peat moss, Java moss or almost any fine leafy plant species. Photo by R. Zukal.

oration in both sexes, however, varies quite a bit depending upon the fish's "mood" and environmental conditions such as temperature, water chemistry and food. The species is native to Colombia, being found mostly in the catchment area of the Rio Magdalena; it attains a length of about 2¼ to 2½ inches (about 6 cm) at maturity.

The fish are quite comfortable if kept in a tank of about 5 gallons (19 liters) in capacity. The tank should be densely planted, and a cover of floating plants such as water sprite or *Riccia* will also help the fish feel more secure. Their water should be of medium hardness and

Eggs are released and fertilized, usually one at a time, while the spawning fish have their bodies pressed close to one another. Photo by R. Zukal.



can have a pH of anywhere from slightly acid to slightly alkaline. A temperature of 72°F (22°C) suits them fine. The tank should be tightly covered for, like most other killifishes, *R. miasa* is an adroit jumper and may spontaneously leave the water for no apparent reason. *Rivulus miasa* is generally a very peaceful fish and presents no problems when kept with smaller peaceful species. They relish live foods such as fruitflies or mosquito larvae, but with a little patience on the part of the aquarist they can be trained to take commercially prepared dry foods, too.

A pair of *R. miasa* that is ready to spawn will do so in surprisingly small containers if the right spawning medium (bushy plants or an artificial spawning

for several days, and then spawning activity ceases for a while. Since the egg incubation time varies from 10 to 14 days depending upon the water temperature, my method has an advantage in that I don't have to continually sort fry of different sizes. In addition, even though I have never observed them actually eating their eggs, if they would eat them I would still have an adequate number of them left over after the parents are removed from the spawning tank.

Their eggs are quite large compared to those of most of the aphyoseioids, which are one of their popular African ecological analogs, and are more the size of the eggs of the *Epplatys* species. Therefore, when the fry become free-



The dark spot on the caudal peduncle of the female easily identifies these *R. cylindraceus* as members of the genus *Rivulus*. Photo by G. Senft.

swimming (which is usually within a few hours of their hatching) they are able to feed on newly hatched brine shrimp nauplii or sifted daphnia right from the beginning. The fry grow quickly if given a good varied diet and by six months of age will themselves by spawning.

I derived a lot of pleasure from keeping and breeding *Rivulus miasa*. If you want to try your hand at killifish keeping for the first time, I can enthusiastically recommend this species—it is colorful, peaceful and very easy to breed.

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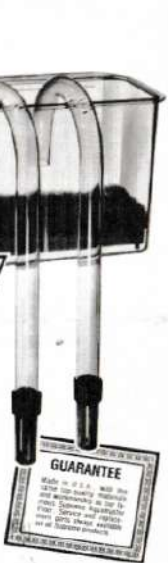
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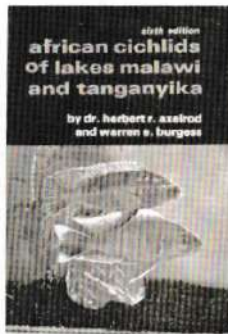
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This newest 384-page edition contains 64 new color photos, mostly of Tanganyikan species such as the newly discovered color morphs of *Tropheus moorii*, taken by Glen S. Axelrod. Altogether, the book contains 460 color photos and a number of black and whites, many of which show a variety of African cichlids feeding and breeding in their natural habitats and in aquariums. This is the world's most complete book on these very popular African cichlids.

Available at pet shops and book stores everywhere. If ordering directly from the publisher, please add \$5.00 to cover the cost of postage and handling.

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A well-developed cluster of hair grass, *Eleocharis minima*, can have as many as 100 slender green leaves. Photo by R. Zukal.

## Aquarium Plants

### Hair Grass

by Dr. Karel Rata

Plants of the genus *Eleocharis* (commonly referred to as hair grass) are represented by about 150 species and are found almost all over the world from the Arctic zones to the tropics. Some species are annual and not suited for use in aquariums, but others are perennial and some of these have been known as aquarium plants for a long time.

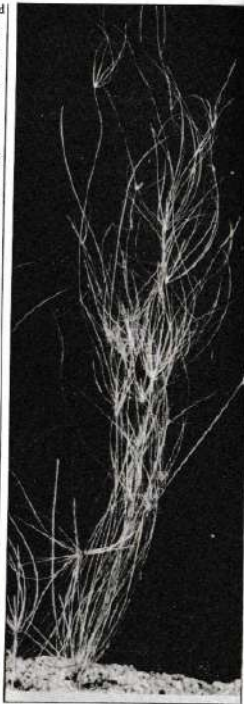
Foremost among them is *E. acicularis*, which inhabits nearly every part of the globe from temperate zones to the tropics, with the exception of Africa. Less well known are the species with stalks that branch off like whorls at intervals of several centimeters and form groups of thread-like leaves resembling umbrellas that have been turned over. One of these species, *E. vivipara* (= *E. prolifera*), occurs in southern areas of the United States where it grows on sandy shores and often in flooded areas. It usually has several leaf whorls one above the other. It tolerates cool water very well, which makes it suitable for both heated and unheated aquariums. In the winter, however, if the light is inadequate, it dies.

One of the newest species of *Eleocharis* introduced to hobbyists is the tropical Venezuelan species *E. minima*. It is an amphibious plant that can be grown in emersed as well as submerged culture. Out of the bundle of fine whitish roots grow numerous thread-like leaves; there may be as many as 100 fresh green leaves on a single plant. In the emersed form the leaves are only 1 to 2 1/4 inches (about

2 to 6 cm) in length; in the submersed form they always grow taller, attaining lengths of four to eight inches (10 to 20 cm). Older plants always have whorls of new leaves growing on the tips of the old leaves. In the submersed form these whorls produce roots and can be cut off and planted. In the emersed form small spikes of the inflorescence grow at the tips of the whorled thread-like leaves. Fruit forms readily, but it is very difficult to raise the tiny seedlings. The plant is propagated by dividing well-developed clusters which, after a year of growth, are large enough to be divided into 10 to 20 new plants.

*Eleocharis minima* is cultivated in soft or medium-hard water having a slightly acid to slightly alkaline pH. The water must be very clean, however, since the very fine leaves tend to get covered with algae and then to trap any fine debris or other impurities that float in the water; an accumulation of organic matter among the leaves can easily cause the plant to rot away. The plant thrives best in older well-established aquariums containing fairly clean sand that is mixed with plenty of mineralized detritus. The plant requires plenty of strong light, and according to experienced growers in the long run artificial illumination is not an adequate substitute for daylight. This means that *E. minima* is suitable for only those aquariums that contain other light-loving species; for example, some of the species of *Sagittaria*, *Echinodorus*, *Cabomba* or *Valisneria*. Artificial illumination can supplement daylight or prolong the plant's day during the winter months, but should not be used as a complete substitute for natural sunlight.

Clusters of these plants have very shallow loose roots. The species is therefore unsuitable for tanks stocked with digging cichlids or large barbs. *Eleocharis* looks best when planted in groups in the central or lateral areas of the aquarium, arranged in clusters of five to seven well-developed specimens spaced two to three inches apart.



Whorls of new leaves form at the tips of older leaves of *Eleocharis minima*. These whorls can be removed and planted in the gravel in clumps. Photo by R. Zukal.

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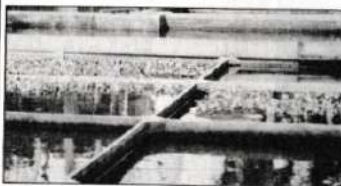
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## THE LINEUP

### Solar Heat Expands Japanese Aquaculture

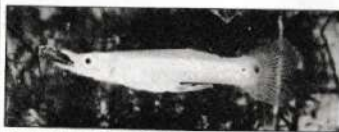
Japan, the world's leader in aquaculture, is investigating the use of a solar heating system for ponds which would allow the industry to be extended into the northern parts of the country. A pilot system using a similar design was successfully used there in tropical fish culturing. The system is capable of raising water temperature in ponds to 80° F. on cloudless days in the winter.



Aquaculture in the Orient.

### Tropical Transplants May Terrorize Texas

Now Texas can be added to the list of states in which tropical fish species are becoming established. According to Clark Hubbs in *A Checklist of Texas Freshwater Fishes*, the popular sucker catfish, *Plecotomus plecotomus*, and the predatory pike killifish, *Boltonia helianthus*, are among the introduced tropicals now proliferating in Texas waters.



*Boltonia helianthus*. Photo by R. Zukal.

### Blackballed

The Colombian Association of Fish Exporters has compiled a blacklist of clients who have defaulted on payments. The list will be updated monthly; by agreement, no member of the association will ship on any basis—to any company whose name appears on the list.

### No C.O.D.'s

Carriers refusing live animal cargo on a C.O.D. basis are causing a lot of concern at both ends of tropical fish shipments. The exporters will be forced to ask for prepayment in all cases, including even the good accounts, and new importers, as usual, will want open accounts.

### Coastal Info

The New England Coastal Information Center at Narragansett Bay will be the first of a network of such centers planned for all of the U.S. coasts and the shores of the Great Lakes. The centers will provide information on laws and zoning regulations, scientific data and publication sources to coastal planners, legislators and environmentalists. The centers will be administered through local Sea Grant programs.

### Doomed Shells

According to Dr. R.T. Abbott, Asst. Dir. of the Delaware Museum of Natural History, Florida's Sanibel Island shelling resort does not need to ban live shelling, as they had considered and we had reported in a recent issue. Dr. Abbott claims that when an offshore live shell washes up on shore it is already destined to die, and throwing it back will do no good.

### Brunori Buys Bausman

Dominic Brunori is the new owner of Bausman Pet Supplies of Philadelphia, which just moved to new larger headquarters. Brunori will retain the old company name and will continue to manufacture tropical and goldfish tonic and foods.

### Plants Too?

The U.S. Dept. of the Interior published a proposed set of rules governing endangered and threatened plants in the *Federal Register* on June 24, 1977. The proposal restricts foreign and interstate commerce and importation and exportation of certain species; it applies to their seeds and roots as well.

### Fishing Rises As Rivers Drop

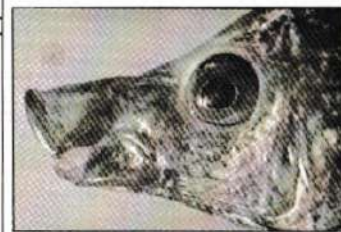
William Johnson of Johnson & Cia., well-known fish exporters of Bogota, Colombia, reports that the rivers of Central and South America have all calmed down simultaneously and the fishing is now better than it ever was. This great species availability should soon be reflected at your local pet shop.



Rio Negro is now more productive than reported earlier in the year.

### Cichlid Growth Rate

Studying the growth rate of certain Malawian Cichlids, according to D. Tweedie and J.L. Turner of the Monkey Bay (Malawi) Fisheries Research Unit, is fairly easy, since they have discrete breeding periods. The age of the young can be determined by size groups since their sizes don't form a continuum as they do in many other tropical fishes that are continuous breeders. The Tweedie/Turner study included mostly larger Malawian cichlids such as *Haplochromis mitsi*, *Lethrinops parvidens* and others.



*Haplochromis mitsi*. Photo by M.K. Gilver.



## Krill Overkill

The National Science Foundation announced that the first in-depth study of Antarctic krill will start in November. Dr. Mary Alice McWhinnie of DePaul University of Chicago will head up the study. The team will in part investigate whether or not krill, which are becoming an important food in the ornamental fish industry, are being overexploited.

## Metaframe Appoints New Prez

Metaframe has a new president. Mr. Marcel Darot, a former executive of the Gillette Co. Like some other Metaframe presidents in the past, Mr. Darot has had no direct hands-on experience in the tropical fish industry, but Arthur Spear, president of Mattel (Metaframe's parent company) feels that Darot's strong marketing background and proven leadership ability will pull Metaframe out of the woods. According to Darot, their plans are to eliminate some unprofitable lines and redirect their marketing efforts more toward distributors and dealers.

## Graduate Frogs Are Better Jumpers

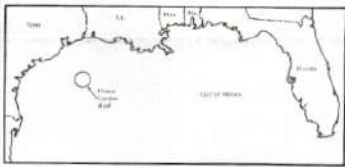
Have your pet frog psychoanalyzed and educated at Croaker College, run by Bill Steed, the world's first "doctor of frog psychology." The college charges \$50 to board and train a frog to help it get rid of its hangups and give it the confidence needed to win the annual Calaveras County (California) Frog Jumpin' Contest, the world olympics of frogdom, claims Steed. To you, Bill, we can only say "ribbet, ribbet!"



"Ribbet!" Photo by M. F. Roberts.

## Rare Northern Gulf Reef Being Protected

Several oil companies are interested in exploratory drilling near the precariously balanced Flower Garden Reefs in the northeastern Gulf of Mexico. These reefs, valuable to fishermen and sport divers for their plethora of fishes and invertebrates, are being protected since the oil companies, according to Taylor Gaffrey in his article "The Unlikely Flower Gardens" which appeared in the July-Aug. issue of *Sea Frontiers*, are not permitted to drill within a mile of them.



## Jellyfish Antiserum To Be Developed

The National Oceanic and Atmospheric Administration (NOAA) has issued a grant to researchers at the Univ. of South Florida in Tampa to develop an antiserum for jellyfish sting victims and to develop an immune serum for persons whose activities make them likely victims. NOAA is primarily concerned with the Portuguese man-o-war, a jellyfish whose swarms cause temporary beach closings around the world.



Portuguese man-o-war. Photo by N.Y.Z.S.

## Christmas Island Brine Shrimp

Christmas Island, part of an atoll that lies 1,200 miles south of Hawaii, and the site of numerous nuclear test explosions during the late 50's and early 60's, may soon be making a major contribution to the tropical fish industry. One of the primary industries on this now thriving atoll is the experimental cultivation of brine shrimp.

## Recycled Shells

According to B.L. Averbach of M.I.T.'s Dept. of Materials Science and Engineering, antipollution enforcement on shellfish wastes may give rise to a whole new industry. Chitin, a material contained in the shells, and chitosan, one of its derivatives, could add strength and durability to food wrap, medical products, bond paper and many other products, say M.I.T. researchers.



Crayfish are rich in chitin. Photo by L.F. Perkins.

## Trauma

Short-term stresses have long term effects on fishes, say E.M. Marseaud, F. Marseaud and E.M. Donaldson of the Fisheries and Marine Service of British Columbia. They showed that stress causes water imbibition in freshwater fishes and dehydration in marine fishes, in both cases resulting in prolonged respiratory and swimming difficulties.

## Fish Up

*Mintel*, a British marketing research journal, claims that budgetger (parakeet) ownership in British homes has sharply declined while tropical fish ownership has substantially risen. *Mintel* estimates that budgetgers are owned in 9% of British homes, but tropical fish ownership is now up to 10.6%.

## Guarantees

Standardization of aquarium and electrical products guarantees has been suggested by Mr. Phillip M. Cooper at a recent meeting of the American Pet Products Manufacturers Assoc. (APPM). The proposal was suggested as a means to stop the soaring costs of product liability insurance brought about by unrealistic guarantees on some products.

## Readers React

### Learning the Hard Way

Each time I see a photograph in your magazine such as the one of Dr. Frank on page 92 of the October, 1977 issue, I experience an ambivalent twinge of envy and horror. I am a devoted fish hobbyist and can appreciate the excitement and adventure of exploring exotic habitats and collecting their fishes. However, readers should be reminded that tropical waters, both still and flowing, harbor multitudes of parasites as well as the fishes we love. Such waters are not to be entered with impunity.

I have been paralyzed from the waist down for three and one-half years as the result of contracting schistosomiasis from the fluke *Schistosoma haematobium* in one of the infected freshwater streams of east Africa. This is one of the liver flukes amply distributed throughout the tropics. *S. haematobium* and *S. mansoni* occur widely throughout Africa, South and Central America and more locally in India. Even such "tame" places such as Portugal and Puerto Rico serve as vectors for these organisms. Another species, *S. japonica*, is distributed throughout the Orient.

Certainly professional collectors and ichthyologists are aware of these hazards, but it should be brought to the attention of the layman that should he find himself in tropical surroundings on an exotic holiday, he should be aware of the consequences of entering local waters. I was carefully alerted to the existence of schistosomiasis (in Africa locally known as bilharziasis), and for that reason purposefully avoided contact with the waters of Lakes Victoria, Edward, Albert and George. I still managed to contract the fluke, however, perhaps in just such a simple task as pushing a Land Rover through a flooded stream during the rainy season... one has only to make bodily contact with the parasite; it is not necessary to drink the water.

Since there is no known prophylaxis for schistosomiasis, the disease is especially insidious and often does not manifest itself until it has already progressed to the final stages. If left untreated, it usually ends in death. This means that each time one collects in tropical fresh waters, one should be carefully examined by a qualified physician (one who is familiar with tropical diseases) who should be alerted to look particularly for schistosomiasis.

In writing this letter, I am not attempting to cause any alarm. I would simply like to alert other adventurous naturalists interested in the tropics to be regularly examined so that they might be spared the dreadful consequences of such a singularly unpleasant, exceedingly painful and dangerous disease.

Robert Gurley  
Philadelphia, Pennsylvania

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

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# RARE and WELL DONE

## New Tetra Treat Due Soon

TFH has created another first in Dr. Jacques Cery's about-to-be-released *Characoids of the World*. This is the world's first comprehensive treatment of tetras and their kin as an entity and is written by one of the world's foremost authorities on these fishes. All 14 families of characoids are discussed, with the majority of the genera and many species illustrated.

Dr. Cery, a renowned French surgeon and dedicated aquarist, gave up medicine to pursue a career in ichthyology. After earning a Ph.D., he became a specialist in the classification and evolution of tropical freshwater fishes, personally collecting hundreds of species during four expeditions to the tropics of Africa and South America. He discovered a new family of fishes in Gaboon and described more than 100 new genera and species.

Watch our ads and your local pet shop for the release of this monumental ichthyological work.



*Nannostomus zebra*. Photo by H.J. Fisher.

RARE  
WELL  
DONE

## Ichthyology

*Ichthyology*, by Karl Lagler, J.E. Bardach, H.B. Miller and D.F.M. Pinnino, John Wiley & Sons, New York, 1977, 800pp, \$18.95. This new edition, written by some of the best-known ichthyologists in the world, is sure to become a classic. The original edition (1962) has been rewritten in part to include major research advances since 1962. The emphasis is still on living fish. The only comprehensive introduction to the field.

## Odd Pets

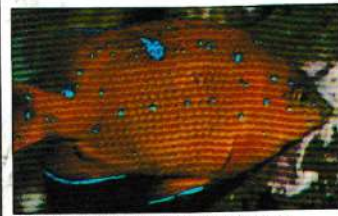
Pet dealers who are not yet selling land hermit crabs or tarantulas are missing a good bet. Since TFH sold over 100,000 copies of *Land Hermit Crabs* in 6 months and 24,000 copies of *All About Tarantulas* in 2 months, somebody out there must be interested in these unusual pets!

## New Map

A new kind of map—the first of its kind—showing submerged roadbeds, rocks, springs, stumps, culverts, bridge ruins, etc. in the Normandy Reservoir, a recreational area in Tennessee, is available for \$1.50 from TVA Map Sales, 400 Commerce, Knoxville, Tenn.

## Underwater California

*Underwater California* by Wheeler J. North, University of California Press, Berkeley, 1976, 276 pp., illustrated, paper bound, \$5.95. This handy guide lists common plants and animals of coastal California and includes information about photography, diving spots and collecting, preserving and identifying specimens.



The garibaldi, *Hypopygus subannulus*. Photo by A. Engesser.

## Qui Mosavi?

George Dale has just described *Apogon mosavi*, a new species of cardinalfish from the Bahamas, Haiti, and Jamaica (*Proc. Biol. Soc. Washington*, 90(1): 10). This very small (under 35mm) cardinalfish is closely related to *Apogon quadrisquamatus* but differs in a few details of color pattern and in gill raker counts. Both species seem to be associated with sea anemones in moderately deep water and might eventually be seen in aquariums.



*Apogon quadrisquamatus*. Photo by F. Collin.

## AFRICA-GO.ROUND

### H. QUADRIMACULATUS

A *Haplochromis* with style and grace, beautiful blue body with a gold-colored side graced by elegant 6" trailing ventral fins.

### H. LIKOMAE

*Haplochromis likomae* is closely related to *H. quadrimaculatus*. It has more brilliant blue and gold colors, the gold being sharply outlined by blue on every scale.

### H. NDIWE

An iridescent blue *Haplochromis* with a multi-color overcast.

### CLOWNS

An iridescent blue and white striped *Pseudotropheus*. A dwarf in size ideal for a medium-size community tank.

### BUMBLEBEES

A rare *Pseudotropheus* of green and yellow striping.

### RED EMPRESS

A beautiful *Haplochromis* blessed with a majestic red side on a blue body.

### ORANGE BLOSSOM O.B.'S

An extra large O.B. zebra with large orange and blue blotches.

### RAINBOW LETHRINOPS

A unique unidentified *Lethrinops* species colored in blue, red, yellow, green and silver in a speckled pattern unlike that of any other African cichlid.

### EMERALD UTAKA

This medium-size Utaka is loaded with color. It has a blue-green face and red chest highlighting a pastel green body.

### RED-TOP CLOWN

This dwarf clown has all of the iridescent blue and white color of the standard clown, with a brilliant red-striped dorsal.

### SUNSET HAPLOCHROMIS

This medium-size *Haplochromis* has a sky-blue body with yellow belly and anal fin.

### H. LOBOCHILUS

This extremely rare large *Haplochromis* has fleshy lips, over-all blue-green coloration with yellow chest outlined by red and yellow finnage.

### RED-TOP COBALT

The largest zebra morph of sky-blue body, lacking any striping, with a red dorsal. The ideal male for the extra-large orange-blossom O.B. or solid orange female.

### P. FUSCOIDES

A solid lemon-yellow Mbuna, it is the perfect change of pace for the hobbyist who wants 4 inches of yellow in his community tank without destroying his budget.

### P. KINGSLEY!

A good small blue community fish, 2 1/2 inches of elongated body, black fins and tail, with a sky-blue dorsal. The female is beige with yellow fins.

### H. INCOLA

A *Haplochromis* that has been rarely captured with females; easily distinguishable by a diagonal oblique stripe from the nape to the caudal. A basically blue fish with blue-red fins on an elongated body.

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## Salts from the Seven Seas



At first glance it is hard to tell that this is a lobster. *Scyllarides latus* is a hermit crab, not a lobster. Photo by G. Marcuse.

## Lobster Tales

Jerry G. Walls

From time to time tropical fish dealers receive a tankful of lobsters of various types. These large and often colorful crustaceans are avidly sought by many marine hobbyists, as they are in many ways the most satisfactory crustaceans for large tanks. Their size makes them almost immune to attacks from smaller fishes, they feed well under most circumstances and they have long lives in the aquarium.

Lobsters fall into two major groups easily distinguished by the presence or absence of large claws or pincers on their front legs. The common Maine lobster, *Homarus*, and the long-clawed langouste of Europe, *Nephrops*, both belong to the family of clawed lobsters, Nephropidae. Both are occasionally offered for sale, but they are cold-water animals that seldom live long in aquariums. In *Homarus* the claws are very specialized, one having cutting edges and the other with large nodules for crushing. *Nephrops* has very

long and slender claws and is very spiny. One clawed lobster, however, is commonly seen in marine aquariums. This is the reef or Hawaiian lobster, *Enoplometopus occidentalis*. This rather small (seldom over 125 mm long) bright red Indo-Pacific lobster is variably patterned with white spots encircled by darker red spots. The entire body and especially the claws are covered with long stiff bristles giving it a very distinctive appearance. Like other lobsters, the reef lobster is a scavenger with varied tastes in fresh and long-dead foods. They are nocturnal in nature, hiding by day in caves and crevices deep on the reef, with low light intensity they will stay active during the day in the aquarium, however.

Many hobbyists confuse clawed lobsters with the freshwater crayfishes or crawfishes of the families Astacidae and Parastacidae. Although some species of crayfish may be as large as small lobsters



The distinctive *Justitia longimana* is a deep-water species seldom available to the hobbyist. Photo by D.L. Savitt and R.B. Silver.

The reef lobster is the only clawed lobster likely to be successfully kept in the aquarium. Once thought rare, it is now frequently seen. Photo by A. Norman.



The blue tail fan and black and white carapace markings distinguish *Panulirus versicolor* from other common spiny lobsters. Photo by A. Norman.

and can even adapt to low salinities, they are seldom as spiny as lobsters and do not have highly specialized claws. The rostrum (projection between the eyes) of crayfishes seldom has more than two pairs of spines, while that of lobsters usually has five or more pairs. Divers often call spiny lobsters crayfish, a usage to be strictly avoided.

The spiny or rock lobsters, family Palinuridae, are often seen in tanks and make excellent additions to large aquariums. Members of this family are easily recognized by their lack of claws on the front legs and by having very long antennae that are strong at the base and quite spiny. The carapace is covered with many sharp spines, and there are usually two large curved spines over the eyes. Often the color patterns of the spiny lobsters are very attractive, blending blues and blacks with yellow and tan, set off by white or reddish spots. The South African rock lobsters, *Jasus*, whose tails are often seen in the frozen foods section of the su-

permarket, belong to this family. All lobsters seem to be edible—and most are delicious.

Tropical spiny lobsters suitable for aquariums usually fall in three genera. The most distinctive and rarest is the long-armed spiny lobster, *Justitia longimana*. Found in the Caribbean and the western Indian Ocean, this deep-water (to 300 m depth) species is bright red and silvery white with the front legs very long and ending in a thick curved segment. The spines over the eyes are strongly notched or serrated. To be happiest, this species requires many caves and rocks as well as a low light intensity.

European and western African spiny lobsters fall in the genus *Palinurus*, named for the pilot of Aeneas of Greek mythology. This genus is often confused with the more commonly seen *Panulirus* (a generic name which seems to have been formed from *Palinurus* just to confuse people) of the Indo-Pacific and Caribbean but differs in having serrated spines

over the eyes and shorter second antennae (below the main antennae) which have very short free ends (flagella) much less than the length of the carapace. European spiny lobsters are seldom sold in the United States but have habits much like those of the other spiny lobsters.

*Panulirus* contains several common species of spiny lobsters from the warmer waters of the world, all very much alike in size (usually adult at 200 mm but reaching lengths over half a meter and a weight of 5-10 kilos) and appearance, differing mostly in details of the spines, gills, and color patterns. Most commonly seen are the Caribbean spiny lobster, *Panulirus argus*, with two sizes of white spots on the segments of the tail, and the banded spiny lobster, *Panulirus versicolor*, of the Indo-Pacific, with a very distinctive black and white pattern on the sides of the carapace and a banded tail ending in a blue-edged tail fan. Other species are often offered, including the spotted spiny lobster, *Panulirus guttatus*, of the Caribbean, a distinctive species covered with a multitude of small yellowish or whitish spots.

Since many species grow to very large adult sizes, it is best to purchase only the smallest specimens available. These are commercial animals with closely regulated catch limits and sizes in all countries, so small specimens are seldom seen. In Florida, for instance, spiny lobsters un-

der about 200 mm total length (not counting the antennae) cannot be legally taken. A specimen this size is already four or more years old, so large adults have already lived quite respectable lifetimes. Give them plenty of shelter and feed them at night just before the lights go off.

Female spiny lobsters are occasionally seen with pinkish or orangish or blackish egg masses under the abdomen. Many aquarists have bought such specimens in the hopes of being able to raise the young and make a small fortune. Lobsters, however, do not respond well to get-rich-quick schemes because their life cycle is rather complex. Unlike the freshwater crayfishes in which the eggs hatch directly into miniature versions of the adults, the tiny eggs of spiny lobsters hatch into pelagic larval stages. After a few molts these larvae become what are known as phyllosoma stages, with a flattened, transparent oval body and very long and slender legs. The phyllosoma remains at sea feeding on smaller plankton for up to six months before transforming into a miniature lobster and settling to the bottom. This type of life history explains the wide distribution of many lobsters, but it also means that it is virtually impossible to successfully spawn spiny lobsters in the marine aquarium.

Finally, a second family of clawless lobsters, the slipper lobsters (family Scyll-



Spiny lobsters are attractive and relatively inoffensive additions to the large aquarium. Photo of *Panulirus argus* courtesy of the American Museum of Natural History.

loridae), is occasionally seen for sale. These bizarre crustaceans are rather difficult to associate with lobsters at first glance because the body is strongly flattened and the antennae are modified as broad flat shovels used in burrowing through mud and debris. There are many species of slipper lobsters, some of them having unusual plates and large spines projecting from the carapace and tail, while others have only low tubercles over the carapace. These are edible lobsters, and a few species are fished commercially, but this family also contains several species with maximum lengths of under 100 mm, making them very suitable for the aquarium when available. Most are undistinguished in color, being variably mottled with tan and brown, and they have the further disadvantage of being strongly nocturnal and burrowers, so they

are seldom seen during the day in aquariums. Their odd appearance more than makes up for these disadvantages, however, and they are not really any more difficult to keep and feed than are the spiny lobsters (some prefer a bit more vegetable matter in the diet, however).

Although lobsters have much to recommend them, they are obviously large animals that require spacious quarters. They also usually have a high initial purchase price, taking them out of the realm of the beginner. Juveniles are seldom available, but the adults purchased should still have many years of life left in them. Lobsters require large tanks, plenty of shelter, low light intensities, and a lot of self-control on the part of the hobbyist—especially with lobster tails now selling for as much as \$9.00 a pound in the U.S.A.

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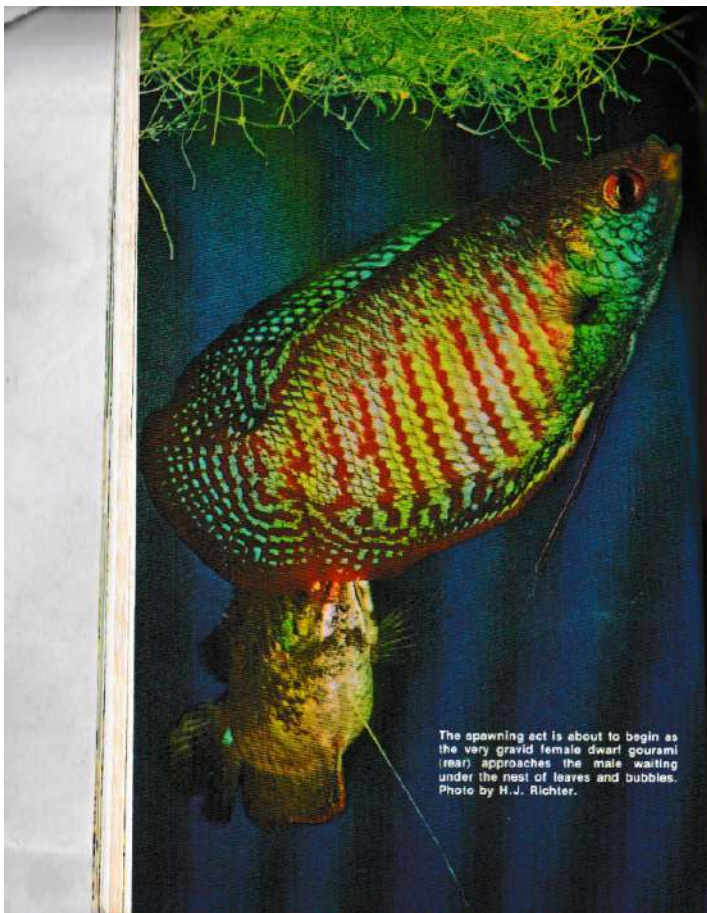


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The spawning act is about to begin as the very gravid female dwarf gourami (rear) approaches the male waiting under the nest of leaves and bubbles. Photo by H.J. Richter.



The male dwarf gourami builds a nest of bubbles that can exceed an inch in thickness. Photo by H.J. Richter.

**Anabantoids**

**Breeding a Forgotten Jewel, the Dwarf Gourami**

by Bud Welty

Like so many of today's hobbyists, I too became caught up in the swells of the African tide. For a while there, I became so intent upon owning and breeding every one of the brightly colored cichlids imported from Africa that I almost forgot there were any other kinds of fishes. After a few years of wall-to-wall egg dummies and swollen mouths, I began to realize that I was missing one of the best parts of

this hobby—observing the great variety of ways in which fishes go about the business of keeping themselves the most numerous and diverse class of vertebrates on Earth.

And so, little by little, I began to rekindle my interest in other fishes. First came some of the uncommon fishes such as the killies. Then some of the cichlid tanks became tetra tanks. And so it went, until

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once again I was involved with most of the popular families of aquarium fishes including my still diverse collection of African cichlids.

One day, while browsing through an old aquarium book, I came upon a photo of a male dwarf gourami, *Colisa lala*. Here, I thought, is a fish that's been around the hobby much longer than I have, and is still as popular with young hobbyists as it was 40 years ago. I could not recall ever being in a tropical fish shop and not seeing a tank of these beautiful and peaceful fish. Then I began to wonder whether if, after breeding discus, a wide variety of African cichlids, annual and non-annual killies, neon and Congo tetras, I could actually be successful with such a basic aquarium fish as the dwarf gourami. I had, of course, bred them years ago, as did many young hobbyists anxious to try their luck with an eglayer, but could I still do it? The thought was almost as challenging as trying to fit into my old wedding suit! Accepting the challenge, I purchased a few young pairs of dwarf gouramis, and much to my delight, I had no difficulty raising them to maturity and breeding them.

There are so many fishes that are long-standing aquarium regulars, are challenging to breed and are every bit as colorful as some of the newest exotics, yet are almost completely forgotten by so many old-timers in the hobby. The dwarf gourami with its alternating vertical bands of red and blue, its red- and blue-spotted median fins and its bright blue operculum and breast is certainly one of those forgotten jewels of the aquarium.

The dwarf gourami, *Colisa lala*, is native to India, being found throughout the drainage basins of the Jumna, Brahmaputra and Ganges Rivers. The climate there is quite warm, and the fish, like so many other anabantoids, is found in shallow swampy areas that are heated by the tropical sun, so their warm water is rather low in oxygen. They, of course, possess a labyrinth organ which enables them to extract oxygen from the moist atmos-



- (1) During courting the male dwarf gourami can be downright brutal with his chosen mate.
- (2) The male takes bubbles of air from the surface; he coats the bubbles with mucus and then blows them into the bubbliest.
- (3) Sometimes the female (lower fish) joins the male in the nest-building activities.
- (4) The male displays before the female, who often responds by twisting her body toward the male. Photos by R. Zukal.

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phere, thus preventing them from suffocating in their oxygen-depleted native waters. In captivity the dwarf gourami can withstand surprisingly cool water as long as there are no sudden temperature drops, but to appear at its best it requires that its water be kept around 80°F (27°C) and even a little higher to breed.

This is a rather shy species, but at the same time it shows a definite preference for brightly lit areas of the aquarium. This behavioral dichotomy is easily accommodated by simulating its natural swampy environment and keeping it in a brightly lit but densely planted aquarium using lots of fine-leaved plants such as *Cobomba* or *Myriophyllum* and some



**Above:** The male adds a few more bubbles to the bubblenest before beginning the spawning act. Photo by R. Zukal.



**Left:** The female approaches the waiting male and begins to slide up his side as the pair begins to go into the spawning embrace. Photo by R. Zukal.

**Below:** The male begins to wrap himself around the female as the spawning act nears its climax under the bubblenest. Photo by R. Zukal.

floating plants such as *Sabotina* or *Lemna*. It will use bits of these plants in the construction of its bubblenest.

Sexing dwarf gouramis is not at all difficult if they are subadults or adults. The males are brilliantly colored compared to the females... the females show only hints of the bright blue and red bands and spots seen on the males. In addition, the dorsal and anal fins of the males are pointed at the distal tips, whereas in the females these fin tips are rounded. At maturity males will reach about 2½ inches (about 6 cm) in length; females are usually a little bit smaller.

Feeding dwarf gouramis is no problem either. They are especially adept at



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The male displays brilliant colors while tightly encircling the female by bending his body into a "U" shape. Photo by H.J. Richter.

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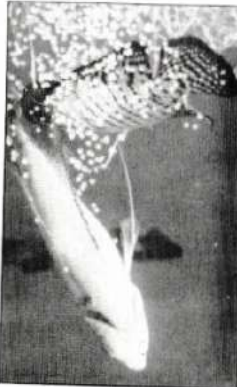
capturing surface-dwelling prey such as terrestrial insects that fall into the water or mosquito larvae (both being natural foods in their wild habitat), but they are flexible enough in their feeding habits that they easily feed on nearly any food that is offered to them in the aquarium, be it something that floats on the surface or something that drops through the water. They take commercially prepared dry foods readily but should be given some live foods occasionally and more often to condition them for breeding.

A chosen pair should be separated to condition them for breeding. While the species is normally a very peaceful fish, during courting the male can be downright brutal toward the female. Their water temperature should be raised to about 82°F (28°C), and with daily partial water changes and feeding the pair as



The male dwarf gourami gathers the eggs in his mouth and blows them into the nest. Photo by R. Zukal.

Male and female relax their embrace, surrounded by a shower of fertilized eggs. Photo by R. Zukal.



much as they can possibly eat, it won't be long before the female is bulging with ripe eggs.

A standard 10-gallon aquarium is fine for breeding a pair of dwarf gouramis. I set up the breeding tank using a 50/50 mixture of water from their conditioning tanks and fresh dechlorinated tap water. The fresh water seems to act as a stimulant and helps excite the breeding pair. I don't use gravel in the breeding tank, because a bare-bottomed tank is much easier to clean after the fry become free-swimming. Floating plants such as those mentioned earlier should be kept in the tank to provide the fish with some security and to provide the male with some construction materials for reinforcing the bubble-nest. In addition, I float some large plastic plants in the tank and anchor at

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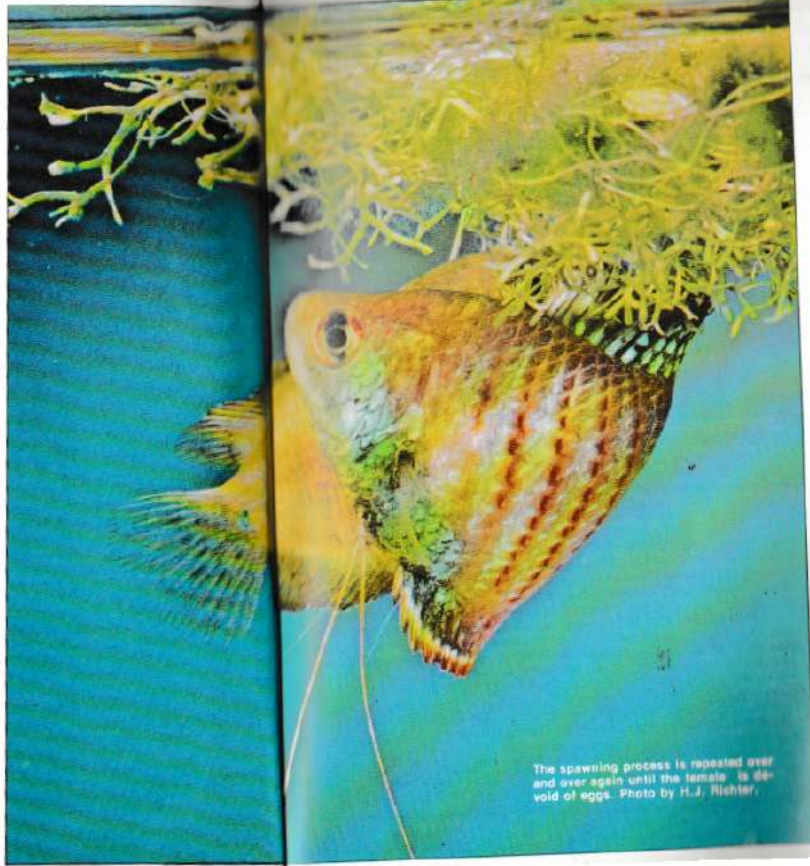
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least one of them in a corner for the female to hide behind when the male's advances get a little too rough. In order to facilitate easy removal of everything from the tank without breaking up the bubble-nest once spawning is complete, I slice two Styrofoam cups lengthwise and float the four halves on the surface. The male usually builds the nest under one of these cup halves. Once spawning is complete, removing everything from the tank (except the male, of course) makes for easier observation of the eggs and fry as well as the male's parental behavior. The tank should be kept tightly covered to retain warm moist air above the water. This will help the bubble-nest stay together and later on will provide the warm damp atmosphere so crucial to most newly hatched anabantoids.

Once the female is gravid enough, the pair is placed in the breeding tank. A male in good condition will show an immediate interest in the female. His color becomes much more intense than his normal already intense colors. He then begins to dash about the tank spreading his fins before the female in an effort to "coerce" her into joining the spawning activities. During this "showing off" period the female is often viciously attacked, so the shelter mentioned earlier can come in quite handy. Finally, the male picks a spot and begins to build a bubble-nest. The nest is constructed of mucus-coated air bubbles. The male gulps the air from the surface and spits out a bubble at the chosen spot. This is repeated hundreds or perhaps thousands of times until a firm nest of bubbles about two inches in diameter and about an inch thick is completed. Bits of the floating plants are used to form a sort of framework for the nest. Often the female even helps in the construction of the nest, especially if the male's courting behavior has not been too violent.

Once the nest is complete the male coaxes the female under the nest. He then encircles her with his body, which is bent into a "U" shape as the female is



The spawning process is repeated over and over again until the female is devoid of eggs. Photo by H. J. Richter.

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Tropical Fish Hobbyist



After each spawning embrace the male blows all the eggs into the bubbliest before the pair engages in another embrace. Photo by R. Zukal.

turned upside down. Whether or not the male squeezes the egg out of the female is not actually known. At any rate, by whatever means, the egg and sperm are expelled at this time, and the egg floats to the surface. The male releases the female from the embrace, gathers the egg in his mouth and blows them into the nest. The whole process is repeated over and over again until the female is devoid of ripe eggs. The female, as well as the unused cups, floating plants and plastic plants should be removed at this time. Depending upon the condition and age of the breeders, the nest could contain as many as 700 or 800 eggs.

The eggs hatch in 24 to 48 hours and the male guards the fry, blowing them back into the nest should they fall out. After about three days the fry become free-swimming. The male should be removed at this time and a sponge filter or

any filter that cannot trap the tiny fry should be started but run very gently. Infusoria and green water should be fed to the fry for the next six days; after that they will be able to feed on newly hatched brine shrimp nauplii. The tank should still be kept tightly covered for a few weeks until the young fish's labyrinth organs are fully developed. Then the cover can be gradually withdrawn by a few inches each day. At about two weeks of age the fry should have daily 5% water changes and can at that time be fed finely powdered dry or freeze-dried foods. The young will reach maturity in about a year.

For those hobbyists who would like a challenge from a very beautiful and yet commonly available fish, I suggest you try breeding dwarf gouramis. These forgotten jewels are not that difficult to breed, but on the other hand, they're not that easy either!

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### Idea of the Month

## Fish Egg File

by Forrest Lipschitz

I know a number of fish breeders who are always breeding a large variety of species, especially killifishes, and are always in a state of confusion as to which gerine dish or airstray, and which ones are due to hatch when. In these hobbyist's fish rooms you can find containers of eggs between tanks, on tank lids, under tables, in drawers or on the floor in several corners, and the right container of eggs can never be found when it's needed.

Until a few months ago, this was the state of my hobby, when last June I found a dish of killifish eggs that were due to hatch the previous March buried in one of my desk drawers under a book. The eggs had hatched and the fry had long since decomposed after dying of starvation. My hobby was badly in need of some system for storing and categorizing eggs so they could be hatched and the fry cared for before it was too late.

Several days later, while browsing through a hardware store, an idea struck me that was destined to end my fish room frustrations. I purchased one of those small multiple drawer cabinets that

is usually used to hold small parts in a workshop or sewing room. The cabinet and drawers were made entirely of plastic, and each drawer became an incubation tray for a batch of eggs. Every drawer had a slot on its front for the placement of easily changed labels.

Now, when I harvest a batch of eggs, I put them in a drawer with a little bit of the appropriate hatching solution and label the drawer as to species, date of spawning, anticipated hatching date, number of eggs or any other data I feel is pertinent. Each batch of eggs can be inspected daily, without having to unstack a pile of odd dishes and trays, simply by pulling the drawer out. The egg trays can be conveniently arranged alphabetically by species, by scheduled hatching date or by any other suitable system, and the system can be changed at will with very little inconvenience. No more will I lose a batch of eggs due to my poor memory or by accidentally dumping them on the floor when lifting a dish by its too loose lid, and my fish room is now a much more pleasing place to spend my idle hours since I no longer have to contend with all that disorganized mess.

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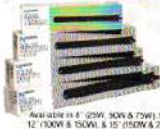
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# Mail Call



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 07733. Please do not substitute MAIL CALL questions with correspondence about subscriptions or book orders.

### A Solution Solution

**Q.** I read in your *Encyclopedia of Tropical Fishes* that plants taken from the wild for aquarium use should be washed and sterilized before putting them into the tank. How can plants be sterilized without damaging them?

Wayne Holden  
San Diego, California

**A.** It is a good idea to wash and sterilize any aquarium plants whether they are gathered from the wild or purchased from even the most reputable tropical fish dealer. The dealers have no way of controlling the conditions under which aquarium plants are grown, since they do not grow them but buy them from commercial growers and importers.

By sterilizing plants, we mean ridding them of leeches, snails, hydra and other pests. Plants should be carefully inspected for the presence of these organisms, especially in the crown area of leafy plants such as Vallisneria. The eggs of some snail species are encased in gelatinous discs that are very transparent and very hard, and it is imperative that you remove them from the plant leaves if you don't wish to become a snail farmer! There are several solutions that plants can be soaked in to remove all but snail eggs which seem to be impervious to most chemical treatments and must be picked off by hand.

**Salt water is one of these solutions. A teaspoon of salt (non-iodized) in a quart of water is about the right concentration to kill these fish enemies, and the plants should be soaked for about an hour. You can also use a heaping teaspoon of alum, a compound available in most pharmacies, in a quart of water, but most plants cannot withstand more than five minutes in this solution. In both cases the plants should be thoroughly rinsed in gently flowing room temperature tap water before placing them in the aquarium. These solutions could be too strong for some plant species, and a little experimentation with milder concentrations might be in order to avoid killing expensive plants. A final solution to the problem, and perhaps the best one, is to purchase a commercially prepared plant sterilizing compound from your dealer. There are several on the market, and their manufacturers provide specific directions for preparing the precise concentration.**

### An Alert Sleeper

**Q.** I have enclosed several photos of a fish which I believe is a *Dormitator*. Can you confirm its identification? Are there any obvious sexual differences in this species? Can they be bred in captivity?

Urmas Lepp  
Valberg, Sweden

December, 1977

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The spotted sleeper is really a misnomer for the predatory *Dormitator maculatus*. Photo by L.E. Perkins.

**A.** Your photos were too dark for us to print, but the fish does definitely look like *Dormitator maculatus*, which is commonly known as the spotted sleeper. This name, obviously derived from its usually lethargic behavior, can be misleading, because this fish is a very able predator that will dash out of its lair to gobble up any fish small enough for it to swallow. It is found in coastal waters of the western Atlantic, from the Carolinas to Brazil, in salt, brackish and fresh water habitats. It reaches 10 inches at maturity and will eat nearly anything. Spotted sleepers breed much like substrate-spawning cichlids, with a pair cleaning off a rock and depositing their eggs there. The very tiny fry hatch in about 24 hours at 75°F (24°C) and require infusorians as their first food.

### Try a Little Chicken Soup

**Q.** I have seven discus in a 55-gallon tank on which I use an undergravel filter and an outside power filter. Most of the fish are covered with white spots that resemble ich, they excrete white feces and don't eat very well. They are being fed on frozen blood worms. I have tried five different medications singly and in various combinations, but none has worked—the disease keeps returning. Can you tell me how to cure this ailment?

Mark Hall  
Magnolia, New Jersey

**A.** Before we tell you how to cure the disease, we would like to tell you how not to cure it. You are very lucky that your fish are alive at all after bathing them in so many different chemicals, and in combinations, yet! If you left your filters on, that may be only one reason that none of the medications worked. In addition, to treat your fish for a parasite such as ich, the treatment must be continued long enough to wipe the disease organisms out in the stage in which they are susceptible to such treatments, namely, the free-swimming stage. This requires that treatment be continued for at least 10 days, even if visible signs of the disease are long gone. Furthermore, subjecting the fish to all of those chemicals at once only caused more stress and weakened them further, making them

easier prey for host-seeking ich organisms. Had you followed the directions very carefully on just one of the recommended medications such as malachite green, your problems would have been over long ago. Ich will succumb to treatment with malachite green, but the treatment must be continued 10 days or the little devils will bounce right back again, as they obviously did for you. Ich can actually be treated without any medication simply by elevating the water temperature to 85 or 86°F (30 to 30°C) for 10 days and providing the fishes with heavy aeration. The free-swimming organisms cannot survive such heat, and the warm water will hasten their life cycle, killing them faster than medication could do alone. With a combination of malachite green as the only medication and elevated temperature, curing ich is a cinch.

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### Scale-Belted Radials

**Q.** I recently purchased some peacock and tire-track eels but I cannot find any information on them. I would like to know where these fishes come from and whether or not they can be bred. How can their sexes be distinguished?

Johnny Zuniga  
San Antonio, Texas

**A.** The common names of the masticembelids are a confusing mess. We have seen *Mastacembelus zebrinus*, *M. armatus* and *M. loenbergi* all referred to as tire-track eels. We have also seen *M. armatus* referred to as the black and gold eel, a name that, although certainly not as dramatic as the tire-track eel, probably best describes just what the fish looks like. We have never heard of a peacock eel, although the name itself implies spots like those on a peacock feather which immediately brings to mind *Macrognathus aculeatus*, a fish commonly sold as the spring eel. Of course, that name isn't alto-

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December, 1977

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*Mastacembelus zebra* is one of several *Mastacembelus* species known as the tire-track eel. Photo by Dr. Herbert R. Axelrod.



*Mastacembelus armatus* is known as the black and gold eel but is also sometimes sold as the tire-track eel. Photo by H. Hansen.

gether correct either, because all members of the family Mastacembelidae are collectively known as spiny eels, which makes any tire-track eel also a spiny eel.

Now that we have succeeded in getting you as confused as everybody else is on this issue, we can tell you that mastacembelids are widely distributed in the southern half of Africa, India, Burma, most of the islands of Indonesia and into China, with some species occurring as far north as Peking.

In their natural habitats spiny eels are found in weedy areas of sandy- or muddy-bottomed streams, rivers or lakes, and some species are even found in similar areas of brackish-water hab-

itats. Most species are nocturnal prowlers and even in the aquarium spend their daylight hours hidden in root tangles or buried in the sand with only a bit of the snout protruding.

Most of the spiny eels reach 8 to 12 inches in length, but some are known to exceed 30 inches at maturity. There is no easily discernible sexual dimorphism in these fishes except at breeding time, when the females are noticeably fuller in the abdominal area due to their ripe eggs. Very little is known of their breeding habits, although one species, *M. pancalus*, has been bred in captivity several times; the actual spawnings were not observed, but the eggs were apparently just scattered over the bottom.

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**Pardon Our Blooper**

Q. In the "Mail Call" section of the June, 1977 issue of *Tropical Fish Hobbyist* you answered a question from Mr. Gary Lahmers that dealt with a method of rearing baby discus away from their parents. In your answer you referred him to your book *All About Discus*, mentioning that a feeding technique was discussed on pages 128 to 135. The only problem is that my copy ends on page 127! I would like to know why these pages were not put into my copy and how I go about getting them.

George P. Rosenblatt, Jr.  
San Diego, California

A. Our faces are red, for our blooper has indeed caused some problems for you. You apparently have the first edition which was published in 1970. The second edition, revised and published in 1972, contains the information to which we referred. We should have

specified in our answer to Mr. Lahmers that the information was in the later edition. We are truly sorry for any inconvenience that we may have caused for you or any other readers.

**Leporinus Lever**

Q. I have in my possession three *Leporinus* species. Two of them have three black spots in a horizontal row down each side and are four to five inches long; the third has a horizontal black line on each side and is seven inches long. Could you identify these fishes for me and tell me how to differentiate their sexes? Have they been bred in captivity, and if so, could you give me any helpful hints?

John Wagenaar  
West Allis, Wisconsin

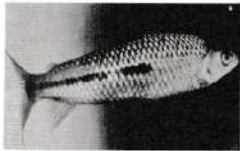
A. Your spotted *Leporinus* are *L. frederici*. These fish, like most others of the genus, can grow to 16 or 18 inches in the wild and are highly sought after as food fish by the natives of their Ama-

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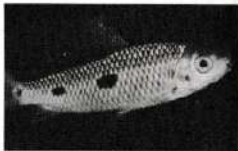
**NOTICE**

*Tropical Fish Hobbyist* traditionally has its pages open to a broad spectrum of editorial features covering widely differing points of view. It also is open to commercial announcements of all sorts regarding products and services for sale. In fact, in most cases we are prevented by law from discriminating among advertisers.

There is a number of long-established and reputable mail order houses in the tropical fish field. There also are a number of firms that lack experience with this highly specialized method of selling and are not always willing or able to cope with the problems it creates for them in terms of customer satisfaction. On that basis, readers should always be aware of the dangers involved with making purchases by mail. They should bear in mind that price alone—even for a standard manufactured item like a pump or filter—is not the only basis for deciding from whom it should be purchased, and even the freshness of discounted food should be a major consideration. A "bargain" or "discount" price on an item may not be any bargain at all when it comes time to service the item or obtain information about it; what one seller offers by way of price may be more than offset by not having a reputable local tradesman to back up its servicing and delivery of full satisfaction. In general, products available locally should be purchased locally.



Because of its uninteresting color pattern, *Leporinus iradensis* has never achieved the popularity of some of its more attractive cousins like *L. maculatus* and *L. fasciatus*. Photo by L.E. Perkins.



*Leporinus melanopleura* is one of the smaller members of the genus, rarely exceeding 8 inches in length. Photo by Marcuse.

zonian habitat. Also, like most of the *Leporinus* species, in the aquarium they should be given some vegetable matter in their diet. All of the *Leporinus* are notorious jumpers, and their aquarium should be kept tightly covered with a lid sturdy enough not to be shattered when they perform their acrobatics. The striped fish could be either *L. agassizi*, which also grows quite large, or it could be *L. melanopleura*, which rarely grows to more than eight inches in length. Little is known of the breeding habits of either of your fishes, but some of the *Leporinus* species (such as *L. fasciatus* and *L. maculatus*) have been bred by a few

aquarists; it is reported that they are egg scatterers that spawn in plants in much the same manner as most of the barbs. They show little sexual dimorphism, so the females can be distinguished only by their fuller bodies, especially when gravid. Most of the fishes of this group prefer temperatures in the middle 70's and prefer moderately hard water that is very slightly acid to slightly alkaline.

**Goldfishicle**

Q. I have a 750-gallon filtered pool stocked with a number of large goldfish and koi. The pool is only 26 inches deep and is likely to freeze to the bottom here in Illinois during the winter. I in-

tend to bring the fish indoors for the winter and keep them in a large aquarium in an unheated but well insulated garage. I have been told that my fish need this cold spell in order to reproduce in the spring and to retain good health. Can you tell me just how cold I should let the water get over the winter?

Rosemary Clark  
Sanwich, Illinois

A. When dealing with temperate species such as *Carassius auratus* (goldfish) or *Cyprinus carpio* (colored carp or koi), you need not worry about how cold their water gets in the winter as long as it does not freeze solid. These fishes are evolutionarily adapted to the seasonal temperature changes of a temperate climate, and during the winter many of their metabolic processes un-

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Even fancy goldfish strains such as this pearl-scaled specimen can withstand some chilling during the winter months. Photo by L.E. Perkins.

dergo a reorganization that allows them to continue to function with little dependence on their outside environment.

As to their continued health with or without a cold period, little factual information is available. It is known, however, that cooler temperatures (within the tolerable range for the species in question) do tend to extend the longevity of certain fishes. For example, one of the best ways to shorten the life of a prize betta is to permanently keep it at the 82 to 85°F (28 to 30°C) temperature necessary in order for it to breed. Similarly, a goldfish given a winter cooling period is likely to live longer and be more prolific. Just how cool they should be kept would be difficult to say, but somewhat cooler than their 65 to 70°F (18 to 21°C) breeding temperature would certainly be in order.

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#### Where Are They From?

I recently purchased a pair of cichlids called *Cichlasoma salvinii*. Since most people with whom I've inquired have never heard of the fish, I was wondering if you could give me some basic information on it. Where are they from and how should they be cared for?

Mrs. M. K. Mixen  
Santa Barbara, California

*A. Cichlasoma salvinii* is a Central American cichlid that ranges from Guatemala and Honduras into southern Mexico. This fish has a rough disposition, especially if it is kept in a small aquarium. If given plenty of room and a good varied diet, it should reach its full size of six inches, and if it is provided with plenty of rocky caves or other shelters it will remain fairly peaceful and even-tempered. This species is tolerant of almost any water conditions in terms of pH and hardness as long as extremes are avoided, and it is especially tolerant of cooler water (66-68°F or 19-20°C). It breeds in the typical manner of most New World cichlids; that is, it is a substrate spawner that offers parental care to its young.



*Cichlasoma salvinii* is usually one of the more pugnacious medium-size cichlids. Photo by Dr. Herbert R. Axelrod.

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Both sexes of the jewel cichlid participate in cleaning the spawning site. Photo by R. Zukal.

**Ubiquitous Jewel**  
Q. In setting up my aquariums I try to maintain within each tank an environment as close to the natural environment of the species as possible. However, I am puzzled over the jewel cichlid. It is mentioned in so many books on African cichlids, yet very little is specifically mentioned in these books about its natural environment. Is the jewel cichlid a lake-dweller or a river-dweller? Even though it spawns on rocks, is it necessarily a rock dweller or is it found over grassy sand flats or around wood beds? What about its water chemistry and temperature requirements? I have been keeping my 6 inch jewel cichlids in a 50 gallon tank in water that is usually neutral in pH, moderately hard and at a temperature of about 78°F (26°C). They have spawned for me many times under these conditions, so I assume that my water conditions are correct. I just want to keep the fish in the most natural surroundings possible.

**N. George**  
Brooklyn, New York

*A. The jewel cichlid, Hemichromis bimaculatus, is one of the most widely distributed cichlids of Africa. It is found in rivers and lagoons almost all over Africa from just south of Morocco to as far south as the Cape of Good Hope and is even found in brackish coastal lagoons. It is definitely not a rock-dweller, at least not in the same sense that Malawiian mbuna are, but it can be found in some of the rockier areas of many African rivers. It is also found in weedy areas of these rivers. Being a territorial fish, sexually mature specimens are not too likely to be found in open water. A generalized aquarium setup with a few rocks and some heavy well-rooted plants such as*

*Sagittaria* or *Aponogeton* species would be the most natural environment for the jewel cichlid. The species readily adapts to almost any water as long as extremes of pH are avoided.

**Ray Belcher**  
Evansville, Indiana

*A. We as well as many of our readers are always interested in knowing about*

**Very Veil Thank You**  
Q. I have spawned albino *Corydoras* a number of times over the past 15 years, and up until last February, nothing out of the ordinary happened. But from 150 fry of last February's spawn, 20 of the young developed semi-veil tails. When they are mature I hope to breed brother to sister with the idea of setting and improving the strain. I hope this information will be of interest to your readers.

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*Corydoras aeneus* with semi-veil tail. Photo by Laurel Morsch.

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**Bucktooth Bull**

I recently saw some fish offered for sale that were called exodon tetras. I liked them and would like to purchase some, but I don't know much about them. Could you please give me some information about their habits, water requirements, food preferences, adult size and breeding habits if known?

**D. Maddox**  
Hanford, California

A. You are probably referring to *Exodon paradoxus*, commonly known as the bucktoothed tetra. This fish usually occurs in large schools near the shores of rivers in Guyana and Brazil. Small specimens are usually peaceful in the aquarium, but adults which can reach six inches in length tend to be a bit testy, especially with each other. This is one of those fishes which, like tiger barbs, is much more peaceful if kept with a large school of its own kind rather than in pairs. A school of bucktoothed tetras should be given a large well-lit tank that is heavily planted around the back and sides with bushy plants such as *Hygrophila* or *anacharis* and with plenty of open area in the front and center areas for swimming. Their water should be maintained at 78 to 80°F (26 to 27°C) and perhaps a bit warmer for breeding. Though they definitely prefer live foods, they will ad-



The bucktoothed tetra is not one of the more peaceful tetra species. Photo by G. Sanft.

apt to prepared commercial fish foods such as dry flakes or freeze-dried brine shrimp or tubifex. They appreciate an occasional feeding of fresh meat such as beef heart or chopped fish or shrimp. The bucktoothed tetra spawns in a typical tetra fashion, scattering eggs over clumps of bushy plants. The fry are rather large compared to those of most tetras and are very easy to raise.

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been observed in the wild caring for their young, but we have no reports of their being spawned in captivity, probably because there are very few home aquariums large enough to allow them to grow to breeding size. Any cichlids that would be large enough to protect themselves from the vicious snakehead would no doubt be much too large to be housed in a 20-gallon aquarium, with or without the snakehead. There are very few aquarium fishes with a pugnacious temperament that cannot be calmed down in the aquarium by providing the right conditions such as shelter and adequate food. The snakehead, however, is one fish that just cannot be quieted. It has a well-deserved reputation for being a vicious killer—even juvenile specimens such as yours! The fish is found in southeast Asia and India. No books have been written specifically on this fish. What little is known about it can be found in most basic aquarium hobby texts.

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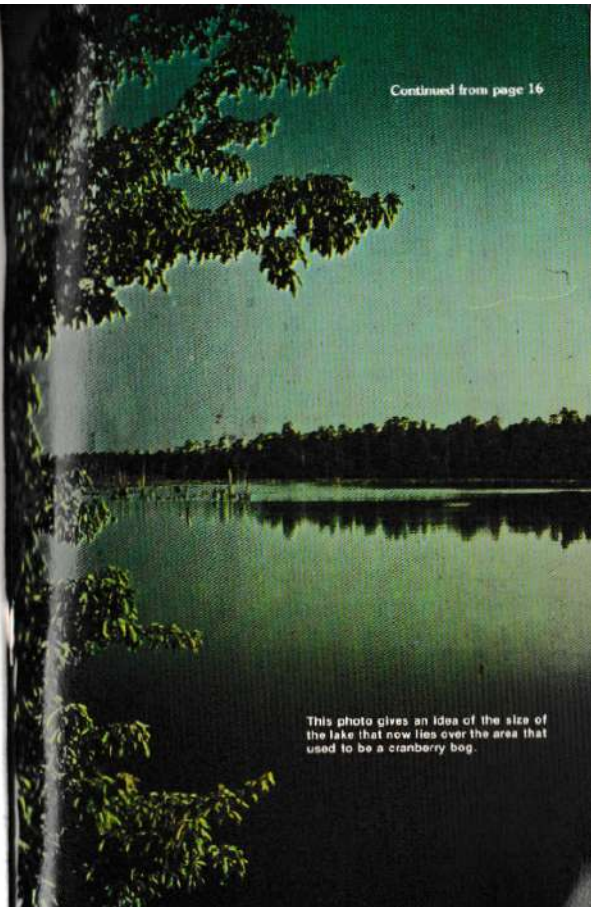
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Continued from page 16



This photo gives an idea of the size of the lake that now lies over the area that used to be a cranberry bog.

wagon and wanted to be sure we were okay. They looked with disgust at the nearby area where some people had picnicked and strewn beer cans all over the place. This is a favorite area for boating and smoking pot... If the police come, just flick the joint into the fast-moving water and all the evidence is gone! The seclusion among the trees, the soft beds of decaying pine needles and the romantic wind speaking of love as it rustles through the pine trees have made the Pine Barrens a welcome retreat for young lovers.

We continued walking until we came to

the lake that was at one time a cranberry bog. It was large, perhaps five kilometers square, with dead trees projecting eerily out of the still black water as though in a late, late chiller film on TV. The bog was only two or three meters at its deepest point. Burt waded in, catching many sunfish, as I took photographs and drank of the beauty of my own home state... ah, New Jersey, why doesn't the world recognize your magnificent beauty? Maybe it's a blessing that it doesn't!

"I'll know a great place to go, Uncle Herbert!" Burt said. "It's a

beautiful lake, full of fish and great for swimming. C'mon."

As we headed for the car we spotted a female eastern painted turtle (*Chrysemys picta picta*) digging a hole in the sand road where she would soon deposit her eggs. She didn't blink when she saw us approaching her... she just froze in place. We watched her for a few moments, I took a picture and we moved on. When we came back an hour later, she was gone, having abandoned her efforts... there were no eggs in the hole she had dug.

We found the lake with its white sand beach

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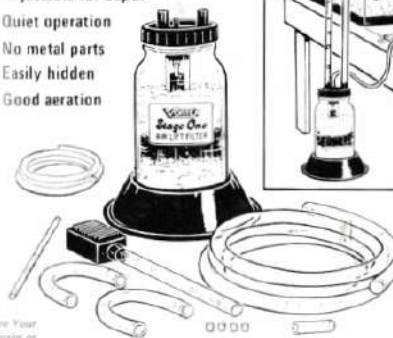
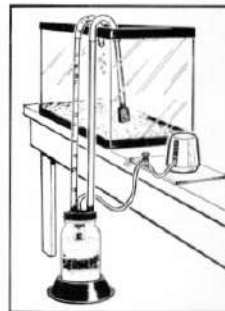
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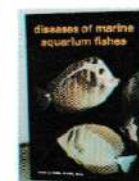
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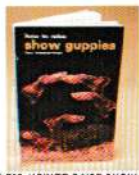
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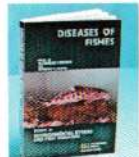
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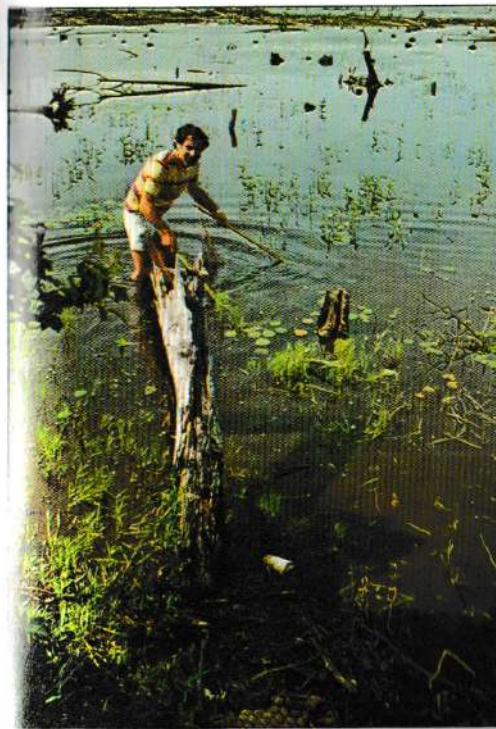


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Frank uses his one-man siphon to collect fishes in the submerged cranberry bog at the Pine Barrens.

September, 1977

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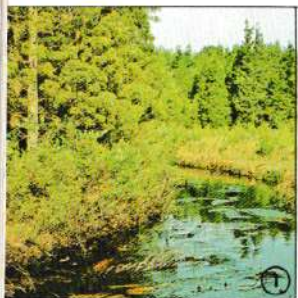
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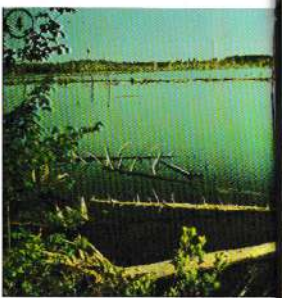
Dr. Frank collects some delicate plant specimens from the bottom of a Pine Barrens stream. Collecting anything from the bottom here is easy, since the water is so clear and seldom very deep.

and Burt wanted no time doing it for a year. He took the same along and made a great catch of black-banded sunfish, bluegilled sunfish and a school of what he called shiners or dace which were actually chubuckers, *Erimacanthus* species. At a small one they make great aquarium scavengers and look and act just like barbs except that they have no barbels. I'd bet that they would make a hit in an aquarium shop, and we have millions of them here! They're so easy to raise that they're commonly used as a bait fish. Burt finished his fishing and his swimming... and now his face was free of wrinkles and frowns. He had prescribed this morning to relax... and he had... and in addition, he had won his bet. I concluded that it was beautiful in the Pine Barrens and that I would be eager to come back. It was all too soon to return home. Burt was an expert in the area. He told me exactly what fishes we would catch and where we would catch them. The fishes were indeed magnificent... how much more beautiful, for example, they were than the blackbanded sunfish, *Erimacanthus chirodon*. I have seen so often in European aquaria. Maybe I

- (1) A meandering stream with emergent vegetation.
- (2) An isolated clear pool with a fine sand bottom.
- (3) A cluster of water lilies in the cranberry bog lake.
- (4) Fallen trees provide shelter for many fishes.



- (5) A burned out forest area surrounds the cranberry bog lake.
- (6) Apparently a lot of parties are held in the Pine Barrens.
- (7) A female eastern painted turtle digs a hole to bury her eggs in.
- (8) The sandy shore and bottom make the lake a good swimming area.



should send some to rejuvenate the stock in Germany. No, on second thought, let the Germans come here to New Jersey to see for themselves the most magnificent "jungle habitat" in the world and they can take home their own sunfish and

gorgeous aquarium plants. And if they come at the right time, they can catch some great marine fishes, too. Now Jersey greets the Gulf Stream some time in late August, and with the Stream comes an assortment of colorful

coral reef fishes from Bermuda and the Caribbean.

I was born and raised in New Jersey... and I have always been proud and happy in my native state... but now I can start boasting about it!

**Invertebrates**

# Fun with Fiddlers

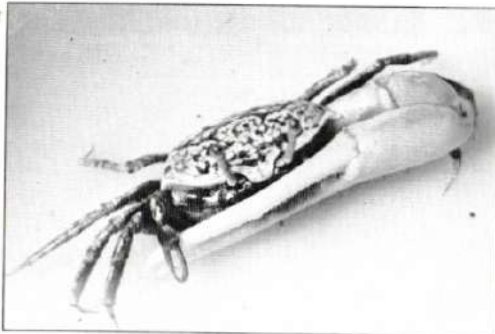
by Mary K. Wicksten

Fiddler crabs (genus *Uca*) live on muddy or sandy shores in tropical and warm temperate parts of the world. These lively little crabs, much studied because of their courtship displays and adaptations to changing temperatures and salinities, are now being sold by aquarium dealers as well as kept by those who do their own collecting.

Fiddler crabs frequently do not last for more than a month in the average aquarium despite the owner's attempts to care

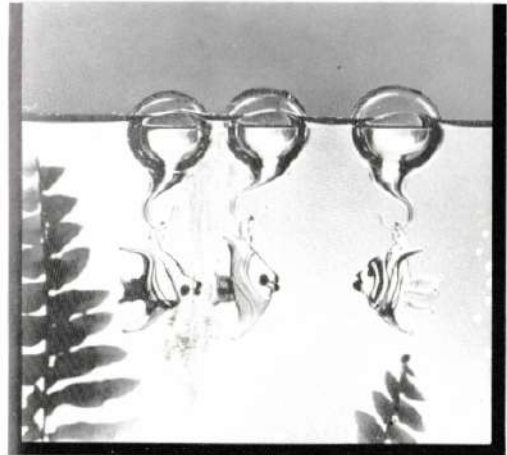
for them. The reason for the aquarist's lack of success with them is not an obvious one of improper food or salinity but often the grain size of the sand. Fiddlers usually inhabit soft substrates from which they derive their food by rolling the sand into pellets and then extracting organic debris. In an aquarium they are unable to roll the gravel or coarse sand and have difficulty eating the chopped shrimp or other food eaten by other kinds of crabs.

Fiddler crabs (*Uca*) having one large claw and one small claw are males. Females have two small claws. Photo by G. Marcuse.



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The small claw of the male fiddler crab serves mainly as a feeding tool, but the large claw is used mostly in territorial defense or as a signal to potential mates. Photo by Walt Deas.

I have kept fiddler crabs successfully for over six months with two easy-to-assemble set-ups. The first is a modified terrarium featuring a bank of fine wet sand, a pool, a rock, and an airstone. The fine sand from a surf-swept beach is kept damp at the consistency of dough. The pool, formed by a dish sunk in the sand and having low edges that the crabs can climb, contains water aerated by the airstone. A rock in the pool gives the crabs a place to climb.

Two problems might be encountered with this arrangement. First, pet stores usually do not sell fine sand, which means that you must collect your own. Fine sand often contains debris that may spoil. Be sure that the sand is rinsed thoroughly before installing it in the tank, and rinse and stir it in the tank at least once a month afterward. Second, if you are

keeping salt water fiddlers, evaporation from the dish will change the salinity, therefore you may need to change the water once a week or more often if you are keeping the tank in a warm place.

A second set-up can be used to display fiddlers in a tank with other marine life. A box from an outside filter or a high, narrow box shaped like an ant farm can be suspended inside the aquarium along one wall. Fill the box with layers of different colors of fine sand, the install one or two fiddlers. The crabs will build extensive tunnels in the sand.

My fiddler crabs eat flaked dry fish food which they pick up with the moist sand. They leave patterns of footprints and pellets when they feed. They also dig burrows from which they sally forth to feed, scuttle or wave their pincers.