

THE

AQUARIUM

MAY, 1969

VOL. II NO. 7

British Isles 2/6 DOMESTIC 35¢

- THE ZEBRA MOUTHBROODER
- THE TURTLE LIVES TWIXT
PLATED DECKS
- A NEW PLATY — THE
MARIGOLD WAG





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COVER

This brilliant male *Pseudotropheus Zebra* was photographed by Andrey Roth using a Zenza Bronica/S2 camera with a 75mm Nikkor lens, on Ektachrome X Film. (Additional credits appear on page 69.)

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THE ZEBRA MOUTHBROODER

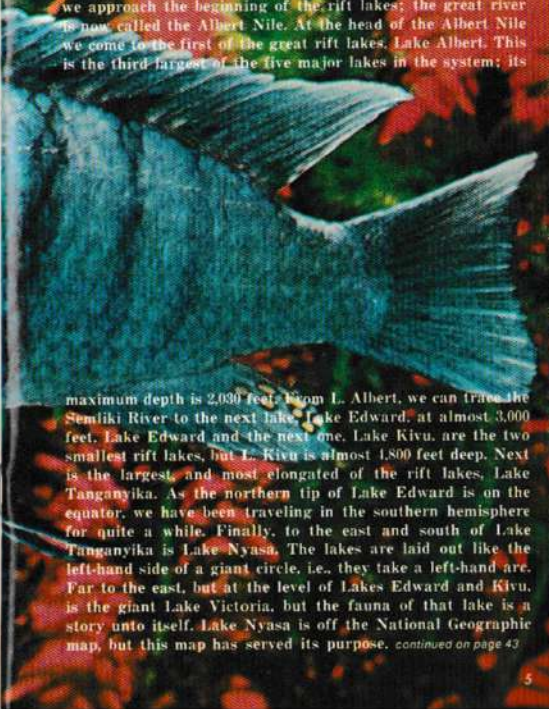
by ROBERT J. GOLDSTEIN



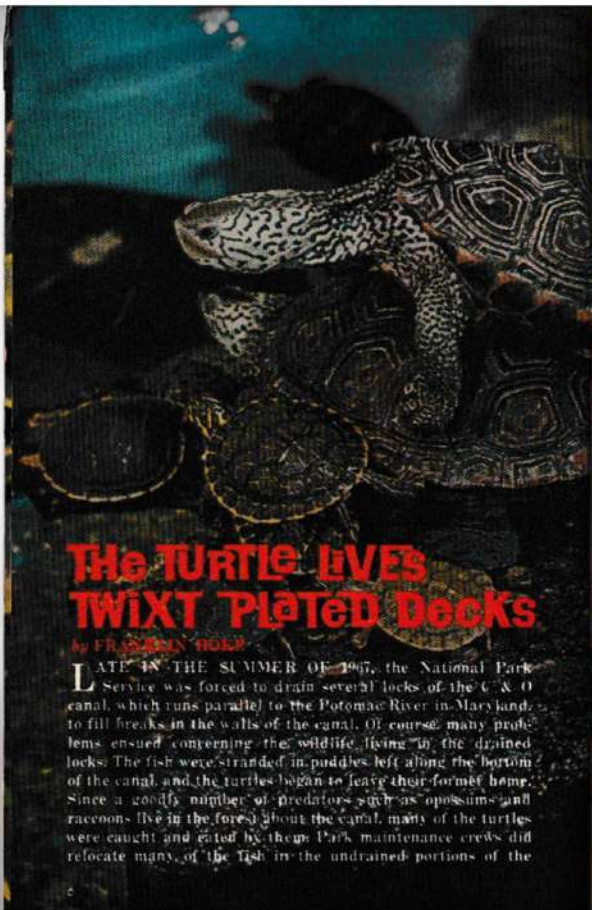
EDITOR'S NOTE: From time to time, *THE AQUARIUM* finds it desirable to publish two articles (or more under certain circumstances) together as a "pair." The following two articles on the zebra mouthbrooder is such a case. Both articles are excellent reading material on this most interesting cichlid, and provide a contrast in both presentation and study that the reader will find most helpful. AJK

ALTHOUGH A GREAT DEAL HAS BEEN written about the cichlids of Lake Nyasa and vicinity, it is surprising to me how little the average hobbyist knows about these fishes. In discussing one of the species, I would like to go a bit further and (1) review the group in terms of origins and evolution, (2) say two cents worth about the area from which these fishes come and (3) I'd like to present some references to scientific literature about them for the benefit of the serious hobbyist.

First of all — what are the rift lakes? If you have an atlas at home, get it out. Or, if you have a set of *National Geographic* magazines, get the one for October, 1963. It contains a map (plate 56) labeled, "Africa: Countries of the Nile." In the eastern Mediterranean, one finds the mouth of the Nile at Alexandria, Egypt. The Nile extends south, completely through Egypt, across the Sahara and through the vast expanses of the Sudan. So far, we have traced the Nile from 31° North latitude to about 2° above the equator. As it enters Uganda we approach the beginning of the rift lakes; the great river is now called the Albert Nile. At the head of the Albert Nile we come to the first of the great rift lakes, Lake Albert. This is the third largest of the five major lakes in the system; its



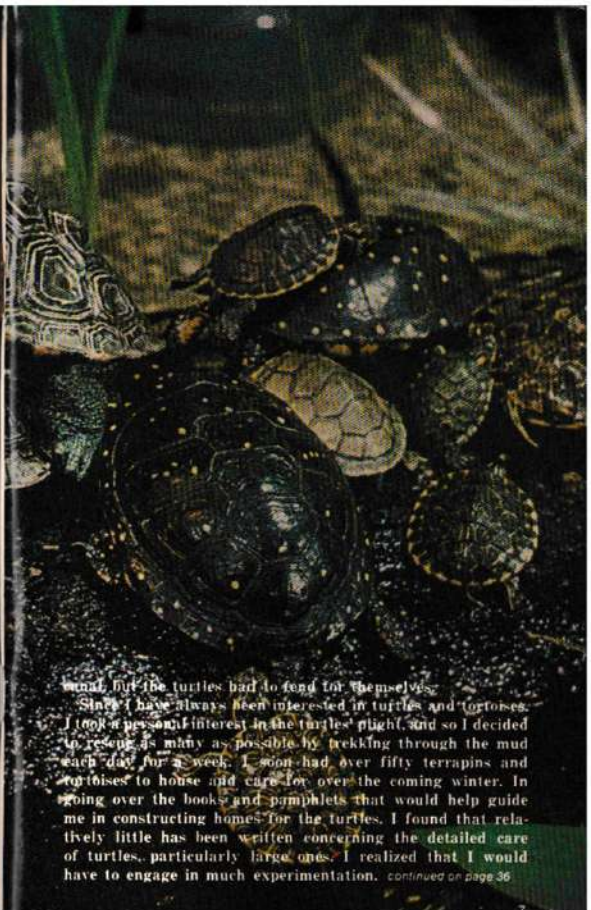
maximum depth is 2,030 feet. From L. Albert, we can trace the Semliki River to the next lake, Lake Edward, at almost 3,000 feet. Lake Edward and the next one, Lake Kivu, are the two smallest rift lakes, but L. Kivu is almost 1,800 feet deep. Next is the largest, and most elongated of the rift lakes, Lake Tanganyika. As the northern tip of Lake Edward is on the equator, we have been traveling in the southern hemisphere far quite a while. Finally, to the east and south of Lake Tanganyika is Lake Nyasa. The lakes are laid out like the left-hand side of a giant circle, i.e., they take a left-hand arc. Far to the east, but at the level of Lakes Edward and Kivu, is the giant Lake Victoria, but the fauna of that lake is a story unto itself. Lake Nyasa is off the National Geographic map, but this map has served its purpose. *continued on page 43*



THE TURTLE LIVES TWIXT PLATED DECKS

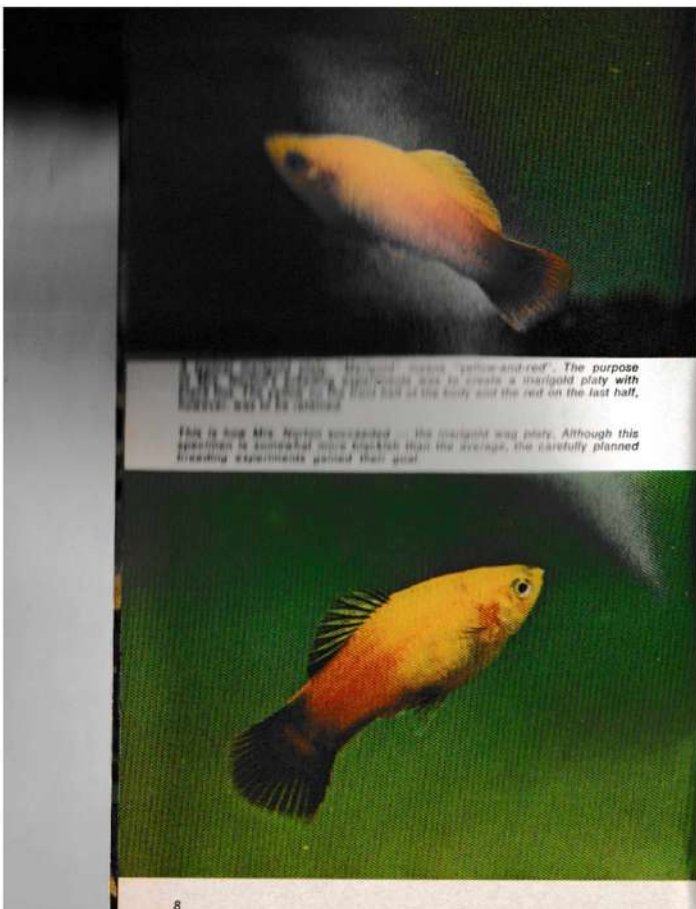
by FRANK BEN HOLLY

LATE IN THE SUMMER OF 1967, the National Park Service was forced to drain several locks of the C & O canal, which runs parallel to the Potomac River in Maryland, to fill breaks in the walls of the canal. Of course, many problems ensued concerning the wildlife living in the drained locks. The fish were stranded in puddles left along the bottom of the canal, and the turtles began to leave their former home. Since a goodly number of predators such as opossums and raccoons live in the forest about the canal, many of the turtles were caught and eaten by them. Park maintenance crews did relocate many of the fish in the undrained portions of the



canal, but the turtles had to fend for themselves.

Since I have always been interested in turtles and tortoises, I took a personal interest in the turtles' plight, and so I decided to rescue as many as possible by trekking through the mud each day for a week. I soon had over fifty terrapins and tortoises to house and care for over the coming winter. In going over the books and pamphlets that would help guide me in constructing homes for the turtles, I found that relatively little has been written concerning the detailed care of turtles, particularly large ones. I realized that I would have to engage in much experimentation. *continued on page 36*



This is how Mrs. Norton succeeded in the marigold wag platy. Although this specimen is somewhat more high-kick than the average, the carefully planned breeding experiments gained their goal.

The purpose of the breeding was to create a marigold platy with black fins, yellow on the front half of the body and the red on the last half.

A New Platy - The Marigold Wag

by JOANNE NORTON

WAGTAIL PLATIES, which have black fins, are very popular and widely available in aquarium shops. The wag pattern exists in platies of various body colors, including red, gold, blue, bleeding heart, tuxedo and spotted. Beautiful red-and-yellow marigold platies also are sold in many pet stores. I decided to develop a marigold wag platy, which would have black fins, yellow on the front half of the body, and red on the rear half of the body.

To get marigold wags, I first raised some virgin female marigold platies. These females, when crossed with a gold wag male platy, produced marigold wag offspring with a body shape resembling the marigold parent. Next, virgin females of this first generation were crossed with large marigold males that had excellent color. Marigold wags with good color came from this cross. As in marigold platies, marigold wags get bright red-and-yellow colors when the fish are about five or six months old. The red-and-yellow color intensities continue to increase until the fish is about one year old. In many marigold wag males, the yellow dorsal color is strongly developed, resulting in an attractive dorsal fin that is yellow with sharply contrasting black fin rays. In some marigold wag males, the tail becomes red with black fin rays.

Although these marigold wags produce a high percentage of marigold wag offspring, they are not yet true-breeding. At present, they produce some fish without the wag pattern, these looking like ordinary marigold platies. Also, some have a white body color instead of marigold (yellow-and-red). Fixing the strain will involve elimination of two recessive genetic factors, one for white body and one for non-black fins. So far, my marigold wags have not produced any comets. A comet platy has a clear tail, edged with black along the top and bottom. If comets were to appear it would be necessary to eliminate another recessive genetic factor from the breeding stock before the marigold wags would be true-breeding. The marigold wag strain can be fixed after several generations are produced, the parents of each generation always being from a brood that consisted of 100 per cent marigold wags.

Marigold wag platies are prolific and should be easy to raise either in tanks or in large pools. In a 30-gallon tank containing marigold wag breeders, there are now many young. The marigold wag is an addition to the group of *variatus*-type platies and also a colorful new wagtail platy. ●

The Water Purslane

By WILLIAM A. TOMEY

TEN YEARS AGO, the American water purslane was used as an aquarium plant, but information on its use in the hobby today is hard to find. The question is, is *Peplis diandra* (as it is known scientifically) still with us? The answer is that the plant currently is one held in the highest esteem, but in Europe, not in America where one would expect the aquarium hobby to be most informed about it!

Peplis diandra is a member of the cat-tail family, Lytraccae, its origin being the southeast portion of the United States such as Texas, Arkansas, Missouri, and West Florida, where it can be found growing in bogs and shallow, stagnant waters. It is, however, also found on the shoreline, growing above (emersed) the water. Its very small flowers appear above and below the water as well, although the fluorescence is more impressive when it grows out of the water. Underwater, the flowers usually don't ripen and consequently we cannot expect the plant to develop its fruits under such conditions.

The water purslane is a real beauty, with brightly colored, green tapering leaves. As they stand densely on somewhat thin, vibrous stems, the leaves take on the appearance of small twigs of fir. They vary in width from 1.5 to 4.5 mm; in length they are approximately 4.5 mm. At the very top of the stems the leaves sometimes take on a reddish coloration, but otherwise they are bright green. Its flowers

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The American water purslane, *Peplis diandra*. Although a native plant to the United States, it is not well known to American aquarists. Yet, it is a perfectly satisfactory aquarium plant and provides an interesting form for the aquascape. Note the small projections where some of the leaves join the stem. These are the flowers.

are not conspicuous, but they are interesting in shape and of a rosy-green color. The flowers are found in the leaf pits and are as fine as the head of a pin.

One can satisfactorily research these flowers only by use of a microscope. Under magnification, we find that the flowers consist of a 2 mm long calyx, the external leafy part of the flower that constitutes the sepals. The calyx is cone-shaped and in its upper portion we find the stamens, or male part of the flower. An unusual aspect of the flower is that the crown leaves, or top covering, are missing in this plant. As might be expected with a flower this small, the fruit is also extremely small and consists of a somewhat round-shaped cap, divided into two compartments which hold numerous prickly seeds.



A closeup of the flower of *Peplis*, highly magnified. The flower lacks the crown leaves that usually serve as a cover to other aquarium plant flowers.

The emersed or above-water form of *Peplis* produces a long stem, some 5 to 12 cm in length. The lower portion clings to the bottom substrate (mud, etc.) and displays numerous very fine rootlets. Under emersed conditions, however, the plant does not reach the length that it does when submersed or completely under water.

The cultivation of the plant is quite simple — it makes few demands upon the aquarist. It does best under strong lighting and temperatures of about 68°F, although the usual tropical fish tank temperatures are acceptable. At times, shoots appear on the stems. These may be snipped off and new plants started from them, much as with *Hygrophila*. The plant is very valuable in the aquascape when used in bunches as contrast against the different colors and forms of other, more familiar aquarium plants. ●

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Clem and owner Hubcap Gleason while away some time at Indiana State Prison.

CONJECTURES FROM STIR

by ARTHUR POWERS

HELLO THERE. MY NAME IS CLEM. I'm a four-year old piranha, pronounced PEH-RAHN-YA. Of course, that's not my given name so perhaps we'd better stick to Clem. Easier to remember. OK?

Maybe I'd better make a clean break of it from the beginning, since the truth would probably leak out sooner or later. I hold the rather dubious distinction of having spent the better part of my life in stir—Indiana State Prison—I'm a little red-faced to admit. Too, I'm the only piranha in captivity (that's my little joke) here, also a dubious distinction which at times causes me some discomfiture. (Ahem.)

Where was I? Oh, yes, Well, I've had four owners since coming to prison, all good fellows really. Well, you could actually say I've owned four fellows, for if it's any one thing you have to be adamant about with inmates it is showing them who is master. Yes sir.

Well, this Paul Owens fellow introduced me to prison living when I was less than a fingerling—at the age of one month, give or take a day. Paul's a real tropical fish enthusiast. Been a member of the prison Fin and Gill Club since its inception at the prison in 1962. Paul sent out and bought me for practically nothing in a Michigan City, Indiana pet shop, which knowledge, incidentally, has never served to bolster my ego.

Pretty sharp fellow, that Owens. Paints in his spare time. Did a cover for an aquarium magazine once, matter of fact. He was working in the

prison psychologist's office when our relationship began. Dick Wich, that's the prison psychologist, was a fish enthusiast, too, so he and I naturally hit it off great, right from the beginning. "Conwise" piranha that I'd become, I didn't dare let on to Paul that I was having any traffic with a "free world" man. He would have cut off my rations of raw hamburger, filched from the butcher shop, I learned later, if he'd tumbled to my buddying up with Wich.

We sort of drifted along in this relationship for better than a year, me all the while picking up bits and pieces of Freud and Adler which, I've heard slurringly mentioned, changed me from piranha to paranoia. Can you imagine? What was expected of a fish, anyway, cooped up in stir in a 10-gallon tank, and me over four inches long and growing like ragweed amidst all that adverse prison atmosphere?

Golly, it like to broke my heart when one day Paul came in packing his gear. Transferring outside the walls, he was. And ready to leave without a farewell, close as we were. I couldn't go; no fish allowed outside the walls. One for the books, huh? Prisoners outside, fish inside. Oh, well. Where was I? Oh, yes.

Well, some cigarettes and candy bars and a couple of IOU's (they weren't exactly IOU's, more of a verbal promise to pay when things got better) changed hands, and without so much as a "see you around, old buddy," Paul changed living quarters and I ownership.

My contact with the prison psychologist stood me in good stead with my next landlord, Bill Moore, a real case-hardened type con, who, if he did nothing else, strengthened my resolve to go straight if I ever do get out of this stir. Oh, don't misunderstand me. Bill was an OK sort of fellow. No Paul Owens, by a wide margin, I'll grant you, when it came to piranha care, but concerned for my welfare, nevertheless. (There was an endless supply of raw meats to feed on, and knowing Moore there's no doubt whatsoever in my mind that he stole every scrap of it!)

Now this next fellow who assumed my title of ownership is, I'm sure, the only one of his kind in stir—same as me. He's the one who named me Clem. But get this. His name is Hubcap! That's right, Hubcap Gleason. Sort of grabs you, huh? But whatever other faults he may have, neglecting me isn't one of them. He's made my time here in stir a virtual piranha heaven.

Nothing is too good for me, Hubcap says. Holy Toledo! I didn't know there was so much beef heart in existence. And baby swords, and hamburger and fat guppies. Is it any wonder that today I'm 10 inches long and still growing? No fooling. And this 40-gallon tank Hubcap keeps me in is heavenly after those smaller, close custody aquariums.

Well, Hubcap tried to sneak out from under ownership responsibilities a couple of years ago. Went to the parole board and talked those people into turning him loose. Never a word, mind you, of what was

impending until the sneak (why almost like a thief in the night) turned me over to Keith Grant, a clerk in the tailor shop. A nice enough fellow, all right, don't misunderstand, but nothing spectacular. Of course, in all fairness to Keith, I think anyone would seem dull and uninteresting after Hubcap.

So, I ask you, why shouldn't I have settled down to a life of comparative ease in the tailor shop? (I'll admit I did miss the raw hamburger and other delicacies to which I'd become accustomed, and often cursed the day that the traitorous Hubcap sold my ownership into the hands of an unimaginative thief.)

Well, sir, I'd hardly had time to eat five pounds of worm culture before Hubcap was back in stir as a parole violator and, as sure as my name's Clem, came mooning around my aquarium, pecking and waving and carrying on like a crazy man his first day back. I hardly recognized him he was so gaunt and hungry looking. (It was evident they hadn't brought him back to stir for stealing hamburger.)

Where was I? Oh, yes, Well, early last year after he'd bought me back from Keith, Hubcap entered me in this prison open house tropical fish exhibit. Really. Free world squares (that's what us hip fish call citizens) crowded into our fieldhouse, walking and talking and snapping pictures (mug shots?) all over the place, upsetting me no end, I tell you.

Such carrying on sorely taxed all the philosophical applications to living I'd picked up in Dr. Wich's office. After all the jotting down and scribbling of notes by the judges I was passed over without so much as honorable mention.

"We can't miss, Clem," Hubcap kept fidgeting at me all day as he sloshed around readying our aquarium. "Think of it, a first place ribbon—possibly best of show. You're the only piranha entered, Clem. You're a cinch!" Well, he fussed and fumed himself into a stupor by showtime and convinced me we had as good a chance for a ribbon as those other entrants. So when the visitors began arriving I was nervous and distracted.

Maybe I'd have done all right if those darned kids (juvenile delinquents, most likely) hadn't kept sticking their fingers in the aquarium, sloshing water all over the place. One fellow kept pecking on the glass, reminding his friend (and me) that I am "just about sandwich size." You can imagine what this did to my piece of mind.

But Hubcap and the rest of the Fin and Gill club members say it was all for a good cause; something about promoting understanding and good relationship between prisoners and society. Largest crowd (850) ever to attend a prison function the newspapers reported. Over 300 aquariums entered in competition. Heavens!

Well, rumor has it (OK, then, the prison grapevine) that the aquarists

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Our impressive new Quiet I Air Pump is a marvel of efficiency. Maybe you'd have been more impressed if we called it an Oscillatory Compressor!

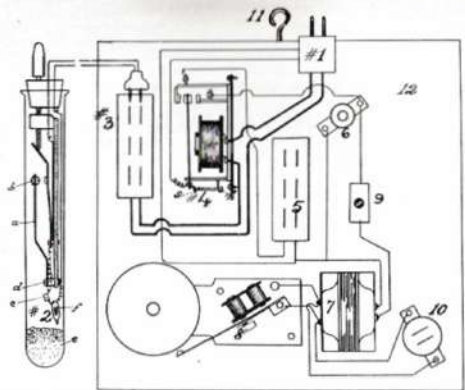
We're very proud of Quiet I. So proud, in fact, we even put it in a clear blue plastic cover so you could see how it works. Because like the works of a fine watch, it's intriguing to see. It has low mounting pads. A set, rubber stopgups.

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One advantage of using a circuit-breaker is that this permits the operator to adjust a thermostat control where fishes are involved and not have to remain for a long time to see that the thermoregulator is not set too high (or too low). Too commonly, an aquarist makes what he supposes to be a very slight adjustment of a thermoregulator control

continued on page 56

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IN MEMORIAM

On February 27, 1969, Dr. William Thornton Innes died at the age of 95 at his home on the campus of Temple University in Philadelphia. With his passing, so also passes the last of the great American aquarists who were responsible for laying the foundations, block by block, of the aquarium hobby in this country.

Dr. Innes' first major contribution to the aquarium world came about in 1908, when he persuaded his father to set the monumental Wolf's *Goldfish Breeds and Other Aquarium Fishes* in type, a labor consummated entirely by hand, and to have it published by the family printing firm. Simultaneously, his activity in the Aquarium Society of Philadelphia, one of the earliest to be formed in the United States, increased until he eventually became Secretary, President and finally Board Member of that important and influential organization. In 1912, he managed to accomplish what the leading aquarists of the country previously could not — the formation of a cooperative publishing venture by the societies of New York, Brooklyn, Philadelphia and Chicago, to produce a monthly aquarium magazine of highest quality. It lasted but two years, but it gave the hobby both the direction and the impetus it sorely needed.

Prior to 1912, the center of activity in tropical fishes was New York City, Philadelphia being the unchallenged leader in the cultivation of fancy goldfish. It was through the efforts of William Innes, however, that Philadelphia was introduced to tropicals, the city subsequently to produce some of our finest hobbyists and to become an aquarium fish center second to none. Some of the greatest of the annual fish exhibitions during the 1920's were held in Horticultural Hall in Philadelphia, but it was William Innes who selected this site and made many of the arrangements.

His own first major work, *Goldfish Varieties and Tropical Aquarium Fishes*, appeared in 1917. It gradually climbed into the aquarist's "best-seller" class, and by 1932 it had reached its 32nd edition. In 1929, he published *The Modern Aquarium*, a first-class but less expensive primer on aquarium keeping that most of today's older authorities "cut their teeth on." In 1932 William T. Innes founded this very magazine, and under his editorship it set a standard in aquarium publishing that has never been equaled. His followers were enthusiastic and they were many, for his gift of translating technical data into readable prose was unique in the hobby. Not only did his long experience give him a most remarkable insight into fishkeeping and the ways of fishes, but also into the mind and problems of the average aquarist.

The "Bible" of the aquarium hobby, Innes' *Exotic Aquarium Fishes*, appeared in 1935. The excellent photos, the masterful color plates, the variety of fishes covered, and the plain, down-to-earth writing about keeping and breeding them were a revelation to aquarists of the day. The "Innes Book", as it was frequently called, leaped into instant popularity. Even today it stands as an example of what a comprehensive fish book ought to be, and its sales remain absolutely remarkable.

In the secondary depression of 1936-37, when the aquarium hobby entered a slump and other aquarium magazines fell by the wayside in rapid succession, *The Aquarium* magazine stood almost alone. During the years of World War II, it was *The Aquarium*, under the leadership of Dr. Innes, that sustained the hobby, preserving it until the aftermath when once again the nation took up fishkeeping with fervor.

In addition to his organizational work in the hobby and his literary work, William Innes produced photographs of aquarium fishes that are still regarded as definitive records of hundreds of species. Unlike most fish photographers who produce pictures of single fish with relative ease, Innes produced hundreds of outstanding portraits of pairs of fishes, one of the most difficult feats of such photography. His color photographs were made when equipment and film was cruder and more difficult to work with, and at a time when such pictures were a great novelty.

In 1956 Dr. Innes retired, but visitors still flocked to his door where they were most cordially received, even until shortly before his death. What more can be said about this great man than to note that his life was both full and rich. He was a former President of the Typothetae of Philadelphia, Chairman of the Dobbins Technical School, Chairman of the Ives Foundation, and President of the National Mutual Fire Insurance Co. Among society associations, Dr. Innes was a member of the Academy of Natural Sciences of Philadelphia, New York's Museum of Natural History, the Pennsylvania Horticultural Society, and the Historical Society of Pennsylvania. His Honorary memberships in aquarium organizations all over the world were too numerous to mention. He further was a member of the Poor Richard Club and Meridian Club, where he served as President. In 1951, Temple University conferred the honorary degree of Doctor of Humane Letters upon him in recognition of his many achievements, an honor accorded no other aquarist.

Dr. Innes is survived by four daughters, Mrs. Austin Homer, Mrs. John J. Lovatt, Mrs. Gray M. Magee, and Mrs. Heberton F. Williams; nine grandchildren and eight great-grandchildren. We join in expressing our sympathy to all. Although he is gone from us physically, he remains spiritually, a man to whom all aquarists owe a great debt. It is fitting, however, that we remember William T. Innes in this simple way, one that really gets to the heart of the matter:

"Knowing that Nature never did betray
The heart that loved her".



THIS IS MY PROBLEM

by HELEN SIMKATIS

From: David Grossier,
Brooklyn, New York 11230

I am going to try inbreeding my guppies. For how many generations can I do this before deficiencies begin to show? For how long can I breed them with other guppies before their characteristics disappear? After infusoria, would newly-hatched brine shrimp be a good second food? If not, what would be?

Answer: There are too many variables to hazard a guess to either of your first questions. Your project, however, will not be very interesting if you know now just how it will turn out. We suggest that you go ahead with your first idea and keep a diary on your results. At the same time, you might set up another tank or two for breeding your present stock of guppies with newly acquired specimens. A journal should be kept on these results also, and eventually you will be able to make your own determinations. Again, however, your results can only be considered as such from the particular stock with which you are working. In other words, another strain might have worked out differently. Infusoria is not used as food for baby guppies. As soon as they are born, they are ready for newly-hatched brine shrimp. After

the second week, their diet should have variety. Live food and a good grade of dry food may be added to the fare.

From: Jerry Marshall,
Greenbackville, Virginia

Question: Recently a marble molly gave birth to several green-bodied, red-headed babies. The red color of the head soon faded out and the babies now are green, transparent, and speckled with dark spots. Is this normal with this species?

Answer: This is normal with one type of marble molly.

Question: If baby bettas are raised together, will they fight each other when they are older?

Answer: Unfortunately, yes. The females, when evident, can be kept in a tank together, but as the males mature it becomes necessary to place each one in a compartment, small tank, or jar to himself. Usually one male will behave rather well in a community tank with no other bettas present but there have been even exceptions to this.

Question: I have a black lyretail molly female, which has several times gotten larger as if she were about to give birth. After several days I would put her in a breeding tank. Two or three days later she would be back to her

normal size with no babies in the tank. I don't think she could have eaten them because of spawning grass which is in the tank. Do you have an explanation for this?

Answer: There are several explanations for this. Sometimes a female molly takes on a larger appearance when her eggs develop within her but they are not fertilized by a male and they are finally absorbed back into her system. Sometimes the eggs are formed but are not viable so even though a male is present, the eggs never produce embryos. Then again the larger appearance may be due to something other than eggs. It could be that at certain times the female takes on fluid and carries the larger appearance until the fluid is expelled. At any rate, I believe it would be better to allow this fish to remain in her tank when she takes on a larger appearance. The removal of a molly when she seems to be gravid can be harmful to both her and her babies if she is going to have any. If you have floating plants in the tank she lives in, her babies, or at least some of them, will be able to hide in them and you can remove them to a nursery tank where they should be fed newly-hatched brine shrimp and a good grade of dry food especially prepared for young livebearers.

From: Mike Alter, Kokomo, Indiana

I would like to know how to sex and breed silver dollars, and how to raise the fry. What kind of food do they require?

Answer: If by silver dollars you are referring to the *Metymnis* species which are usually sold under that name, the male is distinguished from the female by his anal fin which is outwardly curved in the first anterior section and then becomes even as it follows the curve of the underpart of the body posteriorly. Both male and female show orange on the outer edge of the anal fin but at spawning time the orange of the male is bordered by black. These striking fish require a

fairly large tank as they are active swimmers. Vegetable matter should always be available to them either in the form of lettuce or spinach. They should be supplied with plants that are considered expendable because there is no doubt that they will eat them. The temperature of the water should be in the high 70's and it should be soft and slightly on the acid side if spawning is desired. These fish have not spawned frequently for hobbyists but with proper conditions there is no reason why they wouldn't perform. The spawning tank should be furnished with nylon bottom mops or any other artificial spawning medium available at your dealers. The eggs are easily seen and it takes them about four days to hatch. Once free of the egg sac, the babies are ready for newly-hatched brine shrimp.

From: George Sprague,
Lindenhurst, New York

Please give me some information regarding keeping sunfish and bluegills in the home aquarium.

Answer: There are a number of fishes that fall into the sunfish designation, of which the bluegill is one. Because they are natives and not tropicals, they may be kept in an aquarium at room temperature. They should not, however, be subjected to sudden changes in temperature. The careful hobbyist will match the pH and hardness of the water in which the fish are to be kept with that from which they were collected. They should not be crowded. They will accept crushed snails, garden worms, and gradually will take prepared foods such as those fed to tropical fish. In that they are aggressive, size differences should not be great. They have bred in captivity.

From: Lt.-Col. G. C. La Bounta,
New York, N.Y.

I find many references that say mollies must have salt or steroids can use a little salt. My question is to which kinds of fish does this apply and how much salt per gallon is

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ABOUT OUR AUTHORS



TILDEN W. ROBERTS, PH.D.

Tilden Wirt Roberts was born in Donna, Texas, in 1911. He received a B.A. degree from Indiana University in 1933, a M.S. degree from Northwestern University in 1938, and a Ph.D. in Ecology from the University of Illinois in 1942. His experience includes teaching at the high school, college and university levels (Los Angeles Public Schools, University of Illinois, University of Tennessee and University of Southern California), the subjects ranging from biology through entomology, parasitology, ecology and animal behavior. He was also an instructor in physiology (oxygen indoctrination, low pressure chambers) for the US Navy at Pensacola and Norfolk from 1944 to 1946.

His activity in the field of biology-moviemaking is impressive, to say the least. Dr. Roberts was Biologist Consultant and Cinematographer for Walt Disney in the latter's productions of *Nature's Half Acre* and *Secrets of Life*, and served in a similar capacity for the Moody Institute of Science. He has been a producer of

motion pictures on nature subjects since 1950, and his company, Life-cinema Productions, may be familiar to some readers. A number of scenes and excerpts from Life-cinema's *Butterfly Marvel* and *Novel Trappers and Hunters* have been shown on TV programs such as *Science in Action*, *You asked for it*, John Ott's TV program, and *Walt Disney Presents*. Finally, Dr. Roberts is the author of *Behavior of Organisms*, in the Ecological Monographs series, published by Duke University Press in 1942.



HENRY F. LEE, M.D.

Born in a small Maine coastal town, Henry Lee gives credit to a tolerant family for his early interest in the life forms of both the sea and the local lakes. "Heaven alone knows," he says, "how much mud and water I spilled around the house in stocking aquaria with local fish and molluscs."

As a Zoology major at Syracuse University he supervised the science-building aquariums, took oceanographic electives in the summer, did a study on coelenterates of the Gulf of

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Societies at Work

By
HELEN SIMKATIS

IN THE DECEMBER ISSUE OF *Angel-Notes*, published by the Alamo Aquarium Society, Hazel Hall relates a personal detective story in which she played sleuth and apprehended three plant vandals. Besides providing a suspense element which all good detective stories should, this tale has particular value to hobbyists inordinately devoted to aquarium plants as it involves three species of fish that heretofore have had little or no demerits against them in the annals of aquarium literature as being plant molesters. The title of this expose is *Holy Leaves* (the *e* was left out of the word *Holey* to give the piece a seasonal touch). Scene I shows us a veritable aquatic Garden of Eden confined in an aquarium beautifully arranged as a show tank. The swordplants are happy and healthy and so are the heterogeneous species of fishes swimming around them. In Scene II everything is about the same except we see Hazel gazing intently at her swordplants. The leaves have tiny holes in them. By a process of removing the various suspects, she finds that no new holes appear in the new leaves of the swordplants after a pair of clown loaches are evicted. Scene III, however, shows a very depressed aquarium community. All the fish are dead and a faint haze of steam can be seen escaping from the tank. We can tell the heater has malfunctioned because Hazel is holding it aloft and is saying reproachful little words to it. The Swordplants have survived this disaster, and in Scene IV we see once more a beautiful aquatic Garden of Eden. The Swordplants are gently swaying in the airflow but there are no fishes present. We see Hazel gazing into the aquarium somewhat wistfully. No tank lives by herbs alone. Suddenly,

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her eyes light up and she leaves the room. When she returns, she introduces a collection of new specimens into her aquarium, among which are a pair of elephant noses, two portholes, three golden severums, and others. From a tank offstage she adds an upside-down cat, a red-finned shark, and an angel. This could have been the end of the story but it wasn't the end of the holes. In Scene V we see Hazel once more examining her swordplants, and once more they have holes. She doesn't tell us why, but she suspects the upside-down catfish and, out he comes. Then Hazel waits. There are no holes, she tells us some time later, in the new leaves of the swordplants. In fact, there are no new leaves. In Scene VI we find out why. Hazel comes onstage and catches the golden severum in the act of munching tender new leaves at the base of the swordplants. The culprits are netted and we assume that once more Hazel has a vernal aquatic paradise in her living room. As for the plant vandals, the pair of clown loaches, one upside-down cat, and three golden severums, their salad days are over, unless, of course, Hazel slips them a little chopped boiled spinach now and then on the side. This reader felt a little sad for them (come to think of it, she felt sorry for Eve, too). It seems to her that apples and aquarium plants shouldn't taste so good if they weren't meant to be eaten. We haven't done much for the reputations of three species of fishes by passing along this tale to our readers but felt obliged to do so in the line of duty. And, although we are inclined to say, let 'em eat salad, Editor Hall's observations will be of interest to those buffs to whom misery is a hole in a swordplant leaf. This issue also carries Jewel Clinton's thoughtfully written directions for *Raising Brine Shrimp to Maturity*. She uses inverted gallon jars with the bottoms cut out. Her formula for salt-water (borrowed from a friend in that she uses sea water) is 6 tablespoons of aquarium salt or rock salt to a gallon of distilled or tap water and 1½ rounded tablespoons of Epsom Salts. She stresses the importance of setting up the jars first so that algae accumulate on the coral she supplies before introducing the shrimp. Dry yeast, liquid foods for fry, infusoria tablets, hard-boiled egg yolk and bits of lettuce are some of the foods she offers the growing shrimp. She does not aerate the jugs but is very careful that the water does not foul. This is reference material for those who plan to keep seahorses or other fish requiring live food. The article should be read firsthand, however, as we cannot give here all the important fine points she offers. *Angel-Notes* reflects a lively, well-established society and those interested in it or its bulletin should write Editor Hazel Hall, 319 Byrnes Drive, San Antonio, Texas 78209

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A HISTORY OF THE AQUARIUM HOBBY IN AMERICA PART 10

by ALBERT J. KLEE

IN OCTOBER OF 1928, August Roth announced that he would actively attempt the formation of a national organization of aquarists, the first such serious effort since the previous decade when the aquarium societies of New York, Brooklyn, Philadelphia and Chicago formed a loose alliance and published *The Aquarium*, 1912-1914. For a while, Roth referred to the organization as that "Parent Association". He received considerable support for his plan from some notable aquarists. Fritz Gagelman, for instance, of the Automatic Unit Heater Co. of New York City, pointed out that in Germany, every fancier was a member of an aquarium club and every aquarium club was a member of the "Central Organization". In 1928, the Central Organization even issued insurance policies to its members, insuring against damage caused by leaking tanks! The initial concept of the "Parent Association" was that it would have annual shows, and arrange for traveling exhibits in order to arouse interest in tropical fishes. It would have an Advisory Council of scientists to provide information to aquarists about new or rare species of fishes. Tentatively, individual memberships were scheduled at \$2.50/year, this price to include a subscription to *Aquatic Life* (which was, we should mention, the only bona fide aquarium magazine published in this country at the time). For clubs, a per capita charge of 50¢ was proposed, plus \$1.00 per member for a subscription to *Aquatic Life*. The idea of a national organization received support from Richard Dorn, who was quite bitter at the failure of attempts to improve cooperation among New York area aquarium clubs (EDITOR'S NOTE: This situation hasn't improved much to this day), and George S. Myers. Myers, when he was a member of the Hudson County Aquarium Society in New Jersey, attempted the foundation of a federation of aquarium clubs but the idea was, as he put it, "squashed".

In any event, on March 22, 1929, the "Affiliated American Aquarists Association" (AAAA) was formed, a small group of interested hobbyists meeting in the editorial offices of *Aquatic Life* in Baltimore for this purpose. Temporary officers elected were: President, Richard Dorn;

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Vice-President, Fritz Gagelman; Treasurer, August Roth; Secretary, Edwin H. Perkins. The group immediately pledged \$62 to the Association, and it was agreed that any attempt on the part of a member to commercialize his position as a member of AAAA, would be sufficient cause for expulsion.

Shortly after the formation of AAAA, the Great Depression of 1929 hit the country. Although the concept of AAAA was a difficult one to sell to the hobby, the depression definitely took the wind out of its sails and the Association existed mostly as a technicality. In 1932, when the hobby had made a remarkable recovery, another attempt was made to activate AAAA but by this time, two new commercial aquarium magazines appeared on the scene to challenge the leadership of *Aquatic Life*. *Aquatic Life* was somewhat overwhelmed by the newcomers and fell from its position of prominence in the hobby. With it went the Affiliated American Aquarists Association. To this day, no attempt at a national aquarist's organization has ever met with what could be called "success", although specialist's organizations have fared somewhat better.

Before leaving the decade of the 1920s, we ought to review the state of the art of the aquarium hobby in America. It was certainly a period that saw the rise of the use of aeration and electric heating in the hobby. Although the famous KDA water-operated air pump was still widely used, towards the end of the decade large, expensive electrically driven piston compressors costing about \$40 (= \$65 in terms of today's currency) made their appearance. Filtration, however, was virtually unknown during this period (the use of filtration would wait until 1932 when the first inexpensive inside box filter was placed upon the market).

A good gas heater cost about \$5, non-controllable electric heaters about 50% more. Towards the end of the 1920s, however, the Automatic Unit Heater Co. of New York City placed a fully automatic heater-thermostat unit on the market at a price competitive with gas heaters, thus spelling the end of the use of the latter in the aquarium hobby.

A number of books and booklets were popular among aquarists at the time. There was, of course, the old Wolf book, brought up to date by Innes and issued as *Goldfish Varieties and Tropical Aquarium Fishes*. In 1926, George Myers collaborated in the tropical fish part of the third edition. Recognizing the need for a first class, cheaper guide to aquarium keeping, Innes published *The Modern Aquarium*, a 72-page booklet, in 1926. This sold for \$1.00 in the soft cover version. At the time, its only competition was Frank L. Tappen's booklet, *Aquaria Fish*, published in Minnesota. Upon the arrival of the superior Innes booklet, Tappen's publication became obsolete and its sales declined. The book that really was in demand, however, was not published in this country at all. American publications all were characterized by the fact that none really listed very many species. A real need then was for a book that would at

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THE ORANGETHROAT DARTER



by BRAZ WALKER

PERHAPS NOWHERE ARE THERE SO many potential "prophets" denied the proverbial honor in their own lands than in the realm of aquarium keeping. Aquarists of all lands encompassing every facet of the hobby seem consistently to possess blind spots as far as local fishes are concerned. Periodically some advanced aquarist will embark on what is usually a rather shortwinded crusade to "awaken" the hobby concerning fishes from their own back yards. It is usually not long before even the crusader knuckles under to the fascination of some rare and lovely creature from another continent and once again forsakes the natives.

North America has a unique fish population containing odd and beautiful aquarium inhabitants for every situation. A perfect example of an outstanding and breathtakingly beautiful aquarium fish can be found in any one of those little 2½ inch members of the family Percidae (perches) which I shall call "the rainbow group" of darters. They include several species of rather similar coloration and form, among which are the rainbow darter, *Etheostoma coeruleum*, the greenthroat darter, *E. lepidum*, the variegated darter, *E. variatum*, and several other *Etheostoma* species as well as *Etheostoma spectabile*, the orangethroat darter.

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The orangethroat darter, *Etheostoma spectabile*.

Anglers are familiar with the more bulky members of the perch family such as the yellow perch (*Perca flavescens*) and the walleye (*Stizostedion vitreum*). These, however, are perhaps more conventional fishes since they rely on their swim bladders to aid in adjusting their swimming level in relation to the lake or river bottom. Darters, on the other hand, generally swim as if they have "lead in their pants", and some of the subfamily Etheostomatinae to which the rainbow group belongs have, through evolution, completely forsaken this typical ballast system and lost the organ entirely.

The inability of the orangethroat to stay aloft for extended periods is something of a handicap when kept in an aquarium with other swift fishes. A redeeming factor is its unusual intelligence and adeptness at making every move count. Even freshly caught specimens lose little time in learning not only the exact location but also what noises and movements by the aquarist indicate an imminent feeding. After a swift dash to the feeding area, the fish will soon learn that by "treading water" just near the surface, food can be dropped within his reach. This is fortunate since most darters have a decided preference for living foods in the form

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Terrapins sunbathing on the log and pond edge.

Hoke: continued from page 7

Since the winter was not yet upon us, my first effort was to build an outdoor fenced-in pen for all of the turtles. In order to increase the system's efficiency and to make it more compact, I combined the need for a pond home for the terrapins with the tortoises' need for drinking water and a place to estivate. Inside the pen, my father and I constructed a small concrete-lined pool, with a mud wallow below the pond runoff for the tortoises.

The pond was made simply by lining a hole in the ground with one to two inches of sand-mix cement. We painted the concrete with latex-based paint because concrete is quite abrasive and can cause plastral sores when water turtles crawl in and out of the pond.

Along with the terrapins and tortoises we also included several other kinds of water life from local ponds and streams, as well as an assortment of water plants. Catfish and tadpoles were chosen in particular to help the musk turtles, and snapping turtles (we took in only small ones, to make sure nobody got hurt!) for their scavenging efforts in the pond—an important clean-up function. Other life, such as *Gambusia* (mosquitofish), common sunfish, and frogs were included to discourage the production of mosquitoes.

The plants chosen had to meet an important requirement. They had to be able to grow faster than the terrapins could eat them. Water hyacinths, cabomba, and several sturdy strains of lilies proved able to

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Larry Hoke, watching the box turtles eating hamburger.

grow faster than the turtles could eat them and, aside from their diet value, they made the pond more attractive.

The fenced area was simple to construct. Tortoises need shade and a place to estivate or to otherwise escape the summer heat. They also require dry and warm open areas to lay their eggs and to warm themselves on chilly days. We chose a section of our yard that is fairly wet at its low places, containing a few bushes and a willow tree, and also a high point that is well drained and sunny. Around this area we staked in a small wire garden-edging fence with the top two inches bent inwards to hinder the escape of those turtles ambitious enough to try and break out. This fence was later lined with ½" mesh wire hardware cloth; the top edge was bent inwards in the same manner to facilitate the keeping of small and infant turtles that could crawl through the larger meshed fence. About an inch in from the fence, a small trench was dug to make it even more difficult to escape. When we were done we had a very effective low-cost fencing system that was not unattractive in the yard. This outdoor facility was large enough to keep the terrapins and tortoises happy and healthy, until winter approached.

When winter came, we brought in some of the tortoises and all of the terrapins. The tortoises that we left outside were provided with a large hill of leaves, piled up in the pen, in which they could hibernate for the winter. Since we do not live where the winter weather is bitter-cold, a two-foot pile of leaves proved sufficient to shield them from sub-freezing temperatures which, of course, could kill them. Had we lived farther north, a deeper pile would have been necessary. As the

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A view of the smaller system described in the text, about 10-gallons capacity.

leaves were out in the open, moisture from melting snow and rain would be adequate to prevent them from drying out completely. Over the winter we made sure that none of these vital leaves blew away.

Several of the tortoises that I brought inside were provided with a home on a shelf of a bookcase. This "bookshelf terrarium" is of a floorboard cut to fit the shelf, with a plastic fence tacked across the front. A small 1" edging of masking tape around the perimeter of the board served to contain a thin layer of aquarium gravel spread around the pen. For cleaning purposes, the floorboard can be easily removed to be washed.

Because tortoises have a habit of upsetting their drinking water dish or drowning in one that is too deep, I found that a shallow heavy base ceramic or glass ash tray makes an excellent water dish provided gravel is ramped around it to allow them to get at it.

Initially I used a small high-intensity lamp, bent over from the top of the bookcase, to light the pen and keep the tortoises warm. A goose-neck lamp with a more powerful bulb (60-watt) was used when cooler weather approached.

Such a terrarium as this provides most of the things a tortoise requires in his living quarters. I learned, however, that this simple terrarium does not provide the level of humidity needed to protect tortoises from the drying-out effects of wintertime forced-air heating inside the home. Respiratory ailments were among the problems brought on by this drying-out condition. To help solve this problem, I decided to place the indoor terrapin pool in the same room with the bookcase home for the small tortoises I had selected to remain inside over the winter. The normal evaporation of water from this large tank helped



The larger system, about 200-gallons capacity. Both systems are equipped with cascade filtering systems.

provide a more stable, humid atmosphere.

The indoor terrapin pool was selected from a wide array of readily purchased plastic wading pools. I selected an oval shaped pool about three by five feet in diameter, eight inches deep. It proved large enough to contain comfortably the terrapins, and yet small enough not to dominate the whole room.

Because the floor is concrete in the downstairs room it was to occupy, some form of insulation was needed to keep the water from losing heat through the floor and into the ground. A platform was constructed using 1/2" plywood cut to fit the bottom of the tank; this was supported off the floor by slats of pine nailed across the underside of the board at approximately every foot. The top surface was finished with shellac, then paint; a thin sheet of vinyl plastic was laid into the fresh paint to protect the platform against any leaks that might occur, or spillage.

To keep the water of this tank at the desired temperature of 75°F, two conventional thermostat-controlled 200-watt aquarium heaters were mounted at the edge of the tank.

To keep things clean in such a large tank with so many turtles, my father built a specially-designed filter. The filter is powered by a pump (Model # 2A1-A8BC8F5S8; from Gorman-Rupp Industries, Inc, Bellville, Ohio, 44813) that circulates over 500 gallons of water per hour. The filter box is made from a six-inch diameter plastic bottle, with its top cut off to where it extends above the water surface when it is set in the tank.

In the bottom of the bottle, a plastic screen is wrapped around the pump input hose which is jam-fitted through a hole in the wall of the



A view of the outdoor penned pool for both tortoises and terrapins.



A closeup of the edging that keeps the turtles confined in the outdoor pen.

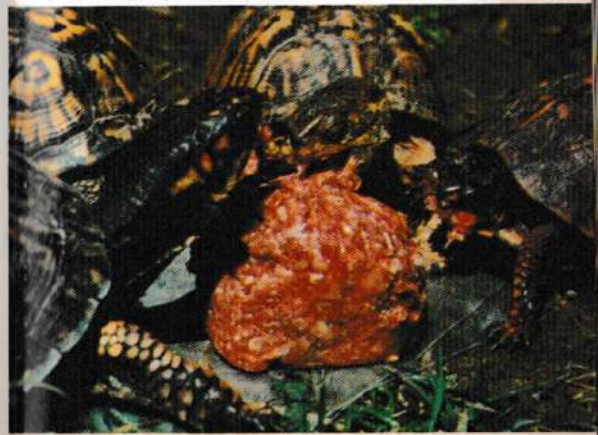


A closeup of the outdoor concrete pool located in the enclosed pen.



Feeding the gel to the turtles in the large system.

Box turtles eating hamburger.





The tripod substructure of treebark sunning platform. Silastic rubber was used to strengthen the bark (the white strips in the photograph), along with 1-inch pine slats into which the plastic tripod legs are mounted. Note the suction cups used to provide a soft contact between the tripod legs and the plastic pool bottom.

bottom edge of the bottle, the other end going to the pump input. A two-inch layer of large gravel covers the screen-protected hose, which in turn is covered with a plastic six-inch diameter coffee can top, perforated with many quarter-inch holes to permit water to flow to the hose.

Above this, six-inch diameter one-inch thick polyethylene foam sponges are placed to serve as filters. (These are easily cleaned in soap and water, after a day or so's use.) The pump itself is mounted on a bracket over the edge of the tank with a hose from its output directing the return water so that it circulates water in the tank.

Several vertical slices were cut in the side of the bottle above the filter sponge line to allow water in the tank to cascade into the filter. It is here that the design is different from other filters. By cutting the inputs to the filter so as to create a downward cascade of water into the filter, floating oil (from the raw fish fed to the terrapins) flows down this cascade and is trapped in the sponges.

We went to this trouble to insure complete filtration so that it would not be necessary to feed the turtles in another container or to have to change their water after every feeding. It was my feeling that the turtles

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This pair of *P. zebra*, male above, seem to be in search of a spawning site.

Goldstein: continued from page 5

Now what is the fuss about the rift lakes? These lakes contain an enormously diversified fauna of cichlid fishes; in fact, the number of species located in these lakes and nowhere else is so great that scientists have not yet agreed on the cause of this burst of evolutionary activity. We will confine ourselves, in what is to us, to Lake Nyasa. Loiselle (*Aquarium Illustrated* 1 (3), pgs. 30-33, 1966) has reviewed the fauna and characteristics of this lake. The water is hard, salty, and alkaline. The fishes of the family Cichlidae can be divided into two major groups, the *Tilapia* species, usually occupying the open waters, and the "mbuna" complex of species, usually occupying the shoreline. The mbuna complex are derived from a *Haplochromis*-like ancestor, and consist of many species of the genus *Pseudotropheus*, and a few species of related genera. These fishes have evolved fairly recently and occupy a wide range of ecological niches. For example, some are plant eaters, consisting of diatom eaters, etc., whereas there are even some which subsist to a large part on the scales of other fishes (Fryer, et al., *Nature*, vol. 175, p. 1089, June 18, 1955). Some have attempted to explain the rapid evolution on the basis of lack of predators (Worthington, *Nature* 173:p. 1064, 1954), but this view is no longer held. Mayr ("Systematics and the Origin of Species," Columbia, 1942) suggested that the species were derived from numerous river populations which entered the lake during a period of desiccation of Africa. Some of these ideas have been discussed by Fryer



P. zebra clearly displays a dominance behavior manifested by color change when the removal of one fish can lead to dominance by another.

Loiselle's advice, I placed them in a 9 gallon show tank with plenty of salt and epsom salts. Our tap water is already highly alkaline, so no pH adjustment was necessary. The change was phenomenal and almost immediate. One of the males colored up intensely in a matter of minutes, assuming a rich medium blue color alternating with his black bands. Later on, the other male colored up, but less intensely. Loiselle has commented on their digging fever, and mine mouthed and sifted gravel and sand all day long, digging under every rock in the aquarium. As the days went by, all the plants died from the hard, salty water, and algae grew on the grass. The fish ate well, algae, beef heart, liver, fish, brine shrimp, and flake dry food. I had no problems in getting them to eat. But they grew as well, and the nine gallon tank soon became too small for the smaller male in company with the larger one and the two females. The fish were then placed in a blister of about 20 gallon capacity. (A blister is the almost hemispherical plastic cover from an old bomber gun emplacement. A number of fish nuts in this area keep them; they were picked up at a surplus store years ago, and have since resided in the homes and garages of a number of local aquarists.) This water was also set up hard, salty, and alkaline, and plenty of gravel and rocks were put in it also. Time went on, and nothing happened. Eventually I placed some other cichlids in the blister, and the water turned green from excess light and the lack of plants to use up the wastes from the fish. Rather than



This pair exhibits the normal coloring of the species which is very interesting but unexciting.

clean out the entire container, I removed half the water and replaced it with tap water; then I placed a large amount of floating plants in the blister in hopes that it would compete with the algae for nutrients and clarify the water. Late that same day I noted a dark baby fish among the floating plants. Because these plants were taken from a tank of *Nannacara anomala* fry, I assumed that I had inadvertently transferred a baby among them; thus, I netted out the baby and placed it in the *Nannacara* tank. Upon close examination, however, I was pleasantly surprised to see that the baby fish was a miniature *Pseudotropheus zebra*. A few days later I cleaned out the entire blister and found four more fry of the same size, all about one centimeter long. The fry were dark, with an iridescent green iris to the eye, and a lighter ventrum which would appear pink after a feeding of *Artemia* nauplii. The vertical dark bands were indistinct, but detectable. (The camera was much more sensitive to the bands than my own eyes, probably because of the magnification involved.) These five fry had survived in an aquarium of many fishes, including several large cichlids in addition to the adult stock of the same species. As I did not know how old these fry were, I did not record the date in my record book. I would guess (working backward in my records) that they became free-swimming at about the time I found them, which would be around the first of April, 1967. At this writing (July 1, 1967) all five are alive and vary from an inch and a half to an inch and three-quarters. They are now with

the adults and all get along quite well.

Two subsequent spawnings were recorded, with alternate females, one on April 12, and the other on May 7. The same male (the larger one) spawned with both females. For a time the smaller male had to be removed as he was badly beaten by the larger male and by the females. Both spawnings occurred out in the open rather than in any of the caves available to the fish. The procedure was typically *Haplochromis*-like, the male displaying with trembling movements over a cleaned section of the bottom. This is in contrast to Loisel's observations with *P. auratus*, which apparently spawned in a cave.

I probably interrupted the April 12 spawning, as I ended up with only a single one-eyed baby after 20 days incubation. This was subsequently lost, although it too was about one centimeter long. But I must discount the data from this spawning, as the May 7 one was probably a better model for the species.

Spawning activity was noted in the afternoon of May 1; in order not to chance interruption of spawning, the female was not removed to a private aquarium until that evening. The female's jaw was somewhat depressed but not as much as in other mouthbrooders (e.g., *Tilapia* and *Haplochromis*). The gentlemen in Chicago noted very enlarged buccal cavities, typically mouthbrooder, in their spawnings of other species of *Pseudotropheus*, but in several spawnings of my *P. zebra* I have never noticed great enlargement. During the incubation period the female took no food, although offered live adult *Artemia*. Her tank contained ordinary dechlorinated tap water and floating plants. Only toward the last week of incubation did her buccal cavity seem unusually enlarged, and even this was nowhere near what I am used to observing among mouthbrooders. On June 3 she dropped her young, for a total incubation period of 27 days. I removed her to the blister, and then proceeded to remove and count the fry. I removed 21 fry, all about one cm in length, and with no trace of a yolk sac. Two days later I noted three more fry in the blister, of the same size, which I conclude were still in her mouth when I moved her. Thus, she had at least 24 fry. What is so remarkable is the size of the fry and the small size (to all outward appearances) of her mouth cavity. I was reminded of the little guy who could eat like a horse and claimed to have a hollow leg!

The fry are doing fine at this writing, eating well, and growing in a 20 gallon tank with some killifish fry. They do not fight with the other species, and only seem to bully each other gently. None of them appear in any way "weak."

The water with the adults is no longer specially prepared, but is ordinary tank water. I use no heaters, and the tanks are all cool. The fish are doing quite well. With this rather verbose description, I should like to introduce you all to Lake Nyasa cichlids in general, and to the very

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pleasing *Pseudotropheus zebra* in particular. I hope many of you will take advantage of the references to some of the important literature which I have presented at the beginning of this article. The use of maps and scientific literature should be considered essential to an appreciation of these fishes.

PSEUDOTROPHEUS ZEBRA

By HENRY F. LEE, M.D.

WHEN THERE WERE STILL ONLY a few *Pseudotropheus zebra* in this country, I was overjoyed to receive six of these beautiful fish. They were about one and a half inches in length and arrived through New York from Dakar in good condition. As always with new fish I was confident that I could have them spawning in no time at all.

For the aquarist the brilliant fishes of Lake Nyasa are new and exciting additions. Here at last are fresh water species reminiscent in color and pattern of the coral reef fishes of tropical seas. In the remote lakes of South East Africa there has apparently evolved an evolutionary pattern somewhat parallel to that of the coral reef fishes. These lakes were never, as some have said, arms of the sea. True they are of somewhat higher salinity than most bodies of fresh water, but nowhere near the concentration of the ocean. Curiously enough, the molluscs of the area have also followed evolutionary patterns somewhat in parallel to their distant kin in the sea.

Upon arrival, my fish were a uniform slate-blue in color and not too thrilling in appearance considering what it had cost to get them from their home to my home! For reasons soon to be clarified, I failed in my attempts to breed these fish. In a sense it was a beginner's failure. However, these beautiful fish were then new imports and it was not possible to turn to the literature for help. When I first received them I knew only that they were cichlids, came from Lake Nyasa, were reported to be aggressive, and would eat almost anything. With this much information available I proceeded on general cichlid terms giving them a fifty gallon tank with rock piles, sunken wood, flower pots, plastic plants, active filtration and a seventy-five degree temperature.

They were shy at first but soon became unusually tame and would take bits of meat from my fingers. They will eat, literally, anything edible. I fed frozen beef heart, red worms and shrimp plus large helpings of dry flake food. They eat at the top, in midwater and at the bottom and will poke their heads a good inch above the surface to get bits of food stuck on glass or rock.

They are not fussy about water conditions but I soon learned that Lake Nyasa water is high in "salts." No actual water analysis was

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available to me but I gradually added pure salt until the content of the water was one level tablespoon per gallon. A few days later magnesium sulphate was added to make a concentration of one-half teaspoon per gallon. The pH by this time was 7.8 and the hardness better than 200 parts per million. In this water one fish developed the beautifully intense color shown. All grew rapidly, but only one achieved this bright color.

They were fat, sassy and aggressive toward all other fish that I tried adding to their tank except clown loaches and plecostomuses with which they lived in perfect harmony. To my surprise my group of large clown loaches (one-and-a-half to two inches) were never in finer color than in this hard and very saline water. The orange and black of the clown loach is a marvelous color contrast to the brilliant blue of *P. zebra*. Other fish of many types were tried but were chased until dead or removed. However, many varieties were considerably smaller than the *P. zebra* and it is possible that some species such as angel fish might be kept with them if sufficiently large. After eight months, the largest of the six fish was over five inches in length, the smallest about four inches.

In general, if one obtains six fish of a variety one expects there will be at least one pair; banking on this, I awaited signs of spawning activity. There was plenty of motion. Mounds of gravel were moved here and there. Tunnels were dug under rocks. Plastic plants were dragged about. There were sham battles but no torn fins. On several occasions I saw two fish locked mouth-to-mouth in terrific tugs of war. For days after these battles at least one fish would have sore, swollen lips—a thing I have encountered with red devils, orange chromides, jack dempsseys and other cichlids.

When the fish had reached what I then thought was full growth, I decided to remove the colorful one for some special photographic efforts. He was placed in a carefully prepared smaller aquarium with water from his usual tank. Thereupon, his color decreased and did not return after the fright of moving was over. He remained healthy and vigorous, but somewhat dull and I soon learned to photograph these fish in a tank with others of their own kind if I wished one at least to show maximum color.

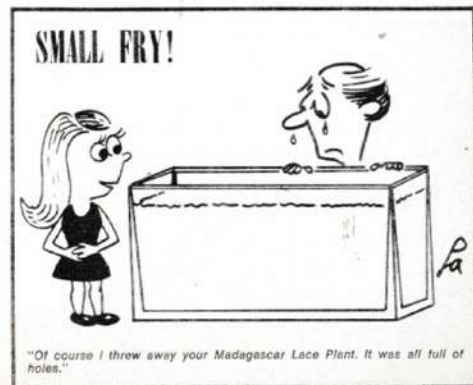
The morning after removal of this fish, I was surprised to find that one of the five remaining in the large tank had taken on the brilliant blue and black color phase. This was an intriguing situation and suggested that a "dominance balance" had been upset by the removal of the first fish. I had seen no damaging fighting and there had been no apparent demarcation of territory within the big tank—no defence of dugouts or caves; no evidence of pairing off in defense of a female. In cichlid communities male fish will fight to establish dominance in a social group; to establish a "territory" or to segregate a female. I had seen no serious fighting suggestive of the above, yet here is a manifestation possibly of a

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relatively peaceful "dominance signal."

The next step was obvious—I removed the now colorful fish leaving four in the large tank. Three hours later one of the four had developed the brilliant color while the other three remained slate-blue. At this point it had been demonstrated that at least three of the six fish were capable of the brilliant color phase and I returned the two previously removed individuals to the big tank. By the following day there was again only one brilliant fish and it was quite obviously the dominant member of the group. Constantly chasing and threatening the others, he never really did them any damage.

Over a period of weeks I determined that all but one of the six were able to adopt the full color pattern and its accompanying dominant behaviour. Thus, social dominance in *P. zebra* may be shown by color exhibition in the absence of real fighting. The question now arose as to whether I had five males and one female. The smallest fish had shown no sign of "ripening." At this point an accident in the form of a cracked heater glass, overheated the tank and four fish were killed. The remaining two, one of which was the smallest, survived and recovered. Dissection of the four that died, revealed that all were males. Previous color change by one of the survivors suggests it certainly was a male. Thus I had five males and one possible female. All my fish had the golden spots on the anal fins and I do not believe these spots can be used to determine sex of



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P. zebra. The two remaining fish continued to grow and to live in peace—one colorful, one dull, but with no signs of spawning. The larger of the two gradually developed the long dorsal fin-tip characteristic of many cichlid males.

Meanwhile my other tanks with other varieties of cichlids were swarming with fry, but *P. zebra* within the limits of my six fish remained something of an enigma. Enigmas are fascinating! To the beginning aquarist nearly everything he sees within his tank is new. There is such a wealth of material available that he can continue for years to explore new fish, new plants and new combinations of interest and beauty.

An observation made many times before is yet brand new to the person seeing it or understanding it for the first time. If this were not so, it would gradually become a dull world indeed for all of us. Certainly dominance behaviour manifested by color change is not unique in nature but *P. zebra* brought it clearly to my attention for the first time and revealed how very rapidly the removal of one fish can lead to dominance by another in a group.

P. zebra are big, vigorous, brilliant and active fish. No doubt others will soon report their spawning behaviour. Right now I have re-learned what I have known for a very long time—put six males in the same place at the same time and one will soon be "Chairman of the Board!"

Hoke: continued from page 42

would enjoy a more natural existence if some way of feeding them in their own tank could be worked out, and thus minimize having to handle them so much. Oil collecting on the water surface was the main problem (other debris being easily handled with such a turnover of water in the filter). The cascade filter worked well as a way of collecting this oil, and so my turtles are fed right in their tank. This has resulted in the preservation of their natural independent behavior.

A place to bask and dry off is important to turtles, so I constructed a ramp using a section of tree bark. It is strengthened from beneath by contoured slats of pine, mounted on three plastic legs with rubber suction cups on their ends to protect the bottom of the tank. Placed in the tank which was illuminated with a 150-watt flood lamp, it provided a place the terrapins could climb upon to get warm and dry. To help make the scene appear more natural, I carefully spread aquarium gravel and rock about the floor of the tank not to puncture the pool plastic.

Two large *Plecostomus* catfish were included to aid the bottom-feeding chelonian scavengers, the snappers and musks. They all help to keep the tank clean by constantly scouring the bottom for food dropped during feeding.

When it came to plants, I discovered that the terrapins quickly

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devoured most any leafy plant placed in the tank with them. I therefore tried using plastic plants. The turtles tried to eat them also, but in vain, of course. A few real plants with woody stalks that held their leaves high out of water did survive for a while, but sooner or later these were eaten also.

An important element of keeping turtles healthy is a good diet. For the tortoises, this was generally no problem, Hamburger or dog food, salad greens and vegetables, grubs and insects from the garden, and even cheese, kept them healthy; they would try most anything offered, and showed a marked interest in tomatoes and banana peels. For the terrapins, feeding was no great problem either for they enjoyed raw or frozen fish, aquatic and salad greens, and such wild greens as dandelion leaves and basil. All helped to keep them healthy.

But in spite of the terrapins' vigor and their voracious appetites, in time I began to notice marked shell degeneration or softness among many of them. I scoured the books and sought advice from the terrapin enthusiasts and experts I knew for a clue to the solution of this problem. One suggestion that seemed most promising called for a diet supplement to be given periodically in a gelatin mix that would contain the bone and shell-building ingredients that apparently were absent from their present diet.

After considerable experimentation, the recipe for this mix most readily accepted by the terrapins contained the following:—

1. Two oz. of fresh fish (frozen smelt is also good).
2. Eight oz. of boiling water.
3. Three oz. of Purina "trout chow", ground up into a powder (feed stores sell it), or similar amounts of good quality tropical fish food.
4. Two oz. of cod liver oil.
5. One and one-half oz. of unflavored gelatin (Knox is the brand I used).
6. One and one-half oz. bone meal (garden supply stores sell this).
7. One teaspoon of diabolic calcium phosphate (drug store item).
8. Twenty drops of red food coloring, to make the gel more attractive to the terrapins' taste.

The gel mix is prepared as follows: the fish is minced into very small pieces (you can use a Waring blender for this, adding the oil at the same time) into a cup containing the measure of cod liver oil. The gelatin is dissolved into the water, and to this is added the fish and oil. The trout chow or tropical fish food is added next, along with the bone meal and diabolic calcium phosphate. Lastly, add the food coloring.

The mix is then poured into a shallow pie tin or dish to gel. It will keep in the refrigerator for several weeks. I found it best to feed the gel before feeding the regular food. I cut it into thin strips from the

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refrigerator dish, and then diced it right into the tank. This allowed me to make sure each of the turtles received a fair amount of the gel with its important diet supplements. Making up a mix a month, and using it over a period of one week, provided sufficient supplement to their regular feeding.

The shells of my terrapins began to harden again within two weeks of their first feeding (which I kept going for three weeks). The monthly addition of the gel to their diet solved the soft shell problem from then on.

One of the ingredients of the mix—the trout chow—proved to be an excellent and inexpensive general-use food in itself. Number 5105 (sold by Ralston Purina through feed store outlets) is the best size of trout chow to feed terrapins as it comes in pellet size bits that float until eaten. (Small pieces that are crunched up and sink to the bottom are quickly picked up by the bottom feeders.) Though a good general food, care had to be taken not to over-feed with it, for if any remained it would spoil and pollute the tank.

Another very important health factor is cleanliness. This was well provided for by the filter, as well as by the bottom-feeding life in the tank. Many disorders, such as fungus problems, were prevented by providing an area where the turtles could completely dry off and get warm.

But in spite of all my efforts, sometimes the turtles developed digestive disorders or infections. The most common problems seemed to involve respiratory ailments, generally brought about by drafts, chills, or a lack of a humid atmosphere indoors. Some of them responded to an oral penicillin commonly prescribed in liquid form by physicians for use by infants and young children. Penicillin also proved quite effective as a treatment for digestive tract problems. When the treatment was effective, the turtles were well within a week.

For open sores and eye infections, the same antibiotic ointments made for human use usually proved quite effective. One in particular, chlorimycetin, comes in a liquid form easily administered with a small cotton swab. Some of these medicines are prescription items, but most physicians, knowing what you are trying to do, will usually help you with needed prescriptions.

Fungus is another problem, although one usually avoided if the tank is kept warmer than 70°F and if the turtles spend enough time under the lamp to dry off from time to time. But when it does occur, a salt dip prepared at about the strength of sea water works well. The afflicted turtles are put in it for about fifteen minutes a day until cured. It is also a very effective way to rid fresh-caught terrapins of leeches. Once, when the entire system needed treatment for fungus, I used a tropical fish fungicide from an aquarium store, mixed at the strength indicated on the bottle. It worked well, and such complete-system treatment has not been

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Detail of the filter assembly, showing the pump and heaters in the background. Polyethylene sponges are used to filter solubles from the water and to trap floating oil that cascades into the filter through the slits in the filter container that extend above the water line.

needed since. Turtles, like people, get sick from time to time, and will often respond to treatment in the same way as a person if the treatment is the right one and is administered promptly.

Although keeping tortoises and terrapins has necessitated quite a deal of work—to keep up with their requirements for living and attending to their problems—they have more than made up for it just by being so interesting and attractive. They are so well constructed for life, with their hard shells and adaptive ways, that I think they might well outlive man. It was a real thrill to bring indoors such a substantial piece of nature's fauna for the winter and to have the chance to observe and experiment with it. That it went so well, made it all the more enjoyable.

That it wasn't too difficult to do, leads me to feel that a similar system would work well in a schoolroom. This would make it possible for students studying such animals to gain first-hand knowledge and understanding about them, and to learn how friendly creatures they are.

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Powers: continued from page 16

are planning another open house exhibit early this spring. Whew! If that is the case I hope Hubcap makes arrangements for a protective screen over my aquarium. (I'm somewhat reluctant to admit that along toward the end of the exhibit, actually when I realized no ribbon was forthcoming, that some of those plump fingers splashing around in the water started to tempt me.)

Most of our days now are taken up with just lazing about. Hubcap's been rather nervous these past few days. Keeps muttering that I'd better be on my best behavior when the photographer gets here. Photographer!!! Excuse me. I've got to get myself together.

Where was I? Oh, yes . . . ●

Roberts: continued from page 20

with the result that the adjustment causes the temperature of the tank to rise five to ten degrees or more.

Whenever any circuit-breaker activates a relay, all pilot lights of the circuit breakers connected to the single safety panel involved turn off, and electric current to all heaters connected to the safety panel is terminated. Therefore, a single pilot light or single warning light is the only light needed in connection with each safety panel. Whenever a relay becomes closed, the circuit-breaker responsible for closing it can be detected either by observing which of the aquaria has a temperature above what it should be, or else the points in circuit-breakers can be observed to see which ones are closed.

Relays will remain closed during periods of weather so warm that the air temperature forces the water temperatures above the points set for shut-off. The switch connected to the bell or buzzer would be left in the OFF position during such hot weather periods.

If the relay produces too much of a hum or buzz when it is activated, remove its spring (shown as "s" in the diagram) and replace it after pulling its ends farther apart so as to reduce spring tension, or bend the hook (h) upwards. Also, a loud buzz or rattle can be produced if the coil mounting becomes loose on its base; the screw or bolt that holds the coil mount to the relay base then needs to be turned so that the connection is tight.

Electrical contact points of circuit-breakers tend not to become damaged by sparking because these points rarely open or close; they close only when connected thermoregulators perform improperly, and during the trial and error setting procedures.

I place sufficient importance upon the safety panel precaution to see that all of my aquaria (ten at present) contain circuit breakers. Cost of materials for a complete panel with one circuit breaker amounts at present to about \$17.50. Thus far, time for construction of a single safety panel

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with a single circuit-breaker attachment has averaged about an hour and a half counting time involved in finding and purchasing parts.

If the blade in a circuit breaker were left in its original thermoregulator position (that is, not turned over), its control could be set so that it would make electrical contact to complete the circuit at about two degrees below the thermoregulator setting, thereby closing the relay and setting off an alarm should a thermostat fail to keep an aquarium sufficiently warm. A special heater, connecting wires for which could be electrically linked through the relay, could start functioning at the same time. ●

Klee: continued from page 33

least identify in an approximate fashion the many new fishes that were being sent to this country by German exporters. To fill this need, the German book, *Ichthyologische Bilderatlas*, was imported in quantity. It was low-priced, contained no text (which was fortunate for American Aquarists!), but it had a tremendous number of pictures, good and bad. It filled the need of the hour and made its author's name a household word among American aquarists and dealers (who used the book to supply names to new importations). The author was Christian Brüning who edited the famous German weekly magazine for aquarists,



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Wochenschrift. The concept of a weekly magazine for aquarists is one difficult for Americans to comprehend, but this was typical of the extent of the German interest in tropical fishes in the 1920s!

The largest fishfarm in the country during this period was Schaumburg's Crescent Fish Farm in New Orleans. Bettas sold for \$7.50 a pair (= about \$12 in today's currency), swordtails \$3.00 a pair (= \$5); rosy barbs, blue acaras, Jack Dempseys, *Aplocheilichthys chaperti*, paradise fish and platies sold for \$1.50 a pair (= \$2.50). In 1929, however, one-year-old angelfish were still \$12 a pair (= \$20). Young angels cost \$2.50 each (= \$4.00)! The large tank manufacturers of the day were Halterbeck (with its "Peerless" brand) and Hans Jensen (with its "Jewel" brand). However, towards the end of the 1920s, an aquarist named M. Raymond Potts, of Caldwell, New Jersey, started making tanks under the firm name of the Potts Aquarium Co., Inc. Potts, who was an aquarist, obtained several backers and started producing a new kind of aquarium. Prior to this time, most aquariums were made of either cast iron or sheet metal. The former was heavy, and the latter rusted easily. Potts, who was treasurer of the firm he founded, came out with a brand-new idea—sheet metal that didn't rust. Thus the first stainless steel tanks were made available to the American aquarium hobby. This was definitely an American innovation, not popularized in Europe until after World War II. In 1931 the name of the firm was changed to the Metal Frame Aquarium Corporation, although "Potts Aquariums" were still featured. Today, the firm is internationally known as Metaframe, Incorporated.

Aquarium Keeping and the tropical fish hobby grew mightily during the 1920's, especially from 1927 onward. In 1929, of course, the great Crash occurred, but the hobby was affected very strangely. As economic indicators dropped, tropical fish keeping rose to heights that seemed dizzy to the old timers. No one has properly explained it to this day, but according to Dr. George Myers: "I suspect it was due primarily to two things—a desire to become absorbed in a hobby and forget monetary troubles, and the hope of making a few dollars by breeding fishes". Whatever the cause, the hobby took a number of giant steps as it entered the 1930s. This decade was to produce many new stars and events.

To be continued.

Societies: continued from page 31

for further information regarding the club or its publication.

Anyone interested in the Great Debate started by the AQUARIUM magazine concerning the use of tubifex worms for feeding tropicals should get a copy of the December issue of *The Wet Pet Gazette*, published by the Norwalk Aquarium Society. Here several of the pieces, both pro and con, have been reprinted. Joe Torres, Joe Anas-

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cabage, and T. Borrelli are the authors of the replies and rebuttals that have appeared in *Aqua Jewels* (published by the Aquarium Society of Broward County) and *Fin Features* (published by the Central Ohio Aquarium Society). Aside from the sound and fury expressed in this material, there can be found considerable information on preparing tubifex before feeding it to fish, the hazards of using it, and benefits derived from it. *The Wet Pet Gazette* is published by the Norwalk Aquarium Society and correspondence regarding it should be addressed to Editor Jean Lucas, 361 Sylvan Knoll Road, Stamford, Connecticut 06902.

Frank Officer's *Annectens, Anyone?* is one more invitation to try the dwarf cichlids and his commentary on *Pelmatochromis annectens*, appearing in the December issue of *Ichthus*, is persuasive despite the chagrin he experienced when his adventure began with this particular species. Looking for a pair of dwarf cichlids to include in a community set-up for a show, he found a pair of *P. annectens* and, two weeks before showtime, he put together what he considered an attractively arranged aquarium containing some small tiger barbs, an especially colorful female betta, two hard-working *Corydoras*, and his pair of *P. annectens*. All went well with his integrated community until a week before the show when the pair of dwarf cichlids decided to raise a family and understandably raised Ned with the other members of the tank. There was nothing else to do but remove the offenders to the breeding pair and set up another show tank sans prize furnishings of colorful rocks, choice plants, and compatible pair of dwarf cichlids. Because the species is particularly attractive and considered difficult to spawn, the author offers suggestions on procedure. He used a 10-gallon tank equipped with a sub-sand filter. No. 1 red flint gravel covered the aquarium floor and few plants were present. The spawning rock should be at least an inch higher than the fish are long, he tells us, the pH was 6.2 at time of spawning, and the temperature was held

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fairly constant between 78 to 81 degrees F. The female chose the back of the rock for her spawning site which was vigorously cleaned. In his description of the actual spawning, he notes that the colors of the fish are intensely vivid and the spot above the female's vent was as bright as a "miniature, newly-minted dime." The eggs are white and tiny at first and they grow dark and larger. The eggs hatch in 48 hours and the fry drop to a depression in the gravel where they remain some five days after hatching. On the fifth day they swim in a cloud behind the female and the author notes that there is some argument between the pair who is in charge. The female wins at first but later the male recovers from his pouting period and the pair begin to spell one another. The dispute worried the author and he finally removed the pair and raised the fry himself. The pair's second spawning occurred 24 days after the first. We have only skimmed the information given here and dwarf cichlid buffs will gain more defined information by reading the original article. Nancy Ann Goertner's *Characteristics and Breeding of the Orange Chromide Cichlid (Etroplus maculatus)*, also appearing in this issue will interest those in the cichlid fancy. *Ichthus*, published by the North Star Aquarists, is an exciting bulletin, filled with a wealth of original material by competent writers. An occasional cartoon adds to its entertainment value and the one that made us chuckle this month shows two white eyes on a black background asking: "Think you have problems? How would you like to be upside-down, whiskered, nocturnal, . . . and scared of the dark?" Write to *Ichthus*, North Star Aquarists, 8344 Humboldt Avenue, South Minneapolis, Minn. 55431 for information regarding the society and its publication.

There is a brief discussion on Doradid catfishes in the January issue of *Fish Tales* (published by the New Orleans Aquarium Society), unsigned, entitled *A Beautiful Doradid Cat* which singles out *Platydoras costatus* as being especially qualified for janitorial services in an aquarium situation where one large fish is featured as the star of the

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show. This fish is also designated as *Doras costatus*. The Doradid catfishes are commonly referred to as "talking catfish" and hobbyists who have never been privileged to own one of these loquacious scavengers and have been curious about them will find considerable information in this article regarding their aptness as aquarium subjects. *Doras (Acanthodoras spinosissimus)* is the species that has found its way most commonly to home aquariums and owes its popularity to its common designation which indicates it has the gift of gab. Many writers of aquarium literature, however, have pointed out that this propensity is overrated and, despite its bizarre appearance, it is essentially shy and seldom seen, if ever heard. Thus, its self-imposed seclusion, in the opinion of most writers, rules it out as a first rate successful aquarium fish. Be that as it may, the talking catfish is often the subject of inquiry in our mail, and here we have a species possessing not only the ability to make sound, the grotesque appearance of a bewiskered thorny-finned oddball, but also dramatic black and white markings, plus, according to this author, a not too retiring nature. Although it may take a while for this fish to show up at feeding time with its tankmates due to its natural tendency to feed during twilight hours, we are told it eventually does make the adjustment. *Fish Tales* is a rather slim bulletin, usually carrying one article, plus

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club news. In that the name *Fish Tales* has been used and is presently used by two other aquarium societies, it might be well for the club to find another. It is well-produced and its society news indicates a lively society which meets the second Wednesday of each month at 8 p.m., at the City Park Casino (2nd floor) in New Orleans. Write to the New Orleans Aquarium Society, 3501 De Saix Boulevard, New Orleans, Louisiana (Zip Code omitted).

"What Makes a Good Club?" — Ted Hilton asks the question in the January issue of *Mollie's Manual*, published by the Swansea Aquarium Club (of Toronto, Canada), and answers it succinctly in three words — "An involved Membership." Between his question and answer, however, are a number of observations that might be considered by well-established as well as newly formed societies. He explains that there are many mundane chores that must be tackled before a group has a place to meet, can pay its bills, or enjoy well-organized meetings. These chores necessitate a small group of people who are willing to meet regularly together and expend energy, time, and whatever organizational ability they possess to see that these not too stimulating matters receive the attention they require. He then goes on to delineate the way the general membership can assist in making the society a lively one. The author does not, however, put

his finger on the mysterious catalyst that brings people together and persuades them to work as a single unit. Such mystique shows up, nonetheless, in every walk of life, and although the writer of this piece neglects mentioning this quality of leadership, it is apparent that he is aware of it. In fact, his article is the expression of such a leader, and we are not surprised to discover Ted Hilton is the President of the Swansea Aquarium Club. This issue also carries Earle Wellwood's *Breeding the White Cloud* which begins with the story of the species and how it became a favorite aquarium subject when the hobby was very young and still enjoys considerable popularity. He then goes on to describe his approach to spawn this fish that is often singled out as easy to breed and at the same time deemed difficult by experienced hobbyists. Apparently this writer was working without the advantage of literature on the spawning of *Tanichthys albonubes* and he based his method of procedure on what he knew of the natural habitat of the fish. Not knowing the precise pH desirable for the species, he mixed snow water with softened tap water, taking a middle of the road route, and aiming for medium hard water with a neutral pH. The temperature used was 68 degrees F. and he chose a tank that was 4 feet long and 18 inches wide (certainly large quarters for this little fish that can be handled in a 12 by 8 by 8-inch aquarium).

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The tank was furnished with anchored spawning mops at one end and the aquarium floor was covered with gravel. Six females and seven males were used, and they were separated and fed well on brine shrimp before placed in the spawning tank. When the conditioning period terminated, they were all introduced into the spawning tank at the same time, and remained there for six days. A 15-watt bulb was used at the end of the tank devoid of spawning mops. They were fed live brine shrimp for the six-day period. As soon as the breeding fish were removed, youngsters began to appear, and each day showed additional ones. Because the eggs were hatching according to the time they were laid, the fry were in various stages of growth. Some were taking newly hatched brine shrimp while others were still just beginning to sample egg yolk. After five weeks the author removed the youngsters to four tanks set up for the purpose. He does not give the capacity of these tanks but he does say that he was not prepared for 2,200 fry. He ended up with 400 in each tank and the remainder were left in the spawning tank. He stresses the importance of not allowing the water to foul and suggests using one cup of salt to 10 gallons of water as a preventative measure against velvet, a disease to which this species is subject. *Mollie's Manual* is one of the fine bulletins that comes out of Canada. It is well laid out and has a smart cover

design. It carries original as well as reprinted material and its club news reflects an active, well-established society. Although the mast-head indicates the society engages in the exchange of bulletins, no address is given or name mentioned for this particular activity. Bill Dey is Editor, however, as well as Vice-president of the society, and we suggest that inquiry as to the publication and the society be directed to him. His address is: 22 Glamis Avenue, Toronto 9, Ontario, Canada.

The New Orleans Aquarium Society would like to hear from other societies to the end of exchanging ideas and information. Write to Mrs. Helen Sweeney, Secretary, New Orleans Aquarium Society, 5623 Mandeville Street, New Orleans, Louisiana 70122.

Mr. Lawrence A. Rupert informed us that a new group, called the Valley Aquarium Society, has formed in Lock Haven Pennsylvania. A membership drive is now in progress and the society publishes a newsletter called *Tank Talk*. Mr. Rupert will be happy to hear from other societies and to receive copies of their bulletins. Write to him in care of the Valley Aquarium Society, P. O. Box 121, Lock Haven, Pa. 17745.

Another new group has formed called The Billings Aquarium Society. Information regarding this association may be had by writing Mr. Marshall S. Caswell, President, Billings Aquarium Society, 2914 Stinson Avenue, Billings, Montana 59102.

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The Milwaukee Aquarium Society will hold its 14th Annual Fish Show May 16 from 9 a.m. to 5 p.m., May 17 from 9 a.m. to 9 p.m., and May 18 from 9 a.m. to 5 p.m., 1969, at the Mitchell Park Pavilion, 524 S. Layton Boulevard, Milwaukee, Wisconsin. Exhibiting is open to members only but the public is invited to attend free of charge.

The First Annual National Tropical Fish Show will be held by the Gold Coast Aquarium Society May 13 to 18, 1969, at the Northside Shopping Center, N.W. 27th Avenue and 79th Street, Miami, Florida. There will be 25 classes devoted to guppies, bettas, livebearers, egg-layers, killifish, oddities, etc. This is an open competition to hobbyists and there is a fee of \$1 per entry. Write to Louis Wasserman, Chairman of the Show, 2711 S.W. 53rd Ave., Hollywood, Florida 33024 or telephone 1-305-981-5528 evenings, for further information.

The Huntington Aquarium Society will hold its Annual Show at the National Guard Armory in Huntington, Indiana, April 13, 1969. There will be a competition for tropical fish generally plus a guppy show. Write to Mrs. Gale Schmid, Secretary R.R.w., Huntington, Indiana 46750 for further information. ●

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several flat rocks (no sharp edges) and a partial change of water should be made about every 10 days. The temperature should be maintained in the mid-70s and the aquarium should be kept clean by siphoning off droppings and uneaten food when necessary. The spawning is accomplished in true cichlid fashion. Usually the female begins by cleaning off the area where she has chosen to lay her eggs. The male may offer some assistance but this depends on the male in-

olved. Some are prone to let the female do all the chores. The eggs are large and the male follows the female as she lays them and after the spawning is completed, the eggs are guarded by either fish, or by both, or by one spelling the other. The eggs hatch by the third day and the babies become free-swimming in from five to eight days. A first food is newly-hatched brine shrimp and after a week the youngsters can be fed on a variety of foods such as minced washed canned

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shrimp, chopped earthworms, frozen adult brine shrimp, etc. In our experience we have found that keeping the youngsters with their parents works out very well besides being a delightful experience watching these big fish take care of their fry. Artificial incubation of the eggs is feasible, if preferred. We removed all but 12 of the youngsters when the babies became as large as dimes. The 12 remaining youngsters were removed when their parents showed no more interest in them.

From: Jeffrey Sacks, Bethlehem, Pa.
I have had a lot of luck with pink congos. Would it be possible to breed an original congo with a pink congo? Would I get a different color?

Answer: It would be perfectly possible to breed a pink *Cichlasoma nigrofasciatum* with a normally pigmented specimen of the same species. The result would be normal (gray) young; if these were interbred, there would result 50% normal and 50% pink.

From: Paul Hak, Clifton, New Jersey
I have just purchased two scats. As I have been unable to locate any literature pertaining to their upkeep, I thought you might be able to offer some advice.

Answer: These are lively fish and should have ample swimming room. They do not harm other fish as a rule and can be kept in a community tank. They are brackish water fish and although not essential, some salt (aquarium grade) in the water, perhaps a tablespoon to a gallon, will be an aid to their well-being. They will take live and prepared foods but vegetable matter should be provided as an important part of their diet. Algae should be allowed to grow on the back and side glasses for their benefit and cooked spinach and lettuce should be offered daily. Temperature of the water should be maintained in the mid-70s. These are rather hardy fish if the diet is proper and they are given plenty of room. ●

Tetra Tickers

By LARRY ARNOLD



The mormyrid (elephant-nose) that gave the author's orangethroat darters a difficult time — *Gnathonemus stanleyanus*.

Walker: continued from page 35

of small earthworms or other wiggling creatures which at times may not be available in quantities to go around to all. The alertness and unusual accuracy of aim of these little perches will usually allow the owner to cater to their persnickety appetites. In a pinch, most will also eat freeze-dried tubifex and frozen or freeze-dried brine shrimp.

There are a few special considerations which must be kept in mind by anyone wishing to keep any of these very special little creatures. I doubt, however, that "Breathes there a man with soul so dead" that, after keeping darters for a period long enough to be considered successful and long enough for the darters to become accustomed to aquarium living and dependency, would not feel so aquaristically enriched that any extra trouble required would seem completely inconsequential.

Of the seventy to one hundred species of darters, most inhabit cool or running water, or a combination of the two. For this reason, heavy aeration is almost essential. Fluorescent lighting is to be preferred because of its coolness in comparison with incandescent. While bright lighting is not appreciated by many fishes, darters are not in the least bothered by it because they are sight hunters and high illumination aids them in spotting their prey and pouncing upon it. "Pounce" is an accurate description of the strike of a darter, and old Tabby would do well to emulate their accuracy.

Very important is the fact that, since some darters have no gas

bladders, suffering from insufficient aeration is not preceded by the customary warning signal of fishes sucking at the surface. An hour of non-aeration in a warm tank can kill them.

The orangethroat darter, *Etheostoma spectabile*, could be considered "typical" of the rainbow group since the requirements for all are essentially the same. The fact that this is perhaps the most widespread of the more colorful etheostomatins not only increases the chances of this being one of those obtainable in a particular area but also indicates the probability of greater adaptability and wider tolerance toward conditions.

I am guilty of having inadvertently created what could easily have been an ecological nightmare for several orangetthroats which I have been keeping for some time in a well-aerated, heavily plastic-planted ten-gallon aquarium. I rather suddenly came up with one of the blunt-nosed mormyrids, *Gnathonemus stanleyanus*, with no available aquarium where live food would have been at all practical. Since this fish was to be well conditioned preceding a series of electro-navigation experiments*, into the darter tank he went since their standard fare was a diet of bite-size baby earthworms which would be perfect for this purpose.

As stated earlier, darters are sight hunters, and they also are apparently dependent on eye-balling their way out of sticky situations. Obviously, they had never heard of radar or the like!

Being outweighed by several times and much less than half the length of the mormyrid hardly dented the enthusiasm of the darters, especially since most of the family Mormyridae are decidedly crepuscular-to-nocturnal in their habits. Feeding was continued in the bright light to be sure the darters got their share, with a later, unlighted feeding to insure at least a morsel or two for the elephant nose. It was completely unnecessary.

Even in the first few days of relative shyness, the excitement of the darters at feeding time was sensed by the mormyrid and out he would fly into the midst of the smaller fish, occasionally bouncing one with a hard lick but more often simply scattering them. After a few passes, they avoided him rather easily, simply hopping out of his frenzied way.

When the lights went out it was a different story because even the quickness and the somewhat lead-bottomed but still enviable agility of the little darters was not designed for night-fighting a "radar-equipped" adversary. Almost as if being thwarted had multiplied his rage, the mormyrid bounced the darters around almost unmercifully in the darkness and semi-darkness.

Ordinarily I would not allow this to continue, but since no physical

* The Mormyridae or elephant-nosed fishes of Africa and the gymnotoid knife fishes of South America produce weak electrical signals to determine information about their surroundings.



A less-colorful darter, but easily kept in the aquarium — the Rio Grande darter, *Etheostoma grahami*.

damage was evident and a rather interesting conflict between two entirely different and highly intelligent types of fishes from opposite sides of the world presented itself, I decided to let the situation develop at least for the time being to see what, if any, adjustments might be made by the fishes involved.

The several mormyrid species which I have kept have all seemed not only extremely intelligent but also highly competitive. Being considerably outnumbered by Lilliputian tankmates which were not disturbed by feeding in the bright light resulted in the mormyrid abandoning the light-shy way and jumping into the fray when the darters were being fed. Each day there was less hesitation and within a week the light was completely ignored.

Darters, especially males, are also competitive. The competition is limited to their own kind, however, and is most intense at breeding time. At first they seemed puzzled by the bombardments of the larger fish which obviously did not want to eat them. A defense plan was soon worked out which perhaps happened accidentally but is now used with what surely seems to be purpose. It is based on the fact that one fox cannot catch eight rabbits which hop in eight different directions. Showing absolutely no fear, they now go about their business normally, having mastered the sidestep even in semi-darkness. They get their share of falling or fallen morsels through their ability to zero in faster with

eyeballs than the mormyrid does with electronics, and he gets a lion's share through sheer aggressiveness and a slower but more accurate location system.

Orangetthroats, as with many of the darters, can be kept in a "tropical" aquarium as long as the water is well aerated. In possibly the most informative and extensive coverage ever given on darters from the aquarist's point of view, Dr. Kirk Strawn (who was, at that time, at Texas University) gave in *Aquarium Journal*, December 1955-January 1956, temperature and breeding requirements for three Texas darters which ranged ideally from high 60's through mid 70's with tolerance even into the 80's. Although some darters may require cooler water, *E. spectabile*, our wide-ranged subject, is certainly in this range situation and can be rather easily spawned in the aquarium.

The orangethroat is an egg-burier, while many other darters deposit eggs on plants, under rocks or in caves or even on the aquarium glass. Parental care is not undertaken and parents will eat newborn young, so they should be removed as soon as spawning is indicated.

Spawning is preceded by courtship and the colors of the males become almost unbelievably intense. Females are less colorful and with heavy feeding become obviously loaded with eggs. Slenderness after having been full possibly accompanied by torn fins indicates spawning.

Eggs hatch in from four days in the mid 70's to much longer at lower temperatures and most darter species can eat the smaller types of newly hatched brine shrimp. For those seriously interested in spawning attempts, the aforementioned article by Dr. Kirk Strawn is almost a must.

For those aquarists to whom keeping ahead of the Joneses is an important part of the hobby, darter keeping should not be sneered at. If you start a darter tank, chances are you'll not only be the first kid on your block but probably also the first member of your club. You might even start a revolution! ●

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STRAWN, KIRK 1955—"Keeping and Breeding Three Texas Darters". *Aquarium Journal*, Dec. Page 408 (Part I)
STRAWN, KIRK 1956—"Three Texas Darters". *Aquarium Journal*, January Page 11 (Part II)

EDITOR'S NOTE: After reading Braz Walker's most excellent article, we are convinced that aquarists will have to become "orangetthroats" themselves to pronounce some of these darter scientific names! As a rough guide, *Etheostoma* is pronounced ETH-EE-OH-STOW'-MA, and that gem of all, etheostomatins, is pronounced ETH-EE-OH-STOW'-MA-TINS! As your editor once had the unfortunate experience of having one of his tape recordings (which was sent to Great Britain) translated by his British friends into "English", our overseas readers are invited to skip this footnote!



Tetra Guppy Food

The Guppy is a very unpretending fish. It is content with simple food, yet is an enthusiastic spawner, and on this score is often called "little Million-Fish." Specially bred Guppies, however, demand a lot of values in their food, and only when getting a really good diet do they develop the full splendor of their fins and colors. Tetra Guppy Food is a new food created especially for Guppies and is being hailed by successful breeders all over the world. It should be fed to growing Guppies frequently, at least three to four times a day. One other meal per day should be of baby brine shrimp (*Artemia salina nauplii*). The combination will insure the very best nourishment you can provide. Fully grown Guppies should regularly be fed TetraMin Staple Food, with Tetra Guppy Food added once a day, and baby brine shrimp two or three times a week. Feed your Guppies properly and you will enjoy them longer. Feed them better with Tetra Guppy Food.



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