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Vol. XXVI, November, 1977 (#261, No. 3)



Cover: A male *Betta splendens*. Photo by H.J. Richter.

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Rates

\$ 75 per copy in the U.S., \$1.00 per copy in Canada or foreign; \$7.50 for 12 issue subscription in U.S. Add \$1.20 per year for foreign subscriptions. Index available in every 12th issue.

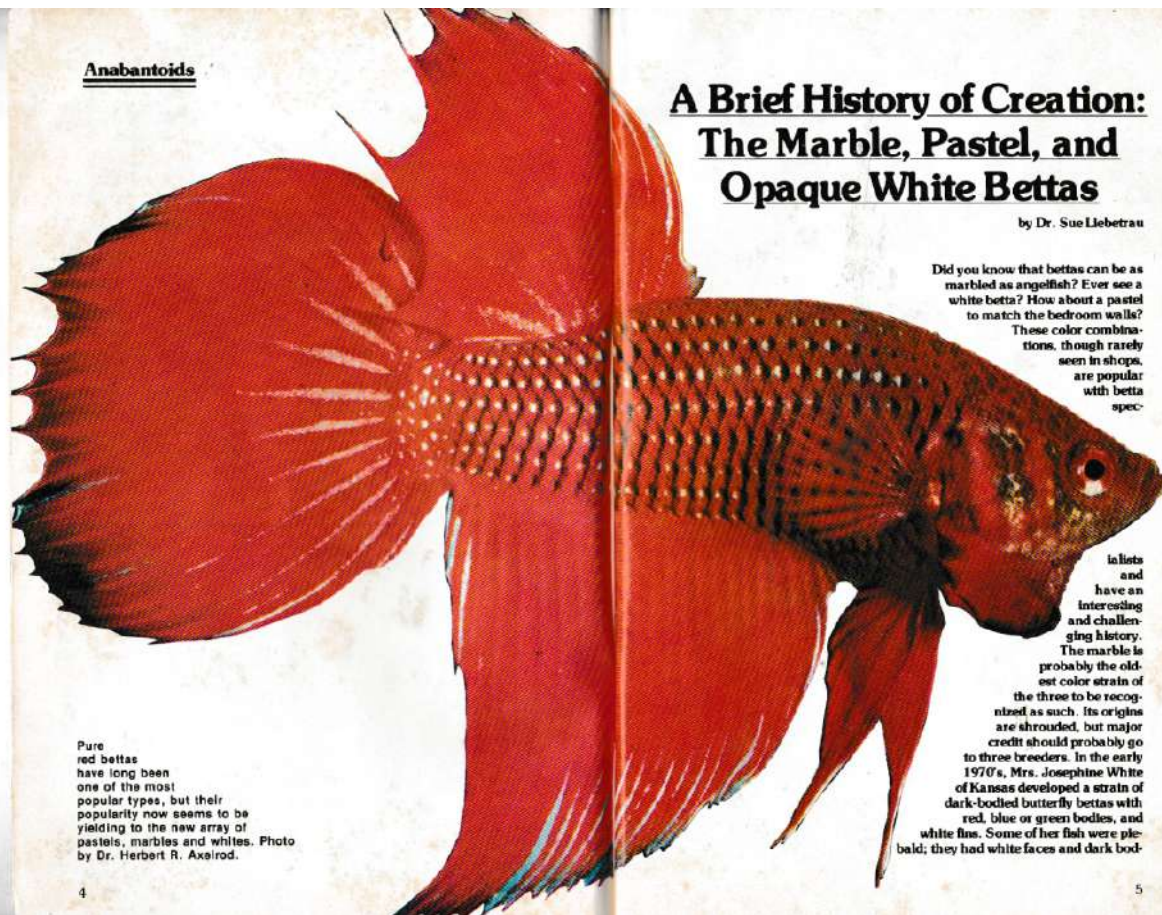
In England and the western Sterling area *Tropical Fish Hobbyist* magazine and T.F.H. books are distributed exclusively through T.F.H. Publications (London) Ltd., 13 Nulley Lane, Hedges, Surbiton, England. In Australia and the South Pacific by Pet Imports Pty. Ltd., P.O. Box 149, Brookvale 2100, N.S.W., Australia. All subscriptions and inquiries should be sent directly to them.

Second class postage paid at Neptune, New Jersey. Published monthly by T.F.H. Publications, Inc., 211 West Sylvania Ave., Neptune City, New Jersey 07753.

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8752 Sunset Blvd., Los Angeles, CA 90069
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Anabantoids



A Brief History of Creation: The Marble, Pastel, and Opaque White Bettas

by Dr. Sue Liebetrau

Did you know that bettas can be as marbled as angelfish? Ever see a white betta? How about a pastel to match the bedroom walls?

These color combinations, though rarely seen in shops, are popular with betta spec-

ialists and have an interesting and challenging history. The marble is probably the oldest color strain of the three to be recognized as such. Its origins are shrouded, but major credit should probably go to three breeders. In the early 1970's, Mrs. Josephine White of Kansas developed a strain of dark-bodied butterfly bettas with red, blue or green bodies, and white fins. Some of her fish were plebeian; they had white faces and dark bod-

Pure red bettas have long been one of the most popular types, but their popularity now seems to be yielding to the new array of pastels, marbles and whites. Photo by Dr. Herbert R. Axelrod.



Mrs. Monte Bickel, Mrs. Barbara Weston and Mr. Jim Sonnier, have produced much valuable information. Essentially, marbles range from black to colorless. Black specimens are usually smoky with translucent fins—the type often called "black lace" or "fertile black." Females tend to be fertile and should not be confused with the "melano" strain—the true black betta, in which the females are infertile. The color begins to change when the fish are about three months old, at which time they may show some iridescence, or even red. Usually the red disappears, or even red. Usually the red disappears, and the dark body becomes spotted with clear areas. In extreme cases, the fish becomes "cellophane"—completely colorless. The eyes may be light or dark, but are not red; these are not albinos in the traditional sense. Of mysterious origin, a genetic puzzle . . . this flashy, individualistic black lace betta is one of our more interesting creations.

Photo above:
This young yellow male has a rounded caudal fin, but as it matures the tail will probably elongate quite a bit—very long tails are rarely seen in young bettas. Photo by Al Liebetrau.

Opposite, upper photo:
The double-tail trait and the black color is a combination rarely seen in bettas, especially since black bettas are not a true-breeding strain (all melanistic females are infertile). Photo by Al Liebetrau.

Opposite, lower photo:
This betta, bred and photographed by James Sonnier, shows the Cambodian (cream-colored body), green, spread iridescence (slight green sheen on the body) and red-less (no red pigment at all) traits. This fish also carries the double-tail trait as indicated by the increased number of dorsal fin rays.



In marble bettas the young first develop a dark overall color, then at about three months of age patches of opaque pastel color or even translucent areas appear, as dark areas begin to disappear. Often the dark pigment disappears entirely, resulting in a "cellophane" fish. Photo by Al Liebetrau.

This opaque white betta, developed by Dr. Gene Lucas, is one of the rarest of the many betta strains available today. Photo by Al Liebetrau.



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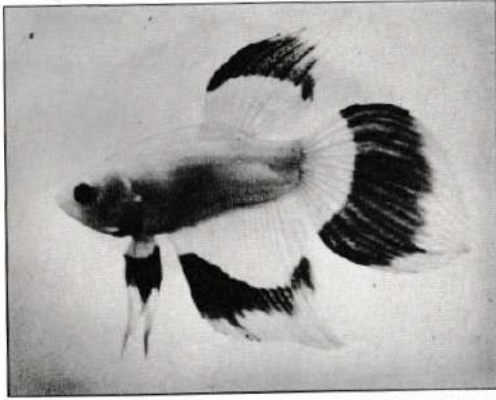
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This is the true butterfly betta developed by Orville Tutweiler at his hatchery in Florida. Note the complete separation of the bands of dark pigment in the fins from the body pigments; it is this complete separation that defines a butterfly betta. Photo by Dr. Herbert R. Axelrod.

bied true. He started with Cambodian stock, bred out the red color and added steel blue, producing a silver fish. At that point, he had some bettas that he called "pastel." I obtained a pair in 1969, and I remember that they were much like the modern pastels. Finally, Dr. Lucas added the opaque factor to produce a whiter betta.

After 1971, several problems still remained with the stock. The fins tended to be orange or dirty yellow. The opacity often extended over the eyes as the fish grew older, and the fish were subject to pop-eye. The females looked better than the males, just as Cambodian females generally tend to be "cleaner" than males. Today, after careful breeding by several people, many of these problems have been eliminated, and the opaque white betta has emerged as a truly beauti-

ful fish. It is still rare, but it is certainly a welcome addition to the world of bettas.

The histories of these three color strains reveal some important parallels. They are similar genetically, except that each has an individual characteristic: the black areas of the marble, the spread iridescence of the pastel and the opaque covering of the white. They all began in the United States in the early 1970's, as the creations of a few talented breeders. All were developed more fully in later years through the work of many people. Finally, they all symbolize the ongoing efforts of dedicated hobbyists to improve and increase the varieties of the beautiful *Betta splendens*.

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Editorial

As I See It . . .

One of the main purposes of the Endangered Species Act as I understand it is to protect those species whose continued existence is in jeopardy by virtue of their dwindling numbers or their habitats being destroyed. Yet few of us, including the Congressman who enact them and the Supreme Court Justices who weigh their constitutionality, realize just how far-reaching such pieces of legislation can be, until they are put into the hands of an enforcing agency.

Certainly no collector of artifacts made from various parts of animals such as scrimshaw (engraved whale's teeth) or tortoise shell jewelry could have been intuitive enough to even imagine that some of their rare antique items would be subject to seizure by Department of Commerce officials who claim to be upholding the provisions of the Endangered Species Act. Yet, this is exactly what happened at a recent antique show in Houston, Texas. Antique dealers at the show were advised by Department of Commerce agents that items made of tortoise shell that had been brought across state lines since December, 1973 were subject to seizure. It did not seem to matter to these officials that the animals from which these items were made died long before the Endangered Species Act came to be.

I have not read the entire act, so I don't know for a fact that the agents were acting within the law or whether they were doing a little ad libbing. But what I do know is that as long as we are going to allow the government to continue tying up our industry in all sorts of legislative twaddle, we had better get on the ball and demand of our government full interpretation of all aspects of their proposals before we allow them to become law.

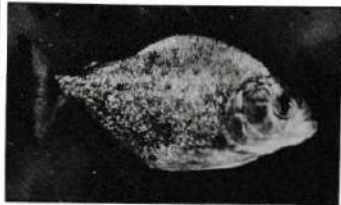
Meanwhile, if you happen to own one of those dried shelled piranhas that are sold by some dealers in trinketry, you had better not take it with you on your next vacation lest you be jailed for carrying animals prohibited by the Lacey Act across state lines!

Marshall E. Oetow

THE LINEUP

A New Canadian

The Canadian Ministry of Natural Resources, fearing that piranhas could become established in certain warm springs near Ontario, is plucking piranhas right out of dealers' tanks in Windsor. A fisheries biologist from the Ministry claims there is evidence of other tropical species surviving in some of these springs.



Serrasalmus species. Photo by Harold Schultz.

New Equipment For TFH

Although there have been many improvements in the quality of *Tropical Fish Hobbyist* recently, (better paper, better printing and new layout designs), there are more improvements to come. We now have our own color separator, which has enabled us to utilize many more new color photos, and our new computerized typesetting machine and web press will vastly increase the speed and quality of our book and magazine production.

Airlines Join PIJAC

The airlines announced that they cannot comply with the latest USDA regulations requiring that the burden be placed on airline personnel to see that animal shipping containers comply with the regulations' standards. The airlines pointed out that this will add to costs and delay shipments, and several carriers may join the Pet Industry Joint Advisory Council (PIJAC) in challenging the USDA's regulations in the courts.

Starvation By Cyanide

While doing a post-mortem on an *Aniphrion ocellaris* that was collected by the cyanide technique, N. Herwig found an accumulation of food that the fish had eaten a few weeks earlier, before it was collected, in its stomach. The cyanide seems to affect the digestive system so that the victim cannot eat and dies of starvation.



Aniphrion ocellaris. Photo by Klaus Feyson.

Pesticides In Deep Water



Deepwater starfish. Photo by V. Carlson.

Assoc. Prof. T.L. Hopkins of the U. of So. Florida is directing an investigation of pesticides in deepwater organisms. In an earlier investigation Hopkins found pesticides in the tissues of deepwater fishes, and he wants to know at what level in the food chain the pollutants begin to accumulate.

Turtle Farmers Seek PIJAC's Aid

The National Turtle Farmers and Shippers Assoc. has asked the Pet Industry Joint Advisory Council (PIJAC) for their support in an appeal to the FDA to lift the 5-year-old ban on the shipment of baby turtles, claiming that they are now producing salmonella-free turtles. PIJAC is studying the proposal.

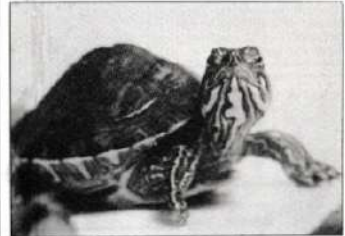


Photo by Robert J. Church.

Jonah and the Trout

Mrs. Vivian Ash of Magnolia, Miss. was shocked to find two small channel catfish flipping around in her sink as she cleaned a freshly caught trout. After being bathed in enzymes and deprived of oxygen for several hours in the trout's stomach, the catfish are now, one month later, swimming happily in an aquarium, said Mrs. Ash.



Same species. Photo by M. Kooler.

Darter Controversy Rages

Construction of the \$116 million Tellico Dam (already 80% complete) on the Little Tennessee River has been halted by the 8th Circuit Court of Appeals, contending the dam's completion will wipe out the endangered snail darter (*Percina tanasi*). But TVA fisheries biologists claim the species will not survive whether or not the dam is completed.

Zocon Sells Furanace

Art Czekowski, Abbott Laboratories' Communications and Services Manager, announced the transfer of exclusive marketing rights for Furanace® to the Zodiac Division of Zocon Industries, Inc. Abbott will still process the product and it will still have the same name.

New FTFFA Officers

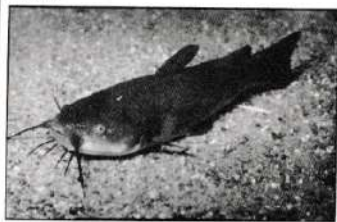
At their recent annual meeting, the Florida Tropical Fish Farms Association (FTFFA) elected new officers. They are: President, Johnny Williams; Vice President, Arlen Wetherington; Secretary, Col. John Hanan; Treasurer, Dick Atchison.

Aid For Aquariums

The 95th Congress is now considering two bills that would provide assistance for zoos and aquariums. The first, HR 2958, provides for some assistance and would establish standards for accreditation of zoos and aquariums. The second, HR-7086, would provide help by establishing a National Zoological and Aquarium Corp.

Catfish Need Vitamin C

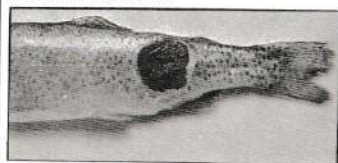
It has been shown by fisheries scientist T. Lowell of Auburn University that Vitamin C deficiency in pond-raised catfishes produces defects in bones, pigmentation, gill configuration and resistance to pesticides and bacterial infection.



Bullhead catfish. Photo by G. Serflin.

Mass Immunization For Salmonids

Tavolek, Inc., a division of Johnson & Johnson, has developed a new *Vibrio* bacterin that will make mass immunization of salmonids against vibriosis, a disease that causes red skin patches and skin ulcers, a reality. This development could mean that we might soon be seeing successful vaccinations for ornamental fishes against some of their common diseases, too.



Vibrio disease in trout. Photo by D.P. Anderson.

New Evidence On Blind Tetra Identity

Much evidence has been produced to show that *Anoptichthys jordani*, the blind cave tetra, is merely a cave-dwelling ecotype of the Mexican tetra, *Astyanax fasciatus mexicanus*. More evidence showing both fish to be the same species was recently reported by three Univ. of Texas researchers who demonstrated that both forms have 25 pairs of chromosomes and that their morphological structure is the same in both fish (Kirby et al., Copeia, 1977 (3)).



Blind tetra. Photo by G. Serflin.

Goldfish Ulcers

An apparent bacterial disease is playing havoc with domestic goldfish breeders, causing ulcers along the fish's bodies and hitting mostly breeding stock, leaving the industry short on young saleable fish. Scientists working with Dr. John Gratzek at the University of Georgia are reportedly close to a solution.



Domestic fancy goldfish. Photo by R. Zukal.

Snake Smugglers

A federal investigation is probing into a number of reported incidents of snake smuggling. Some of the snakes involved are the green tree python, Fiji boa constrictor and Maclell's python. A number of the nation's well-known zoos are involved in the probe as the recipients of the illegally imported snakes.



Green tree python. Photo by G. Marouse.

Rotenone Toxicity

L.L. Marking and T.D. Bills of the U.S. Fish & Wildlife Service found rotenone, a chemical commonly used to collect fishes, to be toxic to a variety of freshwater species. Bills and Marking noted, however, that potassium permanganate was an excellent detoxifier.

Your Fishes' Health

With Life Comes Death

by Jim and Nancy White

As tropical fish hobbyists, we are aware more than most that life is delicate. Often our best efforts at treating an ill or injured specimen are in vain, and the mysterious state we call living is replaced by the reality of death. Grouseome subject? Perhaps. But it is a real part of our hobby and needs to be dealt with.

The reasons for death are varied, but some causes are often overlooked. One such cause is the age of the fish. None will live forever. For instance, guppies, platies, swordtails, mollies and bettas are old at 3 years. An 8-year-old angelfish is well past its prime. The average lifespan of fishes has been given very little attention, and what figures we do have are sketchy at best. This factor is definitely one to keep in mind, for death may be due, simply, to old age.

Then we have accidental deaths. These are probably the hardest to accept, as they are usually caused by our own negligence or inexperience: the hood left

A *Herichthys cyanoguttatus* tends to its large brood of young. Most hobbyists do not have nearly enough tank space to raise such a large brood properly. In order to raise a few good specimens, most of the young should be culled and either discarded or used as food for other fishes. Photo by G. Marcuse.



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open on a tank of jumpers, the decorative though teetering rockpile that collapses, the tank that cracks from the stress of an uneven support, the hurried transfer or addition of fish without their acclimation. Too late we find ourselves saying, "If only I'd been more careful."

We also have untimely mysterious deaths. These differ from accidental deaths in that we have expected death and tried to prevent it. These are often the most frustrating, and can leave us with a sense of hopelessness. Most of us are hobbyists, not ichthyologists, and even after years of experience can't identify all of the maladies that can befall our fishes. Ichthyologists can't identify all of them either, but this is little consolation after a mysteriously afflicted fish has died. If we can't identify the problem, we are ill-equipped to treat it, and must rely on good aquarium management. Sometimes this is not enough, but adding a medication that doesn't hit the problem will only hasten the demise of the fish—sort of like giving insulin for a heart attack.

And so it is that we find ourselves faced with an unpleasant task: what to do with the carcasses of those fishes we lose through old age, accident or disease. It is imperative that they not be flushed into a city sewer system. There is too little known of aquatic diseases and their transfer, and it may be possible to affect our native fishes by use of the "great white porcelain cemetery." An easy and safe way is to put the deceased into a leak-proof plastic bag, squeeze out all the air, knot the top and throw it away with the daily trash. The final resting place will be a landfill or incinerator, either of which will prevent any danger of disease spreading.

Other deaths we may be faced with are purposeful. These are the times we must deliberately cause the death of one or many specimens. Before examining these occasions we would do well to remind ourselves of an important aspect of the hobby; that is, that we have taken on



This *Pelvicachromis pulcher* has no caudal fin or caudal peduncle. It would not survive in the wild and should not be propagated in the aquarium. Photo by R. Zukal.

a good share of nature's work. We decide how much daylight and dark our tanks will receive. We determine how pure the water will be. We set the temperature, pick the food and choose the landscape and tankmates. For the most part, we even decide which fishes will reproduce and when. We take this part a step further; by removing all forms of predation, we usually save far more offspring than nature ever intended to have survive.

This killifish is in the terminal stage of dropsy and is not likely to survive. It should be destroyed. Photo by R. Zukal.



Herein lies our first occasion for purposeful deaths—culling. Should we brag about raising a spawn of 500 angels? Even an inexperienced eye can pick out the superior ones of such a spawn, and these are the ones that should be kept to pass their traits on to others. The inferior ones would never have made it in their natural habitat, and we are doing a disservice to our hobby and our fishes when we propagate or distribute inferior specimens of any species.

What to do with the culls? Feed them to the other fishes. Everything has a reason for being, and in nature's scheme of things the reasons are not always ones that are pleasant to us mortals. One fish eating other fish, though not pleasant,



Note the humped back and rough scales on this swordtail. These are signs of old age in a fish. A specimen in this condition is well past its reproductive prime and will not live much longer. Photo by R. Zukal.

should not be repulsive. It is natural. The predators are nature's culling net, and if you don't like to see it, you needn't watch. The predatory fishes will do what comes naturally without witness, and the culls will have found a reason for being.

Another time for feeding excess fry to other fishes is when there is limited tank space. With the purchase of our first tank we are told, do not overstock! Growing fry must have space and clean water and cannot be maintained for long in cramped quarters. It is much better to

raise 12 healthy fishes than 100 stunted ones.

One more purposeful death we may encounter is that of a large fish that is deformed or perhaps badly injured. Is there a quick and painless way to destroy such a specimen? The answer to this is the hardest of all, for we do not know the degree of pain a fish feels. Many methods have been employed. Among them are to submerge the fish in ice-water or boiling water; put the specimen in a plastic bag and dash it against the floor; mix two Alka-Seltzer® tablets in a pint of water and drop the fish in—the list could go on and on. Obviously there is no easy way to destroy a pet, so each of us must find the way we can handle best when the need arises.

Death of our fishes is not a comfortable subject to write about nor a pleasant one to read about. It is far more enjoyable to recount successful spawnings, beautiful tanks and scores of healthy fishes. But the real world of the aquarist is not always so perfect. Many spawns are dismal failures, tanks do not stay beautiful without regular attention, and since we've chosen to work with living creatures, dying ones are part of the package. Reality must be faced. Some who drop out of the hobby do so because they had visions of beautiful perfection. The resulting disillusionment is often too much to handle, so another tank is relegated to the attic.

Let us begin to sound morbid, we should keep in mind that the vast majority of our pets demand little more than basic care and feeding,

two capacity. The limited space does not seem to distract from the partners' willingness to mate, nor is it inadequate for stirring the new brood. The water in the breeding tank should be soft (1 to 3 DH) and acidic (pH of 5.8 to 6.9), so the breeders should be slowly acclimated to the breeding water. The fish prefer to stick their eggs to the underside of horizontally or obliquely oriented leaves, so the tank should be heavily planted with cryptocorynes, Java fern (*Microsorium pteropus*) or other small leafy plants that do well in acid water. Since the eggs often fall from the leaves, making them easy to spot by the egg-eating parents if the bot-



The female (lower fish) begins to search for a suitable spawning site.

tom is bare, the plants should not be potted, but should be planted in a suitable substrate of gravel or a mixture of gravel and peat moss. Once the breeders are totally conditioned for spawning and the male is placed in the breeding tank with the female, the tank should be partially shaded. Though not actually light-shy, the fish will be more comfortable in a partially shaded tank. First-time breeders will usually begin to spawn within a few days, but experienced breeders will often spawn within a few hours of being placed together. In one case, I had a pair of breeders complete their spawning within 45 minutes of being placed in the breeding tank. I personally feel that *N. eques* is the most prolific breeder I have ever had in my tanks.



As the female seeks out the spawning site, the male (left) begins to slip underneath the female, from which position he will nudge her in the vent area.

Once under the chosen leaf, the female usually turns her belly up, which apparently stimulates the male into approaching to fertilize the eggs.



After the completion of each spawning act the pair swims away from the leaf with undulating movements.

The male courts the female by descending upon her from above and touching her snout with his. The fish do not move about particularly fast at this stage. When the male detects that the female is seeking out a spawning site, he slips underneath her and nudges her vent with his tiny snout. The pair then approaches the chosen leaf simultaneously, but with the male a few inches behind the female, and after a brief inspection of the site the female turns her belly upwards. This is apparently the signal for the male to take up his position under the leaf beside the female. Then the two fish press themselves against one another and one to six eggs are expelled. The male does not fling his tail across the female the way *Rasbora heteromorpha*, for instance, does. After the eggs are fertilized, the pair swims away from the leaf with snake-like movements. The entire sequence is repeated at brief intervals and not necessarily under the same leaf. During these sequences, I have observed that the female does not always choose the underside of a leaf, but occasionally will choose the top side. When the spawning is over, the fish show less interest in each other and more interest in searching out and devouring the eggs. At this time they should be placed back in the community tank.

The fry hatch in 24 to 28 hours and for the next five or six days remain sus-

ended on the walls of the tank or on the leaves. As soon as they begin to actively search for food, I feed them the smallest nauplii of cyclops. They will also eat infusorians or other very fine food at this stage. Their growth seems to be rather rapid during the first month, then there seems to be a temporary halt. Growth from that point on is rather slow, but, as mentioned earlier, they do reach sexual maturity in as few as eight months. From the moment they become free-swimming they swim like the adults—in an oblique head-up position. The number of fry per spawning has varied for me from as few as 30 to as many as 100.

In the aquarium, *N. eques* individuals look particularly impressive when they swim in large schools, which they do if a number of them are placed in the same tank. All the fish come to a halt in the proximity of the plants together, rest together or wait for food together near the surface. Normally, the only individuals that leave the school are those that have chosen a spawning partner. This, of course, makes the selection of breeding pairs an easy task.

I highly recommend these delightful little fish for the home aquarium without reservation. They spawn so easily that they are even good fish for the beginner if he is willing to take the time to provide them with the finer sizes of food that they require.

For Beginners

On Being a Fish-Wife Mid-Wife

by M.L. Stump

I'm not so sure about the fish-wife part, but I've always had a secret hankering to officiate at a birthing, and now I've done it. This is how it came about.

Along with becoming a hobbyist out of control—judging by the number of tanks that keep springing up on every available surface in my house—I have also plunged into every book and magazine I could find on the subject. Because I am a novice, I suppose, some of the things I have read have positively astounded me.

For instance, under diseases and treatments, experts tell you funny things like how to get rid of sea lice their way. In the event your fish have sea lice, my friends, you take a pair of tweezers, sterilized of course, and withdraw the offending louse, which you can then dispose of anyway you wish. Simple, huh? If, I thought, you were dealing with a whale—bound, gagged and well-sedated—you could probably remove all the sea lice you cared to. But how in the world do you get this wiggly little squirming fellow to hold still enough for these ministrations without squeezing him to death?

And then there's a thing called pop-eye. For this you put the medication right on the affected area—which could hardly be any place except his eyes—four times daily. How can you put a drop of medicine in a fish's eye, I ask myself. Doesn't it sound ridiculous?

But I keep worrying about all this. How could you do it with the fish in the water and how long would the fellow last if you took him out of it? The writers of this stuff must surely be out of their minds, I decide.

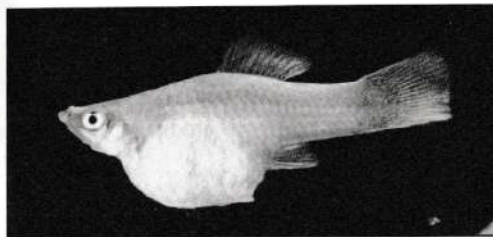
Another one of these experts tells what you do if a female live-bearer becomes bound up and can't give birth. He describes how you are supposed to gently massage the expectant mama's belly. Sure, I thought, Sure.

Just about then I discover this beautiful, half-black guppy mamma who looks just terrible in the gravid region. There is something definitely wrong. She looks ruptured, all swollen and ugly. I keep watching her while trying to ignore her, which isn't too easy. I can't quite erase from the back of my mind what I had read on this subject. No way, I thought.

Another day passes and another. Still nothing happens. She does not produce, and it makes me hurt just to look at her. Finally I see she is hovering at the bottom of the tank, breathing hard, body bent. I still can't get up the nerve. But suddenly I make up my mind, because it's pretty obvious she isn't going to last much longer.

I take a deep breath and roll up my sleeves. I find there is no problem whatever in scooping her up in a net and placing the net in a shallow bowl containing water from her aquarium. It had not occurred to me, nor had I read, that your sick fish can be kept in a net for easier handling, nor that a sick fish does not behave like a healthy one.

Because Big Mama just laid there—almost as though she knew I was trying to help her. I was as nervous as a neophyte surgeon about to perform his first open heart surgery. Gently, keeping her just under the surface of the water (another possibility I was too dumb to think of before), I massaged her swollen sides. I



This female swordtail is egg-bound, a condition often caused by various dietary insufficiencies. Photo by R. Zukal.

couldn't believe it when almost at once, out popped a cluster of babies. . . all dead. I kept rubbing gently. To my intense joy, a live one came rolling out, then another and another, uncurling and swimming off through the net just like that! I was thrilled. No more came and poor mama looked like she hurt so badly that I decided to put her in the maternity ward to let her rest, hoping that once started she'd be able to finish the job herself.

She didn't look any better the next day nor had anything further occurred. Emboldened by my success, I had visions of performing a caesarian—provided I could catch her the second after she expired. But when next I made my rounds,

it was already too late. I realized that any unborn fry would undoubtedly be dead also. But I decided to perform a post mortem anyway and sliced her open with a razor blade. Sure enough, she was still loaded, and many tiny curled up dead things came floating out.

That's life. . . and death. My first attempt at being a mid-wife to an ailing fish, in spite of her demise, had been rewarding and exciting. Thanks to the advice I had read on this subject, I had been able to save quite a few of the babies, and I was filled with a sense of accomplishment. So now I view the previously mentioned experts with a new respect. They knew what they were talking about. —

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Salts from the Seven Seas



The very comical grunt sculpin would make an excellent aquarium fish because of its size, color, form, behavior and ease of keeping.

Our California Fishes

by Warren E. Burgess
Photos by Daniel W. Gotshall

It has been a generally accepted theory that the coral reef fishes are the most brightly colored and that as one moves further north (or south if you are in the Southern Hemisphere) and the waters get cooler the fishes are less and less colorful. To a certain extent this is true—you don't see many butterflyfishes, angelfishes, damselfishes (no anemonefishes), etc. in temperate waters—but then again, there is certainly no lack of exceptions to this generality. The California coast, which can be considered temper-

ate as anybody knows who has been swimming or diving there, houses a number of brightly colored fishes by any standard. A couple of these have become familiar to aquarists, for example the garibaldi and the bluebanded goby, but are rarely if ever kept because of the laws and restrictions necessary to preserve the fauna of the state. But there are others, perhaps less well-known because they are not in the aquarium trade or not considered "exotic" species. The psychology of the idea that the further away the fish's

native waters are the more desirable it becomes should make an interesting study. Our rock beauty or French angelfish, for example, commands a very high price in Japan—to the Japanese these are apparently "exotic" species.

Luobearing marine fishes are not very common, but along the California coast a small family of viviparous fishes called surperches occurs. Mating usually takes place during the summer although actual fertilization of the eggs is delayed until fall or later, even to the following spring. As there is very little yolk in the eggs, the young are nourished by and respire through the ovarian fluid. The



A young flag rockfish is very brightly colored with red bars on a white background. This one was photographed at a depth of 175 feet.



The rainbow seaperch is a common fish along the California coast. It is viviparous, giving birth to living young.

young mature very rapidly and are able to copulate soon after birth. Among the more attractive surperches is *Hypsopus caryi*, the rainbow seaperch. Its delicate orange or reddish and bluish colors are set off by bright red-orange pelvic fins.

One of the more speciose genera on the Pacific coast is *Sebastes*, of the scorpionfish family Scorpaenidae. Of the more than sixty species of scorpionfishes occurring in California and adjacent waters, most are in this genus and are sombre-colored, although reds occur quite frequently in these fishes. There are a number of them that are, however, at-

A juvenile yelloweye rockfish still showing the two bright yellow lateral stripes. Many rockfishes are quite colorful.



When excited, the lavender sculpin erects its fins and casts a wary eye on the intruder.



The tuba-snout is a kelp-dweller that resembles and is closely related to the sticklebacks.

The giant kelpfish is the largest blinid, attaining a length of about two feet (or about 60 cm); it lives around kelp and is noted for its ability to match its coloration to its background.



tractively colored in contrasting red or yellow with black and white. Juveniles tend to be more colorful than the corresponding adult phase. In the yelloweye rockfish (also referred to as the turkey-red rockfish), *Sebastes ruberrimus*, individuals under a foot in length are red with two bright yellow longitudinal stripes running the length of the body. This fish occurs at depths from about 150-1200 feet (50-400m) and is relatively common. The China rockfish, *Sebastes nebulosus*, (black with yellow and white mottling and a curved yellow band running from the third dorsal fin spine to the base of the tail) and the flag rockfish, *Sebastes rubrivinctus*, (white with red bars) are two more examples of bright coloration in this family.

The large kelp beds house a number of fishes, some of which are extremely interesting, colorful or both. The uncommon tube-snout, *Aulorhynchus flavidus*, is such a species. Although not brightly colored (tarnish or yellow with or without dark crossbars), it is unusual in appearance, looking somewhat like an elongate stickleback (it belongs to the same family) with 23-26 short isolated spines before the soft dorsal fin. The very variable giant kelpfish, *Heterostichus rostratus*, which grows to a length of about two feet, is the largest species of the blennioid family Clinidae and can be found among the kelp. It is noted for its ability to change color to that of its background (within limits, of course), from browns and yellow

to greens and even purplish with or without mottling.

Typical cooler-water fishes are members of the family Cottidae, the sculpins. Included in this family is the lavender sculpin, *Leiocottus hirundo*, which has a very pleasing color combination of orange and blue and some elongate rays in the first dorsal fin. With fins raised it presents a very attractive appearance but cannot compete with the first dorsal fin of the sailfin sculpin, *Naucichthys oculifasciatus*, which, however, is not so pleasingly colored. The most bizarre and interesting of the sculpins is undoubtedly the grunt sculpin, *Rhamphocottus richardsoni*. It is small (about three inches or 75 mm) and conical in appearance and activity, hopping around the bottom with the aid of the finger-like tips of the pectoral fins. It has been reported that the female chases the male around until she traps him in a crevice, cave, etc. (in a pinch a discarded glass bottle or old shoe will do) until she is ready for him to fertilize the 150 or so eggs she lays. He is then released. The eggs take up to twenty weeks to incubate (or as few as sixteen weeks in slightly warmer water of 50° F or 10° C). This fish does well in an aquarium if the proper conditions are met.

So we do have some pretty nice fishes in our own back yard, but remember: if you decide to try and collect your own, check with the rules and regulations governing the species that can be taken and their methods of capture.

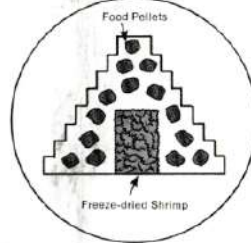
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Potosia angulifera. Photo by Neville Coleman.

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Conus garwini. Photo by Keith Gillen.

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Readers React

Dr. P.H. Greenwood Speaks Out

T.F.H. Publications, Inc. recently received a letter from Dr. P.H. Greenwood of the British Museum (Natural History) which in part was a response to a brief article that appeared in "Between the Lines" in the August, 1977 issue of Tropical Fish Hobbyist. In order to clarify the matter, below we have printed the part of Dr. Greenwood's letter that dealt with the article.

Dr. Herbert R. Axelrod
T.F.H. Publications, Inc.
211 West Sylvania Ave.
Neptune City, N.J. 07753

Dear Dr. Axelrod:

I was irritated, no, to be quite honest I was bloody annoyed with that little snippet "Greenwood's Cichlid Woes" in the August, 1977 issue of *Tropical Fish Hobbyist* which said, "Dr. 'Humph' Greenwood, the greatest scientist (living or dead) to tackle the cichlid problem has created a possibly monstrous situation. If his research proves correct he'll redescribe the family Cichlidae, probably break it into a couple of sub-families, redefine the genus *Haplochromis* to include less than a dozen species... and let the next generation of systematists sort out the hundreds of African Great Lake *Haplochromis* which will be wanting a new generic placement." So let's get Greenwood out from between the lines and back on the track.

To start off with, no scientist likes to be the subject of such a senseless and subjective analysis as the one made in the opening sentence. It's embarrassing at the best of times but more so when another, and outstanding, worker is alive and living just down the corridor (and since when has a dead scientist worked on cichlids).

I'm not about to split the Cichlidae into two subfamilies. Indeed, the paper now in press sets out specifically to show that the only published division of the family is based on phylogenetically invalid grounds, that for the moment there are no characters which can be used to classify the African cichlids at the suprageneric level and finally, that no subfamilial classification will be possible until the American, Asian and Malagassian taxa are revised. This paper, by the way, is in press but won't be out until 1978.

Yes, I shall redefine *Haplochromis* in the way you say, but I'm not shirking my responsibilities and leaving the rest to the 'next generation.' I shall be dealing with the rest of that unresolved polytomy in Lake Victoria in the same paper.

Since I've already been getting anguished letters from aquarists, I'd be glad if you could set the record straight in the forthcoming issue of *Tropical Fish Hobbyist*.

Yours sincerely,

Dr. P.H. Greenwood
British Museum (Natural History)

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Collecting

The African Angelfish Kept in the Aquarium For the Very First Time

by Helmut Debelius



Adult *Holocanthus africanus* in a cave full of *Tubastrea* corals. Photo by the author.

Anyone expecting this to be a description of a new angelfish available on the market is going to be disappointed. It's unlikely that *Holocanthus africanus* will ever be exploited commercially, since it occurs in an area where the export of living fishes is almost out of the question, partially at least because of inadequate airline connections. Also, like most other coral fishes native to this area, *H. africanus* is very rare; it would not be at all practical to run a fish collecting station in

an area where most of the local species are limited to their availability. The area I refer to is the Cape Verde Islands in the eastern Atlantic where my last diving trip took me.

I encountered *H. africanus* a surprising number of times during my trip, usually at depths of 25 to about 100 feet (8 to 30 meters) and not far from the shore. The rocks and boulders found there have sparse growths of algae and sponges on them; such growths form the mainstay of

Juvenile French angelfish have been found off some of the islands of the eastern Atlantic. Photo by Rayburn L. Taylor.

the diet of angelfish in coral and rocky habitats. Most of the specimens of *H. africanus* I found there were adults measuring 8 to 12 inches (20 to 30 cm) in length, and they were either alone or in pairs.

While watching African angelfish, *H. africanus*, over long periods of time I observed that they never ventured far from the vicinity of their home caves. Although the fish sometimes swam about in open water, they immediately retreated to the shelter of the rocks if I approached them too quickly. Following a fish into its hiding-place, I was often surprised at the colorful spectacle that presented itself. Particularly impressive were the *Tubastrea* corals sheltered among the rocks from the powerful surge. I realized, of course, that it would be futile to try to bring fishes of that size home with me even if I had an adequate oxygen supply for them since the journey took 50 hours by plane and boat (including one night at a hotel). In addition, an amateur diver with a single air tank cannot survive the long stages of decompression a fish needs if it is to be brought up unharmed from depths of 100 feet or more.

One of the reasons for my being here, however, was to fulfill a request from Dr. W. Klausewitz of the Senckenberg Museum not only to bring back specimens of all the littoral fauna of the area, but also to be sure to include among those specimens the only angelfish native to this area, *H. africanus*. So I left my camera on board the diving-ship and made various attempts to collect specimens of *H. africanus* in order to preserve them in formalin for research purposes. It did not take me long to realize that a

The adult French angelfish, *Pomacanthus paru*, loses most of the color seen in the juvenile. Photo by G. Marcuse.



hand-net was quite useless since the caves where the angelfish hid had many exits. I sometimes had the feeling, during my many unsuccessful attempts to catch the African angelfish, that these clever fish were toying with me. However, as luck would have it I had brought along a net that was about three feet wide, and after locating all of the exits from the cave I positioned the net in such a way that I was able to drive two adult fish into it. I was quite sorry to see, however, that my rapid ascent to the surface caused much harm to the fish due to excessively rapid decompression, so I did my best to put them out of their misery as quickly as I could.

I shall never forget how the largest *H. africanus* I brought back was caught. The diving-boat was anchored at a shallow spot about 400 feet from shore where rocks were protruding out of the water and where there was said to be beautiful caves. The current was very strong here; so strong, in fact, that my diving partner and I were literally hurled into the grandiose canyons that surrounded the shallow area, and we did not



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come to calmer water until we reached a depth of about 80 feet. While my partner held the camera I succeeded only during my third attempt, in catching an *H. africanus*, using the large net as I had done earlier. We were so thrilled by the many beautiful caves that we forgot all about time and our gradually diminishing air supply. We just made it to the surface using the last bit of air in our reserve supplies, and we intended

to get back to the boat using only our snorkels. Then we discovered that the boat was gone from the shallow area. We learned later that the main anchor had been torn away by the rough seas, and the ship could not come to our aid due to the heavy swells and the shallow rocky area we were in. There was no alternative but to rely on our snorkels and swim through the three to four foot breakers into open water where the boat was not threatened by rocks. With the wiggling fish in my right hand and the camera in my left hand I began the strenuous swim. We



A juvenile *Holacanthus africanus* only a few inches in length hides near a large leatherduster worm. Photo by the author.

were well aware of the risk, for this was the area where we had earlier seen some aggressive sharks. The lookout on the ship's mast had just spotted us when my diving partner suddenly gave a warning cry and pointed at a gray shark that was headed toward us at lightning speed! Pressed against each other back to back we endeavored not to lose sight of the shark which was closing in on us in ever-tightening circles! In this frantic dilemma I

forgot all about the angelfish in my right hand whose wiggling and bleeding due to decompression did not do much to repel the circling shark. The ship reached us just in time though, and we climbed aboard with great relief.

On another occasion I came across African angelfish where I would never have expected to find them. In a large bay, about 1,200 feet from shore, we had

lost the second anchor of our ship and a group of divers were searching for it. I was swimming seaward over a level sandy bottom at a depth of about 50 feet, looking around for the anchor. The seascape was rather barren with no signs of life anywhere.

then, suddenly, I spotted a pair of African angelfish swimming in front of a rock that protruded from the sand. As I approached them they disappeared into a hollow under the rock. Peering into the hollow I found, in addition to the angelfish, three soldier fish. Fortunately, I was able to photograph the angelfish in their

strange surroundings. What these fishes lived on in this barren spot I do not know. More and more, I began to wish I could take a live specimen of *H. africanus* home with me. So I began to hunt for one about four inches long, a size that would be identifiable and hopefully able to withstand the rigors of the long journey home. My hunting started just off Santo Antao and Sao Vicente, the most popular of the Cape Verde Islands, but I was not

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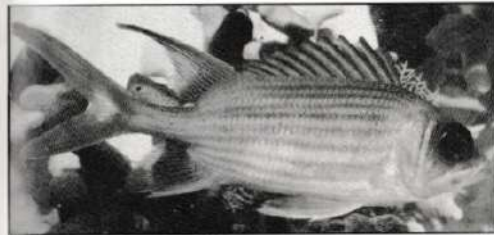
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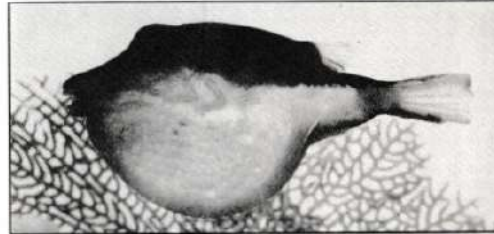


Soldier fishes such as this *Holocentrus ascensionis* are found around most of the tropical and subtropical eastern Atlantic islands. The large eyes aid the soldier fish in its nocturnal prowling. Photo by Dr. Herbert R. Axelrod.

able to find any. Since it was not long until I was due to depart from these beautiful islands, I gave up hope of taking a live African angelfish home with me. The fish would need to start the journey with its excretory system void of feces to prevent it from being poisoned by its own wastes in the shipping container that required at least 24 hours before the last water change and there wasn't enough time left for that.

My very last diving trip was one of the highlights of my holiday. Off the small island of Razo, I detected a spot so ideal that it seemed illusory, and it was at a depth of no more than 25 feet. Here I saw and photographed species of fishes which, at the time of this writing, four weeks after my holiday, have still not been identified. An overhanging rock about 30 feet wide had attracted me with its fascinating variety of life, and I spent so

Ganthigaster rostrata is one of the pufferfishes commonly found in the vicinity of the Cape Verde Islands. The author took two of them home alive along with his African angelfish. Photo by Dr. Herbert R. Axelrod.



November, 1977

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much time there that I used up two air tanks. I was not there very long before I found another *H. africanus*, this time a juvenile specimen about four inches long, but already showing the characteristic coloration. My thoughts once again turned toward taking it home, so a fellow diver helped me catch it, and I managed to get it into a tank aboard ship without injuring it. I immediately returned to the spot where I caught my pined fish and suddenly saw another one peering out of a tiny crack under the ceiling of the overhanging rock. At first I wasn't sure whether I was looking at a *Centropyge* species or a juvenile *H. africanus*. Catching this fish presented yet another challenge to my inventiveness: the small



Above: A *Chaetodon luciae* feeds on the pycnocover of its rocky habitat. Photo by the author.



Left: This subadult *H. africanus* has the colors of the adult but has not yet developed the filamentous extensions of the dorsal, anal and caudal fin that are seen in the adult. Photo by the author.

crack in the ceiling was so narrow that I could not get my hand inside it. So I placed my nylon net over the crack and securely fixed it to the rough ceiling of the rock. With the breathing tube of my aqualung I blew air bubbles into the crack, which forced the fish to swim out into my waiting net. Gently, I took the fish out of the net and put it into my holding basket. Bringing it to the surface from such a shallow depth presented no problems.

Now the real difficulties began. The following night the ship took us to the island of Sal from where we were to depart by plane the next morning. A member of the ship's crew and I took turns during the night changing the water so that as much of the fish's feces as possible would pass from their systems



Below: A juvenile *H. africanus* feeds on the algae-covered rocks of its natural habitat. Photo by the author.

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Moray eels are cave-dwelling fishes that are always a threat to divers who pursue fishes into caves and crevices. Photo by Miloslav Kocak.

before the fish were packed up in the morning. As I observed the fish during the night the dark spot on the upper edge of the operculum of the smaller fish taken that day convinced me that this was indeed another *H. africanus*. In the morning I put all the fishes into bags (I had also captured three *Chaetodon luciae* and two *Canthigaster rostrata*). When I reached the hotel in Lisbon that afternoon, I looked at the fish... to my joy, both angelfish were still alive even though their water had become heavily polluted and the water temperature had dropped dangerously low. I hastily converted the hotel bath into a "fish bath" and gradually warmed the bags from the outside. My oxygen cylinder, brought along for keeping fishes alive, was empty so the fishes had to survive on oxygen extracted from Lisbon air.

The fishes were all alive and well the next morning, but the larger angelfish's breathing had become a bit labored. After another four hours in the air we landed in Frankfurt, and 30 minutes later the fishes were swimming in my quarantine tank. When looking at the preserved fishes the next day, Dr. Klausewitz thought at first that I had discovered a new *Holocentrus*

species. It turned out, however, that the three preserved and the two live specimens were *H. africanus* (although they may have to be properly classified as belonging to the subgenus *Pitops*—this is still being clarified).

There is no indication in any of the literature that anyone has ever captured a juvenile *H. africanus* before, and I am happy and proud to be the first aquarist to have the pleasure of keeping live *H. africanus* in captivity. I donated the larger juvenile angelfish to the Senckenberg Museum for further research. There it swims in a bare tank and readily accepts whatever food is offered. The only other inhabitant of this tank, a *Chaetodon luciae*, has become acutely aware that the angelfish is master of the domain. The smaller angelfish which I kept is very shy by comparison. I am keeping it in my 130-gallon tank in which invertebrates predominate and which is teeming with algae. Its beautiful colors, even if sadly destined to fade as the fish matures, make it the center of attraction in this aquarium; the other fishes inhabiting this tank are a *Centropyge potteri* and *C. tibicen*, a *Pomacanthus semipunctatus* and a *Nemateleotris magnificus*.

Cichlids

Cichlasoma axelrodi Isn't Black When Alive!

by Dr. Herbert R. Axelrod



A juvenile *Cichlasoma axelrodi* captured in the Rio Aguaro in Venezuela. Photo by Dr. Herbert R. Axelrod.

You can imagine how exciting it was to find black cichlids among a harvest of fishes collected with poison in Venezuela in 1971. It was even more exciting to discover that they were a species new to science and to have the fish named in my honor! So it was natural for me to have

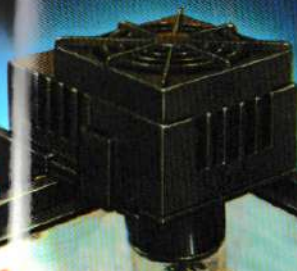
* *Chuco axelrodi* Fernandez-Yepes, TFH, Dec. 1971. The genus *Chuco* has subsequently been placed in the section *Theraps* of genus *Cichlasoma*.

a keen interest in bringing some back alive, spawning them, and introducing them to the aquarium fish trade.

On subsequent trips to the area, I couldn't find any more, nor could any of the professional collectors, until Helko Bleher came across them in Brazil, over a thousand miles from where I found the first ones in Venezuela. Helko photographed them and showed the photos to his customers in Germany. Such an interest developed in them that he was

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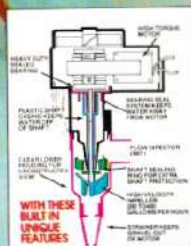
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This mature black cichlid, *Cichlasoma axelrodi*, was about 6.4 inches long and was also captured in the Rio Aguaro. Photo by Dr. Herbert R. Axelrod.

offered \$10,000 for ten pairs, providing no one else got any in the meantime.

Back to Brazil Heiko went... with me tagging along... but we couldn't find any of the black cichlids no matter where we looked.

My last trip to Brazil took me to the Rio Trombetas... about 1,000 miles from where I caught the fish in Venezuela and about 1,200 from where Heiko caught his specimens. We fished with nets all over the area; we didn't use poison, because we didn't want to make the local people think we were killing fishes wantonly... they might not understand the "causes of science." When we came back to the boat I selected those fishes I wanted to photograph and put them into a separate plastic container, adding MS-222 to bring out their colors and put them to sleep. Then I put the remainder of the fishes in formalin to preserve them for future study.

As I started to photograph the "sleeping" fishes, I noticed one beginning to turn black as it went to sleep. When it was

almost dead it turned completely black. I photographed it and could hardly wait to get back to New Jersey to have it checked against the description of *Cichlasoma (Chuco) axelrodi*. Since it was Warren Burgess who identified Heiko Bleher's fish as *C. axelrodi*, he was chosen to solve this mystery as well.

It didn't take Warren very long to give me the bad news... *C. axelrodi* is just a brown fish when alive; turning black when dead! Fortunately, I also took photographs of the fish when it was alive, but I wondered what this fish's breeding colors were like. Now that I know what they look like alive, you can be sure I'll be looking for them and bringing some back to breed.

This is not the first time I've had such bad luck. Many years ago, Dr. George S. Myers wrote about a characin, *Hemigrammus coeruleus*, that was blood-red. He gave the location of the fish, so I went with some other interested people to Brazil to rediscover it. We searched and



A young *Cichlasoma axelrodi* captured and photographed in Brazil by Heiko Bleher.

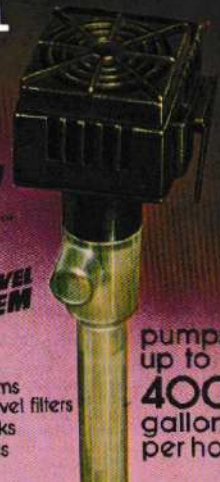
searched but never found it, so we poisoned the stream, collected some specimens and put them into formalin. An hour later the characins turned deep red—but they were red only when dead! It is likely that they turn red when spawning.

Hemigrammus coeruleus in life is a bluish-gray color, but it apparently turns red as it is dying. Photo by Dr. Herbert R. Axelrod.



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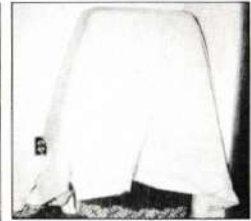
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Tropical Fish Hobbyist

Idea of the Month

Long on Cold, Short on Gas

by Phil Tobias



Towels and blankets got the author's fish through the bitter cold of the 1975-1977 winter. Photo by the author.

I'd rather have spent the winter of '77 in Bowling Green, Ohio, than Buffalo, New York, but not by much. It's true that the snow and cold in Buffalo were worse, but we got our share in Bowling Green. When the governor of Ohio asked us to lower our thermostats to 65 degrees in the day and 55 degrees at night and to close our extra rooms off, we felt obligated to do our share. There was only one problem: we had two ten-gallon aquariums in one of the empty rooms.

At first we didn't know what to do. I'd read once in *Flare*, the magazine of the International Beta Congress, that when the electricity failed heat could be retained in the tanks by lowering the water level and suspending a burning candle inside the aquarium. In our case that wouldn't work; the tank covers were plastic. Somehow we had to keep the tanks 40 degrees warmer than the room, and the aquarium heaters, though they were working, were not of sufficient wattage to accomplish that.

Leaving the tanks alone wasn't going to do it: the aquarium temperatures were already falling. We didn't feel this would hurt our three fancy goldfish, but we were concerned about our rasboras and corydoras. The tank temperatures were 68 degrees and dropping. It was obvious that the two inches of insulation in our rented house wasn't keeping in any heat. Outside it was sixteen degrees below zero and the wind chill factor made it fifty below.

Finally my wife and I came up with an idea: we'd insulate the tanks. We grabbed some unused towels out of the linen closet and draped them over the front

and sides of the aquariums. Then we covered both tanks with a blanket. It worked! The rasboras tank stabilized at 70 degrees, and we gradually let the goldfish tank drop to 55 degrees.

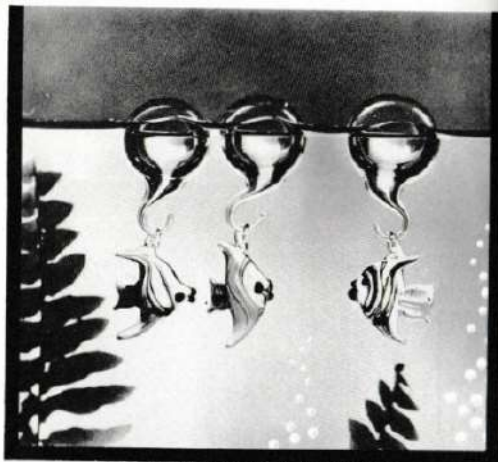
Our first problem was solved. But now we wondered how long the heaters would hold out. These were our oldest tanks and our least expensive heaters. They were standard glass heaters, 50 watts in the goldfish tank, 75 in the rasboras tank. We were worried that the thermostats in the heaters would react to the cold air above the water and thus drastically overheat the tanks. This fear proved groundless. Normal use of the fluorescent light and the blanket-towel combination kept the air above the water warm and prevented it from circulating with the cold room air. Throughout the crises our heaters performed perfectly, without going through any fish-killing fluctuations.

Hopefully this December our winter winds won't hitchhike up to the Arctic Circle before swooping down upon us. But if they do and for some reason you have to close off a room with fish in it, try our towel and blanket technique.

How cold did it get in our back room? One night I left my fish bucket, half full, in the room. In the morning it was frozen solid.

November, 1977

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Tropical Fish Hobbyist

Mail Call



by Marshall E. Ostrow

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

Goldfish in Poland

Q. I am a Polish goldfish breeder. Although I have been breeding goldfish for 12 years, goldfish breeding has never become as popular as it is in the U.S.A. and other countries. In fact, we have very few good specimens, and many of those strains that are popular in other countries have never been seen by most of us in Poland.

The Goldfish Fan Club was organized by the Polish Aquarist's Society in 1975, and I was elected President. I am still the President of this group and am writing in behalf of our club members and other interested goldfish enthusiasts in Poland. I know that in the U.S.A. there are a great number of goldfish hobbyists who have been very



The bearded variety is one of the many fancy varieties of goldfish available on the American scene. Photo by Dr. Herbert R. Axelrod.

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way to use up your old stiff air lines, since the outlets do not need to be very flexible. I also found it to be a good idea to insert an air filter between the compressor and the pipe to make sure that good clean air was being pumped into the aquarium.

Mark L. Clark
Riverside, California

A. Thank you for your interesting comments on multiple tank air systems. We are sure that your suggestions will be helpful to those hobbyists who cannot find the plastic air valves suggested in Mr. Manners' article. As to the air filter, this too is a good idea. There is such a product available in many pet shops, and its use is especially recommended where the hobbyist is using a heavy duty piston pump or in areas of the country where there is a lot of moisture or pollution in the air.

A Useless Cure

Q. I would like some information on the use of muriatic acid as a cure or preventive agent for tropical fish diseases. A friend recommended its use, claiming success in treating ich in clown loaches and angelfish. The recommended dose was one drop per gallon. I have contacted several swimming pool dealers who told me that muriatic acid stabilizes pH and is an anti-bacterial agent.

Jim Hicks
St. Petersburg, Florida

A. Muriatic acid is another name for dilute hydrochloric acid. It might effectively stabilize pH if the water is highly alkaline, but that's in a large swimming pool where an accidental excess added to the water will not cause a disaster. In the aquarium, it's a different story. Hydrochloric acid would drop the pH so fast—even by adding only a small amount—that the aquarium inhabitants would be severely damaged before you could bring the pH back up again.



The clown loach responds well to standard ich treatments. Photo by M. Chvojka.

As to its effectiveness against ich, it is doubtful that it would do much good. Your friend probably elevated the temperature in his tank to 85°F, which will cure ich, and failed to mention that to you. The concentration of the one drop per gallon solution was very low or the fish would have perished from excess acidity. Hydrochloric acid in a concentration great enough to kill ich would surely kill the host fish too.

Flowering Testimony

Q. After reading Phillip J. Brown's article "The Ruffled Swordplant" in the July, 1977 issue of *Tropical Fish Hobbyist*, I would like to say that under similar conditions described in the article, my *Aponogeton undulatus* produced three flowering stalks and grew

New Officers for FAAS

Newly elected officers of the Federation of American Aquarium Societies (FAAS) for 1977-1978 are: President, Susan O'Meara Austin; Vice President, Suzy Kihlander; Secretary, Larry Brande; Treasurer, Dave Ayres. FAAS will continue to offer its help to all member societies in organizing and programming. For information write to Larry Brande, Secretary, 6601 S.W. 46th St., Apt. 106, Davie, Florida 33314.



The ruffled swordplant, *Aponogeton undulatus*, is a hardy aquarium plant that develops a strong root system. Photo by Dr. C. D. Scultherpe.

two or three new leaves between the appearance of each new stalk. The plant was planted in the gravel of a well-established tank and kept between 75 and 80°F.

Anthony Trangario
Atlantic City, New Jersey

A. On behalf of Mr. Brown, we thank you for the testimonial. Mr. Brown has had quite a lot of experience in raising both common and unusual aquarium plant species, and we are sure that he will be gratified to know that his techniques work as well for other hobbyists, too.

The Sunny Side

Q. Several months ago I caught two sunfish about four inches in length. Since they were too small to eat, I took them home and put them into a ten-gallon tank. After a few days the one that was slightly larger than the other began to eat its smaller tankmate. I put a divider into the tank, and now they're both doing fine and feeding on night-crawlers, beef heart and a variety of flake foods. I recently caught a bull-head catfish about six inches in length and am keeping him in a five-gallon bucket—he also dines on nightcrawler!

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ers. Do you think these three fish could live compatibly in a 20-gallon tank? How do you sex sunfish? Are they getting a balanced diet?

David Discezza
Parma, Ohio

A. We don't know what species of sunfish you have, since you didn't describe them, but even if they are one of the species that grows to six or eight inches, they should do well in a 20-gallon (long) tank. Of course, they will never grow to full size if they are one of the larger species, but that should not stop them from breeding if they are provided with the right conditions, especially with a good varied diet, and you seem to be doing that. In that tank they should get along better, especially if you provide them with an assortment of shelters, and under those conditions they should get along well with the catfish, too.



The pumpkinseed sunfish, *Lepomis gibbosus*, is a bit feisty in an aquarium unless it is given plenty of room and plenty of shelter. Photo by Milan Chvojka.

As to sexing them, in some species the male is normally colored a little more brightly than the female, but unmistakably so at breeding time. They can also be sexed by examining the vent area as described by Warren Burgess in his article "Sexing Mobs" which appeared in the August, 1975 issue of *Tropical Fish Hobbyist*. This method is fairly reliable for most fish.

Two Heads Better Than One

Q. Among one of my broods of fancy guppies I noticed one fry with two heads. Could you give me any information on this kind of deformity? I would especially like to know if any two-headed fish have ever survived.

Ed Hofman
Richmond, Virginia

A. Two-headedness has been reported in all sorts of animals from fish to



This is a newly hatched *Aphyosemion gardneri* that has two heads. It lived for only 16 hours and was barely able to swim. Photo by Marshall E. Gastrow.

snakes. The anomaly probably occurs much more often than it is ever reported, because the unfortunate animal bearing this defect rarely lives long enough to be noticed by any human observers.

It is doubtful that the defect is one of a genetic nature, since to produce such a monster would require that mutations simultaneously occur in a whole host of genes, and the chances of that occurring are infinitesimally small; in fact, they are non-existent. Rather, a defect such as this is believed to be the result of some accident during embryological development; in other words, it is believed to be environmentally caused.

Some two-headed animals have lived long enough to become attractions in zoos or circus side shows, but to the best of our knowledge fish have not been numbered among these side-show attractions.

Color Foods

Q. I have several questions on foods and feeding that I hope you can answer for me. Just how do color foods return the natural color to aquarium fishes? I have a tank containing various tetras,

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A school of fast-moving fishes such as the zebra danio creates quite a frenzy on the surface when they are fed. Photo by R. Zukal.

gouramis, angels, danios, platies and a few *Corydoras* catfish. Although they are generously fed three times a day, they always act as though they were starving and go crazy when I feed them. Can you tell me why they do this?

Steve Walsh
East Meadow, N.J.

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A. Color foods are generally high in carotenoids. These are compounds that are responsible for yellow and red pigments in plants and animals. Most vertebrates cannot synthesize these pigments, so they must get them in their food. By increasing the carotenoid content of your fishes' food they will show more red and yellow pigments than they would if not fed such supplements. Enhancement of these pigments, by the way, may not necessarily produce more natural color in your fishes; this depends on which species you have and what foods comprise their natural diet. Some fishes are naturally deficient in red and yellow pigments.

As to the "crazy" behavior of your fishes at feeding time, this can be explained, partially at least, by understanding something about the natural feeding behavior of fishes. Although there are exceptions, in the wild most fishes continually prowl for food. They do not eat regular meals as we humans do, so their frenzied reaction to feeding in the aquarium may be due to the fact that in the aquarium they come across more food at one time than they do in the wild. As a matter of fact, if they do not react to a feeding in this manner in your aquarium, there may be something wrong with them.

Algae Chew Mein

Q. I recently purchased some Chinese algae-eaters and would like to know something about sexing and breeding them. Have they ever been bred in captivity?

John Luthon
La Habra, California

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The Chinese algae-eater has a hole on either side of its head just above the opercular opening which is used to take in water so the fish can breathe when it is stuck to a rock with its sucker mouth. Photo by R. Zukal.

A. Very little is known of the breeding habits of the Chinese algae-eater, *Gyrinocheilus aymonieri*, but this may be because in nature full-size fish are about 10 inches long, and they seldom reach half that size in the aquarium. We have never seen any reports of anyone having them that large in their

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aquarium or of anyone ever having bred them. There are few discernible external differences between the sexes. The males develop nuptial tubercles, but the females do too, making the tubercles useless as a means of sexing the fish.

Black Patches

Q. I have a four-year-old oscar in a 29-gallon aquarium. Its coloration has always been normal, but upon my return from a weekend trip I was startled to find a shocking transformation in the oscar's pigmentation. The entire left side of the fish's head from the snout to the pectoral fin has turned solid black. Both eyes seem to be functioning properly. While on some occasions excitement has caused a darkening of the entire fish, no change that long-lasting or startling had ever occurred before. The oscar has had hole-in-the-head disease



This blue gourami lost control of the melanophores on the posterior part of its body, resulting in a permanent black patch. Photo by R. Zukal.

for about eight months but has eaten and behaved normally. Could a stroke or other brain damage have caused this phenomenon?

Bob McDonnell
Granger, Indiana

A. Some sort of brain damage is probably associated with the permanent black patch on your oscar. The darkening or lightening of a fish is caused by a spreading or contraction of black pigment granules in the chromatophores of a fish's skin. This pigment migration is neurologically controlled by a part of the central nervous system. Your oscar has apparently lost its ability to contract the granules in the chromatophores of that part of its body where the black patch appears. This could be associated with your oscar's hole-in-the-head disease, or it could be from

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other causes. Whatever the cause, the result itself is not fatal to the fish, though it could cause some problems with behavioral signals should you try to breed it. A cure is not known, since nerve tissue, especially of the central nervous system, in most vertebrates does not regenerate very well, if at all.

Freshwater Clams

Q. I would appreciate any information you could give me on a species of freshwater clam that lives in a small lake in southwestern British Columbia. It is a light translucent brown color and appears to be quite active.

Bryce Dixon
Cochrane, Alberta, Canada

A. The clam you have described could be any species of several different genera that inhabit fresh waters of the U.S. and Canada. We would need much more information than you have provided



Closet of a glochidium, showing the hooked barb by which the glochidium attaches itself to the fish.

in order to identify it. Here is some other information that could be helpful if you are keeping freshwater clams in your aquarium. The larvae (called glochidia) of the common larger clams of North America

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are secondarily parasitic; that is, after they are expelled by the parent clam they are picked up by fishes or salamanders and live parasitically off their hosts, attaching themselves to the gills or fins of the host. After a few weeks they fall off and become free-living clams. Normally glochidia do no harm to their hosts, but the marks caused by their encystment are rather unsightly. They do represent a potential threat in

the confines of a small aquarium, however, if they infect their host fishes in excess numbers and if the hosts are under stress or otherwise in poor health.

Female guppies heavily parasitized by glochidia of freshwater molluscs. Photo by Dr. Heinz Schneider.

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use these native plants in tropical aquariums, goldfish tanks or outdoor pools?

Otic Brown
 Hanover, New Hampshire

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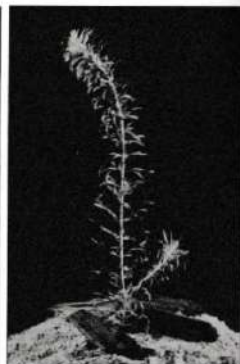
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Myriophyllum are the same species that are sometimes offered for sale in pet shops, but the ones carried by the shops are plants that have been raised commercially and previously adapted to aquarium conditions. In general you won't have good luck in transporting native plants from the wild into your



Elodea requires strong illumination for good growth in the aquarium. Photo by R. Zukal.

aquarium—besides the dangers involved such as introducing disease organisms that your tropical fishes are not immune to, the plants usually do poorly.

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Toads - Dry Frogs

by Jerry G. Walls



Bufo garmani of southern Africa at first glance appears very much like the common *Bufo fowleri* of the eastern U.S., accentuating the difficulty of identifying toads. Photo by G. Dibbey.

The very word toad has come to mean something or someone who is low in stature or behavior, and often it carries with it the misleading connotation of vileness or meanness as well. Yet the common toads, with very few

exceptions, are harmless and even helpful little helpers that make the best pets of all the frogs. Toads as a scientific group form a well-defined family of frogs, Bufonidae, containing about 10 genera and several hundred species

and subspecies. Except for the familiar and typical genus *Bufo*, with at least 200 species, the genera are few in species and restricted to Africa and Asia. *Bufo*, however, is found over most of Eurasia, Africa and the Americas, being absent

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only from Australia and some of the smaller Pacific islands; it is the only toad genus likely to be seen by the hobbyist. Typical toads are easily recognized by the short hind legs, two blackish digging spades on the hind feet, rounded parotoid glands behind the eyes, often heavy cranial crests on the head, horizontally oval pupils, and—especially obvious—the thick, dry, usually warty skin.

The skin is to a great extent what makes a toad. Unlike the thin, wet skin of more typical frogs, the thickened skin of *Bufo* is not very subject to dehydration under moderately dry conditions. Thus toads can inhabit in abundance areas which are death to normal frogs, with many species common even in true desert conditions. Most toads, however, are still to be found near water or at least on moist lawns and woodlots. The flattened shape of most toads allows them to hide under stones and branches during the day, coming out to feed on insects at night.

Toads of the genus *Bufo* are a variable lot, with species ranging in size from one half to one inch (*Bufo rosei*, Africa; *B. quercicus*, U.S.) to a maximum of over nine inches (*Bufo marinus*, tropical America; *B. biombergi*, Colombia).



The long single-file strings of eggs are characteristic of most typical toads. Few other frogs lay such egg strings. Photo of *Bufo fowleri* eggs by the American Museum of Natural History.

The average size is probably about 2-3 inches, although many common species reach 4-5 inches. In most species there are large and small warts on the back and sides, but occasionally the warts may be completely absent in some species and the skin smooth but still dry. In almost all species there are distinctive round or oval, occasionally triangular, parotoid glands present behind the eyes and weak to heavy cranial crests on the head; the crests and parotoids are variable characters often very important in the identification of species. The tympanum or eardrum is usually visible, although in some African species it is covered by skin and not visible externally. The eye is usually blackish but may have bright golden reticulations.

Most toads are brownish or blackish in color, with lighter or darker patterns emphasizing the warts or parotoids. Commonly there is a narrow white stripe down the middle of the back and often broader white stripes on the sides. In many species there are distinct patterns of white, yellow, orange or even green or blue spots and mottling on the back. Most of the patterns are cryptic, allowing the toad to

remain hidden from predators by closely matching the color and texture of the soil and plants it lives in.

Typical toads have a simple life history. A few hundred to several thousand eggs are laid in lakes and ponds during the early rains of spring (tropical species may breed all year), the adults congregating in often vast numbers to produce a very noisy crowd of excited toads. Males are usually distinguishable at a glance from females by the dark vocal pouch under the throat and horny brown tissues on the hands and forearms. Amplexus (mating) in toads is often prolonged, the pair being joined for hours or even (rarely) days. Male toads have the reputation of being very near-sighted but determined during the mating season, and more than one collector has had his shoe or leg grasped by a male toad hoping he had found a female. Once grasped, the leg is likely to remain in possession of the toad until rather drastic actions are taken.

The eggs are usually laid in the form of long gelatinous strings containing the darkly pigmented eggs in a single row, unlike the large clumps or masses typical of most other frog families. Development

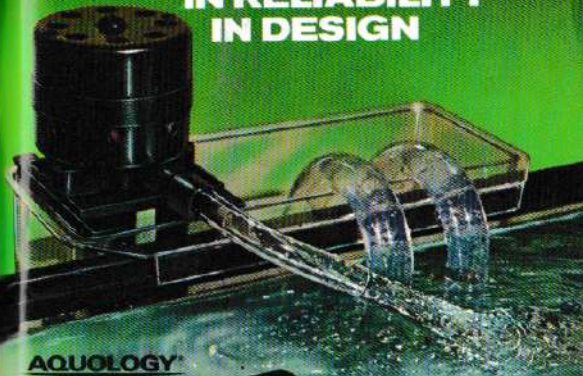


An exception among toads, *Bufo carens*, a pretty little red toad of southeastern Africa, lacks obvious parotoid glands behind the eyes. Photo by G. Dibley.

Bufo americanus is a common toad of higher elevations in the northeastern and central U.S. and southern Canada. This pair in amplexus was photographed by J.K. Langhammer.



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The giant toad, *Bufo marinus*, has now become a great villain in many parts of the world where introduced. The extremely large triangular parotoids make the species unmistakable. Photo by L. E. Perkins.

from egg to toadlet is usually quick, from 2-6 months in most species. Like most other tadpoles, those of toads are vegetarians, scraping detritus and other algae from leaves and occasionally taking small nibbles from the tender new growth of water plants. Transformation from tadpole to toadlet usually occurs at a small size and with all the tadpoles from one egg string metamorphosing at once. Country roads in the south are often literally covered with thousands of half-inch

black toadlets of *Bufo fowleri* and *B. variceps* for a period of several days until the young disperse. Curiously, young toadlets are nearly smooth, the warts developing with age. In nature most toads probably survive only 3-5 years, but certainly some individuals have been seen to attain 10-12 years in nature and over 15 in captivity. Sexual maturity is often reached within 3-6 months of transformation. Tales of toads being found in corners of old buildings or under

Siberian permafrost are not true. Like several other groups of frogs and salamanders, toads are able to produce a toxic or noxious mucus from special glands. In *Bufo* these glands are especially numerous in the parotoid glands and sometimes in the larger warts of the back. When *Bufo* is attacked by a skunk or snake, a thick milky mucus is secreted, often in great abundance. In some of the larger species, such as *Bufo marinus*, this mucus is definitely toxic to animals

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Tropical Fish Hobbyist

2. DATE OF FILING
9/22/77

3. FREQUENCY OF ISSUE
Monthly

4. LOCATION OF HEADQUARTERS OR GENERAL BUSINESS OFFICES OF THE PUBLISHER
211 West Sylvania Ave., Neptune City, NJ 07753

5. LOCATION OF THE HEADQUARTERS OR GENERAL BUSINESS OFFICES OF THE PUBLISHER THIS PERIOD
211 West Sylvania Ave., Neptune City, NJ 07753

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T.F.H. Publications, Inc., 211 West Sylvania Ave., Neptune City, NJ 07753

8. EXECUTIVE EDITOR (Name and address)
Executive Editor: Dr. Herbert R. Axelrod, 211 West Sylvania Ave., Neptune City, NJ 07753

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the size of dogs and small children, causing severe respiratory difficulties; dogs have been known to die after mouthing a large *B. marinus*. In most toads, however, the mucus is just annoying and stings if it gets into your eyes or mouth; be sure to thoroughly wash your hands anytime you have handled any toad—or any other amphibian, for that matter. Needless to say, toads do not cause warts.

Keeping toads in captivity is usually simple. If the tank is given a deep cover of leaf mold or coarse potting soil, the toad is likely to burrow in and disappear from sight for weeks at a time. Instead just provide a shallow covering of

Top: The very flat *Bufo viridis* of Eurasia and northern Africa is often spotted with bright green, but the color can change rapidly to brown or even red. Photo by Van Paam.

Center: Several South American toads have unusually developed cranial crests and even crests on the jaws. This *Bufo* species from Brazil would be perfectly camouflaged in leaf litter. Photo by H. Schultz.

Bottom: The extremely long and quick tongue of toads has earned them quite a reputation as insect predators often of great commercial value. Photo of *Bufo fowleri* by M. F. Roberts.



Bufo alvarius, a seven-inch native species of the southwestern U.S., has a toxic mucus secreted when the toad is disturbed by predators. Notice the large glands on the hind legs. Photo by J.K. Langhammer.

The common European toad, *Bufo bufo*, has few distinguishing marks and is quite variable in color and size. Photo by G. Dibley.



leaf mold, sterilized soil or a coarse sand-charcoal mixture; be sure to provide hiding places in the form of branches, stones, plant roots, etc. Although toads usually cannot jump as far as typical frogs, they can climb wet glass sides if desperate enough to escape, so be sure the tank is securely covered, preferably at least half

with glass to reduce loss of moisture from the terrarium. Most toads enjoy soaking in a bowl of water or being lightly sprayed every few days; they must not be kept too moist, however, or fungus will result, especially if leaf mold is present in the tank. Toads are generally not at all choosy about their food, taking a very wide variety of insects (including ants and sometimes Japanese

beetles), snails and slugs, earthworms and even small frogs and lizards. Some of the larger species will eat small birds and mice. During the warm months the toad's terrarium can be placed under an outside light and it will eat the beetles and moths attracted to the light.

commonly occurs in captivity. As mentioned earlier, there are at least 200 species of *Bufo* currently recognized, with about 15 species found in the United States and only a handful in Europe. It is probably impossible for the hobbyist—or even most herpetologists—to correctly identify toads taken outside the U.S. or

The natterjack toad of Europe, *Bufo calamita*, inflates itself and becomes rigid when confronted by a predatory snake. Photo by G. Dibley.



Although usually a nocturnal feeder in nature, many pet toads can be easily trained to accept food during the daytime. Tadpoles can be fed spinach (canned or frozen) and various greens, but be sure to keep the water clean at all times. Mating

Europe. Even the species of the United States and Canada are often difficult to distinguish because of individual and populational variation in cranial crests and color patterns. See the usual field guides for coverage of the U.S. species, but accept as a fact the impossibility of identifying all the animals

with glass to reduce loss of moisture from the terrarium. Most toads enjoy soaking in a bowl of water or being lightly sprayed every few days; they must not be kept too moist, however, or fungus will result, especially if leaf mold is present in the tank. Toads are generally not at all choosy about their food, taking a very wide variety of insects (including ants and sometimes Japanese

you are likely to find in a pet shop.

One introduced toad, *Bufo marinus* (originally found from Mexico to central South America), has become a pest in Florida and almost everywhere else it was introduced. Originally spread around the world to help control sugar cane borers, it soon ran out of insects to eat and began working on the local populations of frogs and toads. Additionally, this large species hogs breeding pools over most of the year, making it

impossible for the native species to breed. *Bufo marinus* is also an exceptionally toxic toad, having been known to kill dogs and possibly being dangerous to humans. Fortunately most toads are harmless or even helpful, and the example of *Bufo marinus* is exceptional.

Although toads are very hardy in captivity, there is another way to keep them as pets that may appeal to many people. If a section of lawn near a light is kept well watered and not

mowed (hand trimming is allowable), it can be stocked with a toad or two of a local species (usually these will wander in unannounced anyway). The toads will feed on insects drawn to the light at night and soon get used to humans observing their feeding movements. If cover is provided during the winter, such as a board over a deeply spaced protected corner, your toads will be present and happy for many years, pets yet still part of nature.

Bufo blombergi of Colombia is a giant toad with unusually smooth skin. Reaching sizes over nine inches in length, this species is often the highlight of larger zoo displays of amphibians. Photo by G. Marcuse.



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