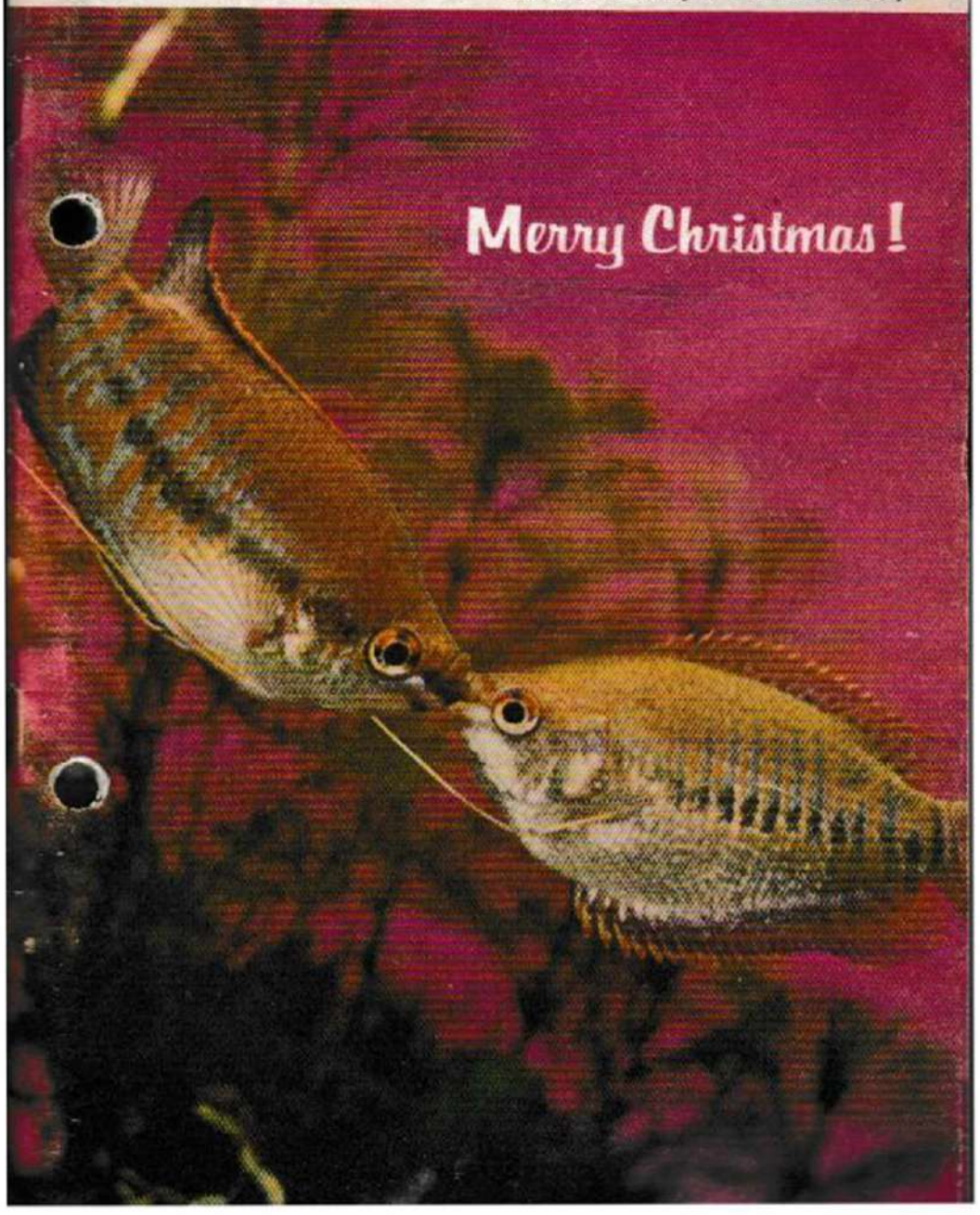
DECEMBER, 1968
VOL. II NO. 2

THE AQUARIUM

British Isles 2/6 DOMESTIC 35¢



DECEMBER, 1968
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THE AQUARIUM

founded in 1932 by Dr. William T. Innes

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On The Cover

Using a motorized Nikon F on Kodachrome film, Andrey Roth captured the Christmas spirit displayed by these beautiful Gouramis. (Additional credits appear on page 69.)

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A male thicklipped gourami, *Colisa labiosa*.

THE THICKLIPPED GOURAMI

By William A. Tomey

THE THICKLIPPED GOURAMI, *Colisa labiosa*, a fish originating from Northern India, Assam and Burma, is a very handsome specimen that is a favorite with beginning as well as experienced aquarists. The thicklip derives its name from the somewhat darkish bands around its lips, giving them a sort of slightly puffed appearance. It has a typical gourami shape and is usually available at most aquarium shops, at least during part of the year. Although growing to 4 inches (and even more), these fish are simple to keep. They are not sensitive to the usual run of fish diseases, and they are gentle companions to their tankmates. In its natural habitat, the species is found in shallow waters containing much vegetation, especially floating plants, at a temperature of from 79 to 90°F. In the aquarium, on the other hand, it demands no special water requirements at all.

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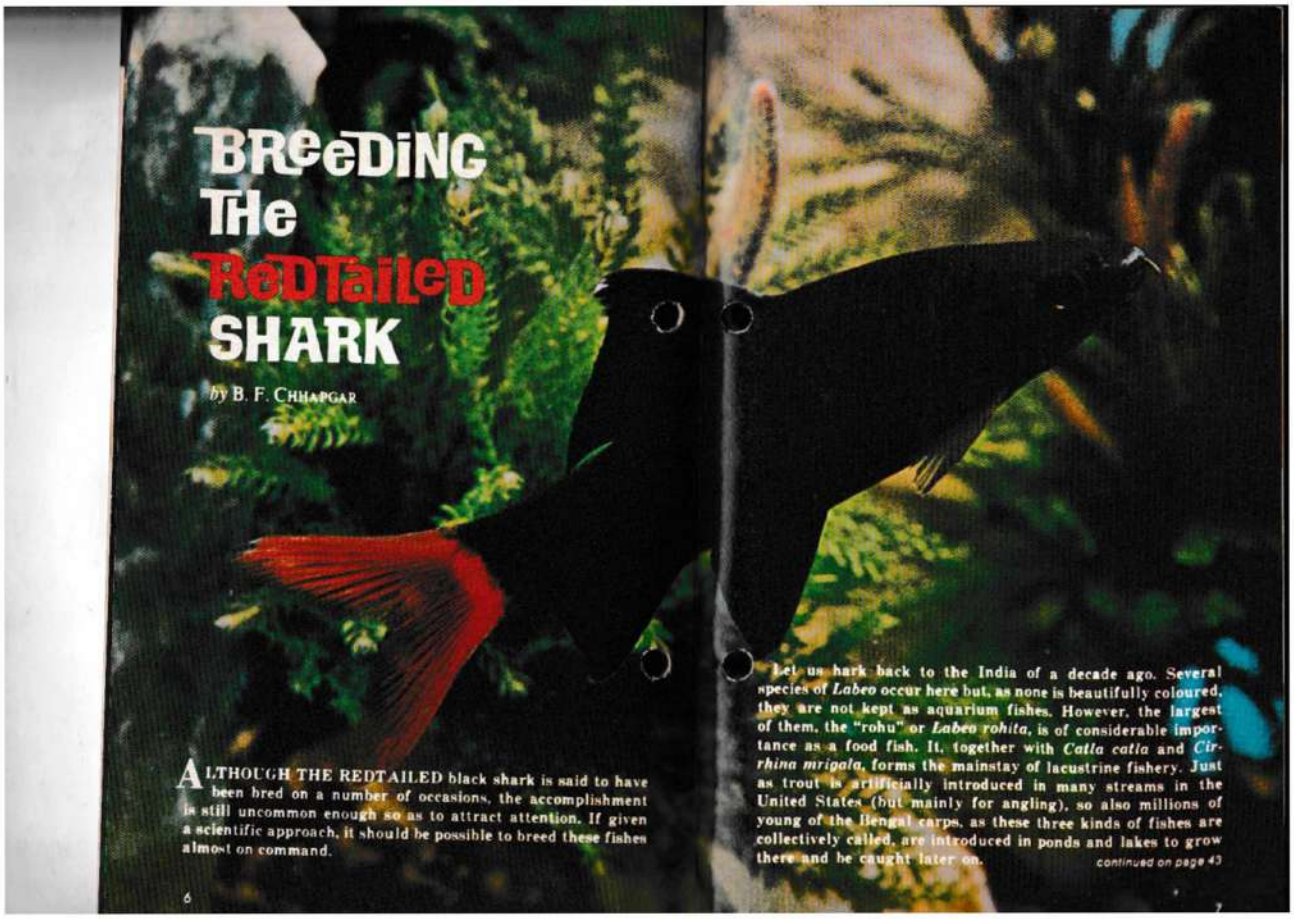

BREEDING THE REDTAILED SHARK

by B. F. CHHAPGAR

ALTHOUGH THE REDTAILED black shark is said to have been bred on a number of occasions, the accomplishment is still uncommon enough so as to attract attention. If given a scientific approach, it should be possible to breed these fishes almost on command.

Let us hark back to the India of a decade ago. Several species of *Labeo* occur here but, as none is beautifully coloured, they are not kept as aquarium fishes. However, the largest of them, the "rohu" or *Labeo rohita*, is of considerable importance as a food fish. It, together with *Catla catla* and *Cirrhina mrigala*, forms the mainstay of lacustrine fishery. Just as trout is artificially introduced in many streams in the United States (but mainly for angling), so also millions of young of the Bengal carps, as these three kinds of fishes are collectively called, are introduced in ponds and lakes to grow there and be caught later on.

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Unlike most livebearing fishes, the female mosquitofish (shown here) drops her young, two or three at a time, over a period of four to six days.

THE MINI-LIVEBEARER

by HENRY W. ROBISON

HETERANDRIA FORMOSA, the mosquitofish, is the smallest member of the livebearing family Poeciliidae, and ranks as one of the smallest vertebrates known to man. The name "mosquitofish" seems to refer more to its size than its food preference. Being one of our native fishes it carries with it the stigma of being a "native" which discourages a large number of hobbyists from keeping it. People seem to have an aversion to fishes procured from their surrounding waters. Any fish caught locally is often regarded simply as a "minnow" and is not thought to be worthy of consideration for the aquarium back home.

Essentially a southern species, this diminutive fish inhabits swamps, sluggish streams, ponds and ditches ranging from North Carolina to Florida and West to Louisiana along the Gulf Coast. There it lives in thick matted growths of fine-leaved plants where it hides from predators and searches for tiny microcrustaceans. The writer has taken *H. formosa* from canals and ditches near New Orleans, Louisiana, where it lives peacefully with *Poecilia* (= *Mollienesia*) *latipinna*, the sailfin molly. Anyone with a dip net and an adventurous soul can collect this fish practically in his own backyard if he lives in the southern United States.

Differences between sexes are easily discernable. The female is considerably larger than the male, usually ranging from 22 to 25 mm in length (1-inch equals 25·4 mm). Males reach a maximum length of 18 mm. Both sexes exhibit an irregular, brown horizontal band from the tip of the snout to the base of the caudal fin where it terminates in a dark spot. A series of vertical bars (6–9) run into the band from above sometimes crossing it. The body color is a light brown to olive with a bright white belly below the brown band. The dorsal fin of both sexes carries a deep black spot edged with attractive red to orange and slants at an angle of 60°. The anal fin of the female is milky-white, rounded on its edge and sports a black spot in its middle. As in all livebearers, the male's anal fin is modified into a gonopodium for use in fertilization.

Heterandria formosa is not a fussy eater and will consume small foods with relish. *Cyclops*, *Artemia*, algae, and especially *Daphnia* are great favorites with this fish. In nature, *Daphnia* constitutes the bulk of its diet and if supplied with a sufficient portion of *Daphnia* while in the tank, *H. formosa* will reproduce in large numbers and remain quite active and healthy. Prepared foods are also accepted, along with frozen foods and the new freeze-dried foods.

A small, thickly planted aquarium of 1 to 3 gallons with plenty of floating plants should be provided for *H. formosa*. This small fish does better if kept in a tank of its species. It is quite aggressive for such a tiny fish and will provide a world of entertainment for its keeper. A temperature of 60 to 70°F is ideal. It has been the experience of the writer that

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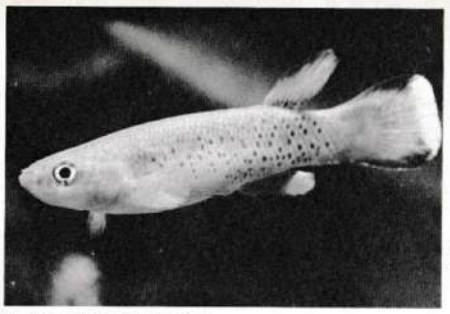


A male firetail killie, **Rivulus milesi.**

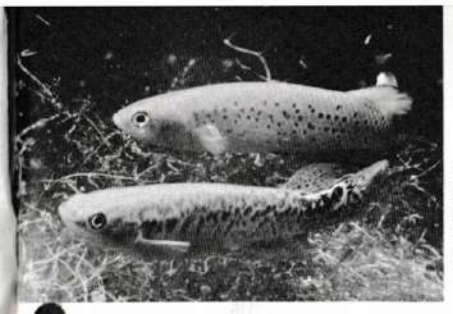
The Firetail Rivulus

by WILLIAM A. TOMEY

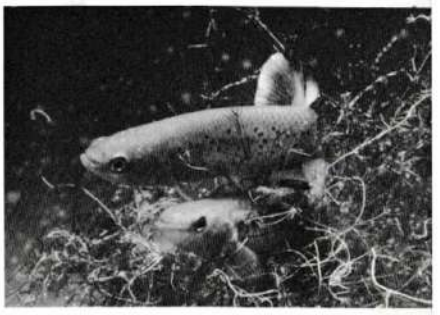
THE FIRETAIL RIVULUS, *Rivulus milesi* (the last portion being properly pronounced ME'-LES-EYE), marvelously colored and formed. Its original habitat is Colombia in South America, although other species in the genus can be found from South America to Central America, through the Caribbean region and even the United States. As the genus is spread over such a wide area, its individual species live under widely differing conditions. There are, for example, not only strictly freshwater species but some (e.g., *Rivulus marmoratus*) which even live in tidal areas. The firetail *Rivulus*, however, is purely a freshwater fish.

The description of the male firetail is as follows: body bluish-grey on sides, turning a pretty lavender as the fish grows older; reddish spots on the sides in an irregular pattern; belly rose or salmon-colored, back beige. The eye is golden. Dorsal, ventral and anal fins are yellowish-green, edged in black. The tail is beige; upper and lower margins are black; rear edge of tail with a cream-white submargin and a red edging. (Editor's Note: There are color varieties of *Rivulus milesi* as follows: rear tail edge gold or yellow; rear edge orange; rear edge completely white. The first variety has been known as the "goldentail *Rivulus*," and the last-named has been referred to as "*Rivulus elegans*.")

The female is mottled in brown and has a striking ocellus or "*Rivulus*



A pair in the initial nuptial stages. The female is below. Note the prominent "rivulus spot" at the base of her tail.



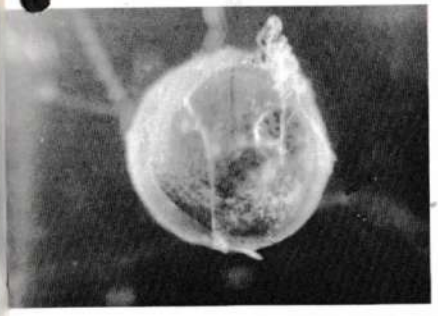
The male attempts to press the female into the mass of spawning grass.

The female (note her plumpness) is ready to spawn.

In any event, the male takes the initiative and presses the female deeper into the spawning site.

After laying an egg or a few, the partners split up for a short while. They come together again and again to repeat the process.

This is the famous S-shaped position of the spawning pair. The extent of bending of the spinal column is fantastic.



This is a newly-laid egg, hanging from the spawning grass by a series of sticky threads.

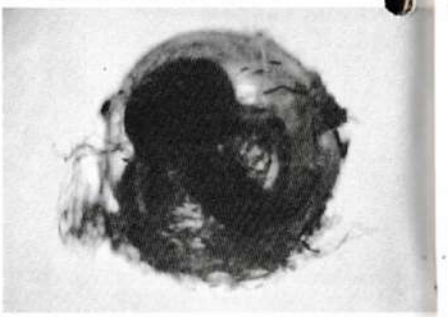
spot" at the upper base of her tail (a portion actually being on the tail itself).

The firetail killie is a quiet fish which may be found at any level in the aquarium. They are active eaters and must be fed well. In nature they feed on aquatic insects, particularly those which frequent the surface of the water. Consequently, they are extraordinary jumpers who can find the smallest hole in the cover of the aquarium. Many hobbyists have found their firetails, dried up on the floor of the room, simply because their aquaria were carelessly covered. (It might be observed that dried, they "don't swim so good"!)

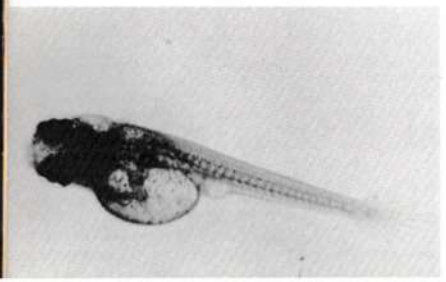
This beautiful fish is rather easily bred. The eggs are large, approximately 2.0 mm in diameter, and the development of the embryo can be

After three (3) days, development of the embryo can be seen.

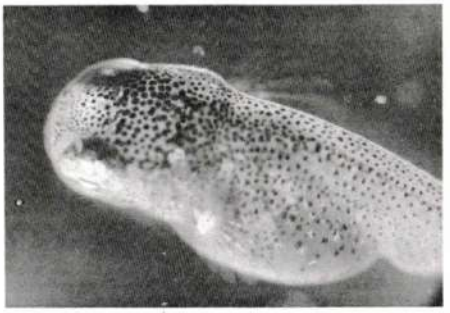
In six (6) days, the eye of the embryo is easily seen.



In 10 to 14 days, the egg is ready to hatch.



A newly-hatched fry. Note the yolk sac from which the fry draws nourishment for a day or so.



A closeup of a fry shows the presence of many black pigment cells.

followed without difficulty with the naked eye. At a temperature of 72 to 79° F the eggs will hatch in about 10 days; at lower temperatures, the hatching time is longer.

The new-born fry readily take newly-hatched brine shrimp; their rearing poses no real problems. The accompanying photographs will serve to show something of their spawning and the development of the eggs and fry. ●

EDITOR'S NOTE: American experience is that often, the eggs of *Rivulus milesi* will not hatch within the suggested 10-day period. Occasionally the eggs will go for 30 to 40 days, embryos visible, without hatching. One solution that has been found effective, is to shake the eggs, even if this means taking them for an hour's ride over a bumpy road in an old car! (Addition of a microworm culture to the container of eggs will also be found effective in hatching the eggs.)

As for the scientific name of the firetail killie, we refer readers to an article in Volume I, Number 3 (Fall 1964) of the JOURNAL OF THE AMERICAN KILLIFISH ASSOCIATION ("A review of the elegans complex", pgs. 7–14) which indicates that *Rivulus milesi* may be a synonym for *Rivulus magdalenae*. One ichthyologist has suggested recently that both names are in turn, synonyms for *Rivulus elegans*. There is no doubt, however, that the firetail killie is *Rivulus milesi* and we recommend the use of this name until a final professional opinion is rendered. AJK

AQUARIUM DECORATION

by B. F. CHHAPGAR

COMPARED TO THE NUMEROUS articles on keeping or breeding fishes, there are hardly any on the subject of aquarium decoration. And this is as it should be for, in this field, individuality counts rather than cut-and-dry rules. It may not be amiss, however, to list some general points, and then leave the decorator to work out his own details.

Let us first take the question of an aquarium as decoration in the home (or office), and take up decoration in an aquarium at a later stage. Gone are the days of the "window-sill" aquarium, placed there because this was the only suitable place where it could get sufficient light. Technological advances in the materials used for making an aquarium, as well as ancillary equipment in the way of illumination, heating, and circulation, now enable one to have it in practically any size, shape and position.

I have seen aquariums ranging from the sublime to the ridiculous. One of the most novel, but at the same time revolting, was a pair of earrings in the shape of two-inch plastic bowls, holding a guppy each. More a case for the S.P.C.A. than a sensible idea! Compared to this, the "picture-frame" aquarium, a tank of size 12"×8"×4", with a false front in the form of a photo frame, is quite an excellent idea. This can comfortably accommodate a couple or trio of small fishes as well as a pigmy plant or two. Air-breathing fishes would not be distressed in it, provided the room is not chilly.

Another unique idea is the receptionist's table shown in the accompanying pitotograph. The amount of water it holds is deceptively large. It is in fact two aquariums in one—one horizontal and the other vertical—and the fishes can swim from one to the other. The horizontal part, constituting the table-top, requires pigmy plants, but the vertical side can accomodate even tall ones like *Vallisneria*. But it's not the thing for a table-thumping executive!

An aquarium with a clean decorative frame does not need to be hidden behind a facing. But it is always a problem to hide the paraphernalia making up the filters, aerators, lights, etc. These can be concealed in a cabinet enclosing the aquarium, or there can be a "hole-in-the-wall" aquarium. The latter is best for a living room or a waiting room—the aquarium being flush with the wall in front but projecting into a back

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ABOUT OUR AUTHORS

HENRY W. ROBISON

Henry W. Robison was born 23 years ago in Albany, Georgia, and as a boy, traveled extensively as a consequence of his father's U.S. Air Force occupation. It was at one of the Air Force bases that he was introduced, at the age of 12, to the tropical fish hobby via a friend who supplied him with the inevitable pair of guppies.

His hobby developed into an occupation after he graduated with a B.S. degree in biology from Arkansas State University. Currently, Henry is completing work on his Master of Science degree in biology at ASU and will soon begin work towards his Ph.D. in zoology, specializing in ichthyology, at Oklahoma State University.

Henry has kept and bred many egglayers (including some of the "problem fishes"), his favorites being the anabantids and our native darters. His prime areas of interest are ecology, ethology and genetics. He has written several articles concerning tropical and native fishes, and his other hobbies include genealogy, all aspects of zoology, and paleozoology, especially fossil fishes.

In his trailer home, Henry and his wife continue the hobby while he continues his education. He hopes to teach at the college level when he finishes his Ph.D., with perhaps a retail tropical fish business as a sideline.

WILLIAM A. TOMEY

For 30 of his 37 years of life, William A. Tomey has been a fishkeeper. A resident of 's-Gravenhage, Holland, his professional life is that of Tax Officer in his country's revenue service (with time out during the war, serving as a Sergeant in the army). Most certainly, however, today he is one of Holland's leading aquarists.

Will has held the post of Inspector of Aquariums for the Dutch Aquarium-Terrarium Federation (*Nederlands Bond "Aqua-Terra"*, or *NBTA* for short), and has been a member of that organization's Examining Board. Besides being in demand for lectures on subjects aquatic, he is an accomplished writer and photographer whose work often appears in that most excellent of Dutch publications, *Het Aquarium*. His

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THIS IS MY PROBLEM

by HELEN SIMKATIS

From: J. C. Filiatrault, Laval, Quebec

I have a well-planted 36-inch by 12-inch by 12-inch tank with three female and two male giant black mollies with orange fins, and a lot of baby mollies (60). My water stays at 76 degrees F, pH 7-4. I feed them dry food, mosquitoes, flies and butterflies. I introduced in that tank recently a nice and colorful couple of "supposedly" shy and quiet dwarf gouramis. Probably I was misinformed about gouramis but the male ate all but a few baby mollies, and killed female (2) and male (1) mollies. I went out for a weekend and noticed that on my return the slaughter had occurred. Is it normal? Are gouramies this aggressive? P.S. The male built a big nest.

Answer: The dwarf gourami has a very good reputation and is not known to be a killer. However, these were extenuating circumstances. The male had spawning on its mind and mollies are inveterate trespassers. Furthermore, there are few adult fish who will pass up baby fish as a tidbit if such are to be had for the taking. When a hobbyist has success with mollies, as you were enjoying, it is good judgment not to upset the applecart and continue to keep the mollies to themselves. They like a good sized aquarium, well-planted, and if fed in the manner you practiced, they seldom bother their own fry. Yours was an ideal molly community and it is too bad that you didn't allow it to remain so. Had you set up the gouramis in a tank of their own, you probably would have agreed with the person who "misinformed" you that they are a shy and non-aggressive species. Finally, as you did not actually see the attacks, there is also the possibility that your trouble was due to another cause.

From: Paula Humphrey, Shreveport, La.

I have ordered a Madagascar lace plant. Would you please give me some pointers on the best way to encourage its growth. It will go into a 15-gallon tank.

Answer: A clay flowerpot about 4 inches in diameter with a hole in the bottom should be used. It should be washed in hot water. Place a marble in the hole and cover the bottom with a layer of aquarium gravel. A layer of peat moss should follow. More gravel should cover the peat moss and a layer of charcoal (crushed with a hammer) should follow. Now cover the charcoal with a sprinkling of dehydrated sheep manure. A thin layer of peat moss follows with a thin layer of gravel over that. The bulb should be nestled down into the

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A NEW CLASSIFICATION OF FISHES, PART III

by ALBERT J. KLEE

THE MOST IMPORTANT SUPERORDER OF ALL is Ostariophysi, a collection of predominately freshwater fishes that includes, as we have stated, about 47% of all aquarium species. The Superorder consists of two Orders, viz., Cypriniformes and Siluriformes, with the former further subdivided into three Suborders (Table I). Because the Suborder Characoidei is comprehensive, we have listed its Families (aquarium Families asterisked), together with pronunciation and typical genera, in Table II. The suborder is further summarized in Figure 1. It should be noted that the Family Characidae contains the previously-separated Families Crenuchidae, Acestrorhynchidae, Serrasalmidae, Tetragonopteridae, Creagrutidae and Glandulocaudidae. This single Family alone contains about 11% of the total number of aquarium species!

Going down the remainder of the list of aquarium Families in Characoidei we find two important Families, Lebiasinidae (i.e., pencil-fishes—the Family includes the previously-separated Nannostomidae) and Gasteropelecidae (hatchetfishes). Most of the remainder of the aquarium Families contain certain popular fishes, interest in Curimatidae and Citharinidae being quite limited, with only the diehard oddball specialist interested in the fierce predators of Erythrinidae and Ichthyboridae.

This brings us now to the other two Suborders of Cypriniformes, summaries of which are given in Table III (aquarium Families asterisked) with Family sketches shown in Figure 2. The Suborder Gymnotoidei includes the electric eel and the sundry South American knife fishes, all of which are aquarium specimens of sorts. (Note that Apteronotidae replaces the previously-used Sternarchidae.) The important Family of Cyprinoidei is, of course, Cyprinidae which includes the barbs, minnows, rasboras, goldfish, etc. A little over 12% of our aquarium species come from this Family. Accordingly, two Families, Cyprinidae and Characidae, account for almost one-quarter of all of our aquarium species! As for the remainder of the Suborder, this includes the lesser-important Gyrinocheilidae (e.g., the Siamese algae eater, *Gyrinocheilus*) and Homalopteridae (which contains the strange-looking and rarely seen *Gastromyzon*) and the more important Cobitidae which contains the loaches and weather-

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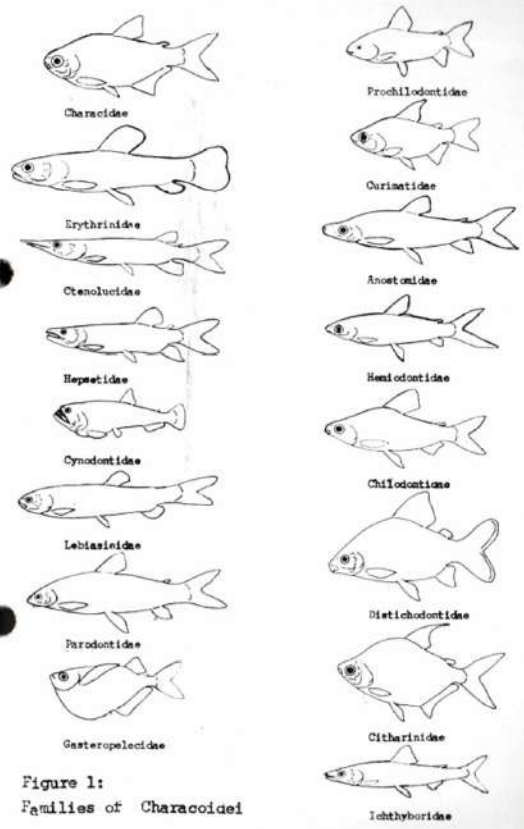

Figure 1:
Families of Characoidei

Societies at Work

By
HELEN SIMKATIS

THE MANY INQUIRIES REGARDING the American Cichlid Association received by this writer indicate that such an effort fills a long neglected need in the hobby. What we have learned about the organization suggests, however, that this corresponding club is geared for advanced hobbyists in the cichlid area of the hobby. Rare and new species are given special attention, and taxonomy, ecology, and behaviorism are a few of the studies pursued. Exchange of ideas, specimens, and results of experimentation are encouraged. A membership in the society includes a subscription to the ACA's newsletter and a roster of the members. The membership fee is $1 and John Byrd, 4875 Mt. Armour, San Diego, California 92111, is the person to whom those interested in the society should write.

The North Star Aquarists is a newly organized group in the Minneapolis, Minnesota area. The July issue of its official publication, *Ichthus*, is designated as Vol. 2, No. 1, but this is the first issue we have had the privilege of reviewing. Richard Ibeling discusses *The African Blockhead* in this issue and deplores this popular designation for *Streatocranus casuarius* as lacking dignity. We have to admit this is true. But then, popular designations often do and we dislike them more when they malign the essential personality of a species. As any rate, Author Ibeling prefers "lionhead cichlid" and he so neologizes a popular designation for the species throughout his article. He apologizes that his subject has little claim to beauty a little needlessly, because hobbyists either insist on pulchritude or downright ugliness and only species falling in between require defense. He agrees with Chlupaty's report on the requirements of the species found in Sterba, that the fish is undemanding insofar as water conditions are concerned, but disagrees with the statement that the fish is "peaceful outside of breeding season". He found the male testy with its mate as well as with the *Plecostomus* and *Synodontis* species he introduced to rid the aquarium of algae at a time that breeding was not on the male's mind. Again in contradiction to Chlupaty, he found the species prone to be a digger and a plant vandal. The first spawning accomplished in the aquarium was not successful as the male ate the eggs. Those with *Steatocranus casuarius* in mind will be warned by this piece that the "Blockhead" from Africa (if author Ibeling will forgive the nomenclature) is no paragon of virtue and changing its undignified designation hasn't helped a bit.

In the August issue of *Ichthus* Gary Grannes asks: *Is Ozone the Answer?* Undoubtedly, Author Grannes thinks it is, and bases his opinions regarding it on personal experience. This is the best explanation of how this aquarium aid works for the hobbyist that we encountered and if ozone clears up bacteria and removes urine from salt water in the manner author Grannes describes, it certainly has a place in the serious hobbyist's set-up, and especially in the accouterment of the wholesale shipper of fish. Roger Klouda's account of breeding turtle eggs in his *Two Months to Hatch*, appearing in this same issue, will be of interest to those aquarists who include the study of turtles in their hobby. Write to *Ichthus*, North Star Aquarists, 8344 Humbolt Avenue, South, Minneapolis, Minnesota 55431 for information regarding this new society and its publication.

The July issue of Aqua-Focus (published by the Aquatic Researchers of San Antonio) carries the second part of Don Hohenstein's *Now You Take the Egg . . .* (Part 1 was reviewed in this column last month). Here he compares the fertilization of fish eggs with that of birds' and the development of the respective embryos. The differences are outlined and the similarities delineated. Both sections of this piece are an adventure in the natural processes of nature that are seldom discussed in such a fascinating way. This is good reading for fish buffs but anyone with a curiosity regarding living things will find it most rewarding. Dr. Harry O. Specht, in this same issue also fills us in on *The Fire Killy* (*Nothobranchius rachovii*), one of the outstandingly beautiful killifish species. Excellent directions for spawning this colorful little fish are given, from setting up the aquarium with a bottom-covering of peat moss or sand, to storing the eggs for a 3 to 4-month period as well as feeding procedures, etc. Editor Leona V. Bradley, as per usual, has concocted a magic brew of good reading for her

following and we have only skimmed the surface here. Write to Aqua-Focus, 301 Blanco Road, San Antonio, Texas 78212, for information regarding the publishing society and its publication.

Keeping native fishes in a home aquarium has a special appeal to those hobbyists who like to work in the field collecting their own specimens and live food. Donald Fowler discusses *Native Fish for Aquariums*, commencing his article in the July issue of *Mid-West Aqua-Notes* and winding it up in the August number. For brooks and streams, he recommends a hoop net with a fine dark colored mesh, while in ponds, lakes and rivers, a minnow seine manned by two collectors is preferable. Game fishes such as bass, pike, and pickerel, etc. are best left behind as they require a tank to themselves because of their aggressiveness. Bluegills and other sunfish, Author Fowler tells us, can be kept together in uncrowded conditions. Catfish and eels, kept with fishes too large to make a mouthful, make good scavengers as well as interesting subjects. Dace, darters, shiners, and killies make the best candidates for a peaceful, natural appearing aquarium. Trout are not recommended by this writer for the home aquarium because they require cool water having a high oxygen content. Although the species recommended here (dace, darters, shiners, and killies) relish live food such as insects, larvae and small or chopped earth worms, they will accept prepared dry foods. For beauty, the dace, we are told, take first place. The darters come next and all require a quick handed collector. The more aggressive sunfishes are attractive, too, the pumpkinseed, spotted sunfish, the long-ear sunfish, the yellow bellied sunfish, the bluegill, and the black banded sunfish sharing equally in desirability. They are easy to care for but, of course, require plenty of room. Of the 47 species of killifishes found in American waters, the author prefers the top minnows (*Fundulus*). These species require plenty of room, also, and frequent additions of fresh water. Kept in cool water, they will spawn in captivity. Native fish buffs will find this article reference material. In the August issue of *Aqua-Notes*, Kaye Skowron has a good word to offer for the silver dollars (*Metynnis sp.*). Despite their avid appetite for plants, they are peaceful and seem to ignore smaller fish as tidbits. Mollie food and frozen spinach should be supplied to these vegetable lovers. They are attention-getters, this author tells us, and visitors to her fish room seem to favor them over other species. For information regarding the Mid-West Aquarists and their publication write to the society at 5552 W. Fullerton Avenue, Chicago, Illinois, 60639.

Hal Storick gives special attention to betta or gourami fry in his

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VIEWS AND REVIEWS

DISEASES OF FISHES, *second Edition, by C. Van Duijn, Jr.*, 1967, *Charles C. Thomas, Publisher, Springfield, Illinois*, 309 pages, $9.50.

The first edition of Van Duijn's *Diseases of Fishes* has long held the reputation of "the best thing available" to aquarists with a reading knowledge of English only. That work appeared in 1956. Since that time a number of improvements in fish husbandry have been published, ranging from new treatments of diseases to more information on previously obscure conditions. Van Duijn has taken advantage of the data on treatments, but has apparently ignored or missed advances in parasitology and nomenclature, and for this reason the second edition is somewhat disappointing.

The arrangement of the book essentially follows the first edition; there are chapters on skin parasites, respiration and gill diseases, sporozoans, bacteria and viruses, eye diseases, internal organ diseases, tumors, miscellany, chemistry and dosages. Thus, the book follows a plan useful more to the pondkeeper than the biologically oriented person who prefers his organisms treated phyletically, and dislikes thumbing through the book because, for example, gill flukes occur in a separate chapter from skin flukes.

The author's English is a little odd to an American and there is considerable archaic usage (e.g., ". . . parasites of *vegetable* origin (p. 57)"; "dichromate of potash" (p. 77) for potassium dichromate; "carbonate of lime" (p. 266) for calcium carbonate. There is no reference to major works such as Yamaguti's series on worms and other invertebrates, or Wardle and McLeod's *Zoology of Tapeworms*. The contributions of Dr. Myron Gordon on fish genetics and cancer have all but been ignored, and there is no discussion of parasitic isopods.

There are very few typographical errors, e.g., a line left out on top of page 21 and in page 56, but some are important such as the oxygen concentration of water on page 89 and the decimal omitted on page 95 for carbon dioxide concentration. Some errors are even humorous, such as the term "geni" for genera (p. 63, footnote) and *butschli* (p. 71) which should be capitalized and set in normal type. Even worse, *Oodinium limneticum* (on p. 47) is said to be a protozoan in the *dinoflagellates* (a category of algae), yet on p. 105 *Oodinium ocellatum* is stated to be a plant.

I have two real gripes with the book, however, which I will discuss separately. These are the editorial arrangement and some of the biology. First, the biology because this is more important. On p. 24 the generic name *Chriopeops* is used; this has long been correctly known as *Lucania*. In the discussion of fish epidermis (p. 7), although mucus (slime) cells are discussed, there is no mention of club cells (see discussion of "fright" below). Further, the author fails to note that, in brooding cichlids, heavy slime secretion is normal (and highly developed in *Symphysodon*). The discussion of "fright" on p. 267 was not carefully researched, or the author would have found the important paper by Pfeiffer (1962) in *Biological Reviews*, volume 37, pages 495-511, which discusses the role of club cells in fright substance production.

Formalin dosage is said to be critical, or else resistant strains may be produced (discussion of flukes on p. 29). To be kind, I'll merely say that this conclusion is on weak ground considering the generation time of the parasites, the protein-precipitating action of the drug, and the lack of data to back this contention. The author is invalidly extending what is known of bacteria (very short generation time) and antibiotics (very specific mode of action, often on particular enzymes). Bacteria may become resistant by 1 in 10,000 of the organisms being a mutant which either uses a different enzyme instead of the one interfered with, or possesses an additional enzyme which may digest the antibiotic. But, even assuming enough flukes around to supply some mutants, the action of formalin is so general, that I would venture to say that it would be impossible to have a mutant to its action even among tens of thousands of bacteria—not to mention a small number (relatively) of flukes. One way that bacteria *might* develop resistant strains is by the formation of a totally carbohydrate capsule, but such things do not occur in worms at all. Thus, his analogy is invalid.

On p. 42 the caption to the figure of *Ichthyophthirius* in methylene blue is utter nonsense: "*The 'ich' . . . tried to get rid of the parts that had been penetrated by the dye by rapid division.*"

The use of italics and the term *forma*, as in (p. 160) *Pseudomonas putida forma Davidi* is archaic and should be discouraged.

On p. 192 Van Duijn refers to fatty degeneration of the internal organs and gives the impression that this can be a direct result of having too many fats in the diet. Actually, fatty degeneration is a descriptive pathological term—not a disease—and may be brought on by all sorts of metabolic disorders, especially in liver.

The acriflavine controversy deserves special discussion. On p. 50 the author describes the origin of the concept that acriflavine might cause sterility. He attributes this to Patterson, writing in *Aquarium Journal* (1950). In 1956 Patterson wrote Van Duijn that *Aquarium Journal* had misconstrued his ideas. In any case, Patterson clearly retracted and denied the concept of acriflavine-induced sterility. Van Duijn, however, points out that acriflavine and related compounds can affect [bacterial] nucleic acids, and from this finally takes the plunge (p. 197 and elsewhere) where he states that acriflavine may indeed cause a temporary sterility. I would caution Van Duijn that there is no evidence for this whatever. In fact, killifish fanciers have used acriflavine for years as a bath in which eggs are incubated from spawning to hatching. Since this is a period of rapid and tremendous cellular division and embryonic differentiation, and no adverse effects are known, all the evidence would indicate that acriflavine does *not* affect the nucleic acids of living fishes, and hence

continued on page 63

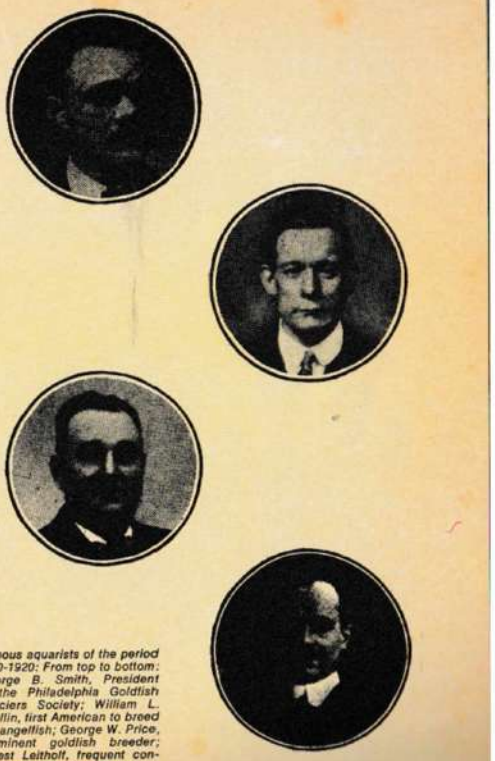
A HISTORY OF THE AQUARIUM HOBBY IN AMERICA PART 13

by ALBERT J. KLEE

IN SEPTEMBER 1915, AQUATIC LIFE appeared on the American aquarium scene, the first of our really important national magazines. Edited by William A. Poyser, former editor of THE AQUARIUM (1913), and published by Joseph E. Bausman, a well-known Philadelphia aquarist, the magazine was owned jointly by them. By this time, Poyser was a resident of Philadelphia and the magazine was published from that city. A single copy cost 10 cents, a yearly subscription (the magazine was published monthly) $1.00. Consisting of 16 pages at the start, additional pages were added in due time. Being an independent publication with no ties to any particular aquarium society, AQUATIC LIFE was closer to what we think of today as a commercial magazine (or "slick") than were its predecessors. It boasted the finest authors and the highest quality articles. Because of its cosmopolitan interests and wide circulation, it was extremely influential in the development of the aquarium hobby and we shall refer to it in future installments of this series. We might note, however, that its editor was a most modest gentleman. His name is hard to find in the pages of AQUATIC LIFE, and he is hardly remembered today. This, we believe, is most unfortunate.

By the end of 1915, three additional aquarium societies had been added to the list: the *American Federation of Goldfish Fanciers* (headquarters in Brooklyn, with S. Chichester Lloyd as its President), the *Reading Aquarium Society* (Pennsylvania, with J. R. Melcher as President), and the *Lancaster Aquarium Society* (Pennsylvania, with Hiram Peoples as its President). Contrary to what may currently be believed, the hobby in 1915 reached to almost all parts of the country. In 1916, the following societies were added to the roster: *National Aquarium Society* (St. Louis, S. Chichester Lloyd, President; note that by this time, the *American Federation of Goldfish Fanciers* had merged with the *Brooklyn Aquarium Society*, and Lloyd had moved to St. Louis), *Pittsburgh Aquarium Society* (Dr. O. T. Cruickshank, President), *Washington Aquarium Society* (Washington, D.C., Dr. R. W. Shufeldt President and

continued on page 49



Famous aquarists of the period 1910-1920: From top to bottom: George B. Smith, President of the Philadelphia Goldfish Fanciers Society; William L. Paullin, first American to breed the angelfish; George W. Price, prominent goldfish breeder; Ernest Leitholf, frequent contributor to **Aquatic Life.**

APISTOGRAMMA WICKLERI

by WILLIAM A. TOMEY

A male in the "inferiority color phase". In this phase, the longitudinal strip is prominent.

BECAUSE OF THE PROPENSITY OF many of the larger cichlids to dig in the bottom of the tank, it has become customary to repeat the rule of thumb, "No cichlids in the planted community aquarium". One may argue the merits of this advice but few of its advocates would disagree with the addendum, "Except for dwarf cichlids". Indeed, almost all controversy ceases when dwarf cichlids of the genus *Apistogramma* in particular are specified. A little-known member of this genus is *Apistogramma wickleri*, one of the so-called "indianhead" apistos (as cichlidophiles refer to the members of the genus), a group containing *Apistogramma cacatuoides*, *A. ornatipinnis* and *A. steindachneri*. In early 1960, Dr. Wolfgang Wickler of the Max-Planck Institute, sent several specimens of a fish referred to in the trade as *Apistogramma pleurotaenia* to Hermann Meinken of Bremen, Germany. Finding it to be unlike that species, however, Meinken described and named it after Dr. Wickler. The habitat of the species is, unfortunately, unknown.

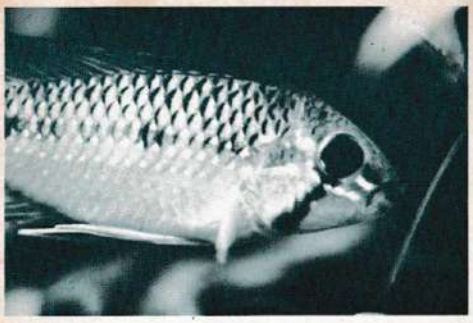
A female **Apistogramma wickleri.** Note the shorter fins.

A magnificent specimen of a male **Apistogramma wickleri.**

This is a head-on view of a "defeated" male who has just returned to his own territory.

The most significant colors of the male *Apistogramma wickleri* (which reaches a length of almost 2¾ inches) include bright greenish-blue spots over a basic body coloration of blue-gray, and an orange-red crest on the dorsal fin. The tips of its lyretail are reddish, the long sharply pointed pectorals yellowish but transparent, depending upon the emotional state of the fish. A black line starts below the eye and proceeds diagonally back across the gill covers. An irregular black colored line is sometimes found from the eye to the root of the tail. The line broadens at several places to form a number of indistinct spots, especially on the root of the tail itself. At other times the line disappears, with only the spots remaining, to be replaced by a suggestion of diagonal stripes. The female (about 1½ inches in length) is noticeably smaller than the male, but not any less colorful. She can and does alter her body coloration and sometimes appears temporarily in a canary-yellow phase with black spots on body, tail and gill covers (the last-named spot being really a short line).

Apistogramma wickleri is peaceful with other fishes under ordinary



An intermediate color stage in the male, showing the presence of an indistinct longitudinal black line, and the many greenish-blue spots characteristic of the fish.

circumstances but if either their "territory" or spawn is threatened, they immediately assume a combative attitude, with head lowered and fins spread fully. Individuals seek the most favorable sites for their territories and males will stage real "cock-fights" in their defense. The loser in such fights alters his normal coloration which then is replaced by a pale yellow body hue and the dark longitudinal stripe mentioned previously. This is the "inferiority color phase", after which the loser ignominiously retreats!

In breeding, the female selects the site which is typically a broad leaf or smooth rock. The site is carefully polished by both male and female prior to spawning. In general, the pair seeks a quiet, protected location which is easily defended. The somewhat rose-colored eggs are laid down in rows by the female and fertilized by the male in typical *Apistogramma* fashion.

After all the eggs are deposited and fertilized, the female sends the male away to guard herself and the nest from intruders. Her care consists of removing infertile or fungused eggs, and fanning the eggs to oxygenate and keep particles from settling on them. In a community tank the chances for hatching are poor, but they develop well in a breeding tank set aside for the purpose. A mixture of infusoria and newly-hatched brine shrimp starts the fry on their way to maturity; growth is rapid. Undoubtedly, *Apistogramma wickleri* will prove exceedingly popular with devotees of dwarf cichlids.●

TOMEY: continued from page 5

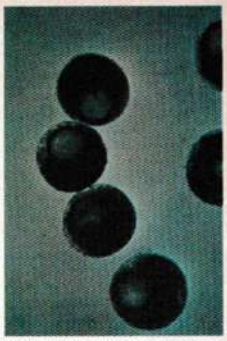
A side view of the nest shows that it protrudes an inch above the surface of the water.

The basic coloration of the thicklipped gourami is greenish-brown. This is overlaid with eight or nine reddish vertical bars. A dark stripe runs along the body from head to tail root where it ends in a blue spot. Although both sexes are beautifully colored, the colors of the male are more intense. During spawning, the male also exhibits dark-violet coloring under both belly and throat, and his ventral fins ("feelers") are more reddish.

If your fish are well-conditioned on a variety of foods, such as white worms, brine shrimp, tubifex and dry flake foods, the nuptial rituals may be yours for the observing. The male darkens and then commences the building of a bubblenest among (typically) floating plants (water sprite is excellent). At first, the bubbles are quite coarse but as time goes on, the bubbles added to the nest become smaller, perhaps half as large as those produced by bettas. The nest, however, is not as tidy as those produced by other gouramis. It usually encompasses an area of 3 to 4 inches in diameter.

Should the female approach the nest at this time, she may be driven away by the male. Certainly she takes no part in the nest-building activities. Because there is some danger of damage to the female during spawning, a good supply of refuge plants is advisable in the tank. When the nest and the partners are ready, the female takes up a position, below the nest, alongside the male.

Fertilized eggs, newly laid, are clear. One egg in this photograph has started to fungus.



In six hours, development can be seen. A few hours before hatching, this is how the eggs look.

Newly-hatched fry are extremely tiny and must be fed (after the yolk sac is absorbed) the smallest of live foods such as ***Englena.***

At this size, the fry consist mainly of eyes and yolk sac. A typical spawning will number in the hundreds and the main problem is in feeding them a sufficient quantity of live foods they are able to swallow.

A male in full spawning color. The dark band about the mouth gives the fish the appearance of having "thick lips."

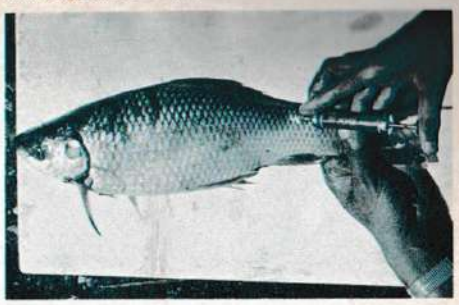
A female thicklipped gourami. Her colors are less intense than those of the male. Her vertical bands are lighter and not as complete, thus making the horizontal line appear stronger than in the male.

As there is some danger of damage to the female during spawning, a good supply of refuge plants is available.

The male then embraces the female and they slowly sink through the water, rolling as they fall. During this time, the female drops several eggs which are immediately fertilized by the male. As the eggs are lighter than water, a good many simply float up into the nest, while the male picks up some eggs in his mouth and places them into the nest directly. Unfertilized eggs darken, then fungus. Fertilized eggs, on the other hand, are clear (betta eggs are an opalescent white, while those of the dwarf gourami are faintly amber) and after a few hours, development within can be observed under the microscope. A typical spawning will consist of 700 to 800 eggs. Hobbyists, of course, generally successfully hatch only a small portion of the total number of eggs produced.

The eggs hatch in 36 to 48 hours, depending upon the temperature (which should be around 80 to 82°F). During this time the male stands guard over the nest (remove the female after spawning) which may project almost an inch above the surface of the water. After the eggs hatch, remove the male also. Green water from a pond or cultivated infusoria will make an excellent first food. The larger infusorians, however, are too big; *Paramecium* is too large but *Euglena* is perfect. From the second week on, powdered dry food and some newly-hatched brine shrimp may be added to this diet, and in three to four weeks, almost any food will do.●

CHHAPGAR: continued from page 7



A "ripe" redtailed shark being administered hormone via injection.

Until about a decade ago, none of these fishes could be made to breed artificially, so that the pisciculturist had recourse to collect the fry from the rivers where they bred naturally. All sorts of "stimuli" were visualized as being necessary for the fishes to breed, such as the right temperature, cloudy weather, a rapid flow of turbid water into the lakes, and fish culturists tried to duplicate these conditions, but to no avail. Only when the use of gonadotropic hormones was made could the fishes be stimulated to breed in confined waters.

In the beginning, sex hormones and pituitary extracts from slaughterhouse mammals were tried, but were unsuccessful. The first breakthrough came when pituitary extracts of fishes were tried. It was then found that best results were obtained by using extracts from the same species of fish, but that extracts from related fishes would also serve the purpose. However, the extract must be made from the pituitary gland of a sexually mature fish *collected during or just prior to the natural breeding season.* Moreover, the sex of the donor fish did not matter, so that the pituitary extract from a fish could stimulate another fish of either sex. The technique of breeding *Labeo rohita* by hormone stimulation has been perfected since then and is described below.

For collection of the pituitary gland, a freshly killed mature fish is selected in the months of May and June. Glands from fishes properly packed in ice for as long as ten days have also been found to be effective. The top of the skull is removed by oblique strokes of a meat chopper, and the brain exposed. The fatty substance over the brain and fluid is

The skull of the redtailed shark is opened to expose the brain.

The brain is then lifted up, showing the pituitary gland lying inside a hollow cavity.

swabbed away with dry cotton. The front parts of the brain (i.e. the olfactory lobes) are then severed with a knife and the brain is lifted up and backward with forceps. This exposes the cavity where the pituitary gland is lodged, covered by a membrane (the *dura mater*). The gland can now be carefully picked up without damaging it.

It is not necessary to use the freshly collected gland; if properly preserved, the glands retain their potency for over two years. As the hormones which stimulate breeding (gonadotropic hormones) are soluble in water, the glands should not be washed with water. The glands can be dried in acetone, but this method necessitates storage in a refrigerator, and that too inside a desiccator. If the glands are preserved in absolute alcohol in an airtight tinted-glass phial, they can be kept in a cool place even at room temperature, obviating the use of a refrigerator.

When required for use, the gland is taken out and dried over a filter or blotting paper. The required quantity of gland is crushed with normal saline or distilled water in a tissue homogenizer, diluted and centrifuged. The clear fluid can then be injected into the fishes to be bred.

Injections are normally intramuscular, administered at the root of the tail or in the shoulder region. The syringe needle is inserted under a scale, and the muscle is then pierced at an angle. Not more than 0·1 ml. of prepared fluid should be injected for every pound weight of fish, to avoid distress.

Labeo chrysophekadion. *The Black Shark is a most peaceful fish and makes a useful bottom scavenger. Its overall color is a velvety black, but with age, tends to take on a bronze tinge, mainly on the tail.*

The fishes to be injected should have their sex products ripe. This can be determined by pressing the abdomen of the male slightly, when milt will ooze out. The fully gravid female will have a swollen vent. The sexes can be distinguished by the fact that the tip of the pectoral fin reaches the eighth or ninth lateral line scale in the male, but extends only up to the sixth or seventh scale in the female. Usually a preparatory dose of pituitary extract is given to the female, at the rate of 1 milligram of gland per pound of fish. This is followed after 6–8 hours by the first or regular dose, at 2 mg/lb for the female and 1 mg/lb for the male. A second dose may have to be given to the female if she does not respond to the first dose, this being again 6–8 hours after the first dose.

The above method of induced breeding with pituitary hormone injection may be tried out on *Labeo bicolor* as it is closely related to *Labeo rohita*. It is not necessary to have pituitary gland of the red-tailed shark; that of the *rohu* would do quite well. There might be a few snags to using this method; thus the small size of the fish precludes the possibility of giving massive doses by injection. This is offset by the fact that very small doses would be required, albeit administered with a steady hand so as not to injure the fish. The dosage required still remains to be worked out, as an overdose might result in collapse of the fish. This can only be done by trial and error. Once again, the method is successful with *rohu* only at the onset of the monsoons—delayed monsoons result in re-absorption of the eggs, after which no amount of injection of extract will bring the fish into "condition". Thus injections may be successful only when given at the time when the red-tailed sharks normally breed. However, this method sounds quite promising until such time as the aquarist has learned the "ropes" on how to breed the fish naturally.●

CHHAPGAR: continued from page 16

This modern cabinet set-up with both freshwater and marine aquaria shows just what can be accomplished with a modern decor.

room, where handling can be easily done.

With the current trend towards wall-to-wall carpeting, the aquarist may like to extend this idea and have a wall-to-wall aquarium. To make a single large one would entail enormous effort, but a similar effect can be achieved by a series of long tanks, each of the same dimensions. The aquarist can use his own ingenuity to decorate the ends of each tank so as to give an illusion of continuity.

Aquarium-cum-bookcase cabinets seem to be a common idea, but the usual mistake is to have the bookcase under the aquarium. Water dripping from above while cleaning, etc., can ruin the books below. A more practical variation is to have two shelves with a [-shaped cross-

A receptionist's table-cum-aquarium occupies a prominent place in this office!

section, and install an aquarium of the same width and height in line with and between the two. It will then form an integral part of the whole unit.

With modern homes of open-plan pattern, where the rooms have only half-partitions between them, a large aquarium projecting at right angles to a wall can be used to partition off a large hall into two semi-private rooms. In a room with large windows and low sills, an aquarium at right angles to the window, with its base the same height as the sill and resting on a slab of the same material as the sill, can form a partition wall.

Finally, let us come to the decoration inside an aquarium. Too much stress is unduly laid on creating a "natural" environment. If one were to duplicate the conditions existing at the bottom of an urban pond, one would have to place some old shoes, a worn auto tire, rusty tin cans, and maybe a dead cat, inside the aquarium! It would suffice to have the plants not too sparsely or symmetrically placed, so as not to give a formal appearance. A main focal point of many plants or stones placed rather on one side of the aquarium, with an isolated one away from this to set it off is a good scheme.

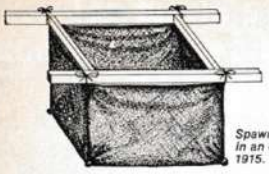
The specialist might go in for an aquarium housing the plants and fishes of a particular continent. I was most pleasantly surprised to receive a letter from an American aquarist asking for a list of fishes found in the River Ganges. The accompanying photograph shows an aquarium with Indian plants and fishes.●

KLEE: continued from page 32

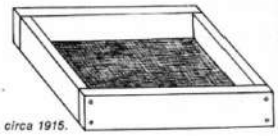
Other prominent aquarists of the period. From left to right: A. A. Phillips, Jr., leading goldfish fancier of the Brooklyn area; Charles E. Vissel, a goldfish breeder in Brooklyn who was later to become the "Father Of The Fancy Guppy"; Joseph Froehlich, Vice President of the Brooklyn society; and W. H. Helmbach, of Allentown, Pa., another leading goldfish breeder.

Dr. Hugh M. Smith, Honorary President), and the *Essex County Aquarium Society* (Newark, Lothair Smith, President; its Secretary was none other than one of the earliest aquarium pioneers in this country, Max G. Hammerschlag).

We will end this list of early US societies with 1916 as the hobby added new societies, city after city, after this date with consistent regularity. For the record, however, we should mention that both the San Francisco and Boston groups underwent reorganizations prior to 1917 and were, in effect, different societies by that date. Also, the *Chicago Fish Fanciers Club* incorporated as the *Chicago Aquarium Society*. It is of interest to note that the new *Boston Aquarium Society* had as its Secretary a young man who, in future years, was to be the Director of the world-famous Shedd Aquarium in Chicago, i.e., Walter H. Chute. We leave this chronicle of aquarium societies with the note that the St. Louis group came under heavy criticism for its choice of name. As



Spawning net (used suspended in an ordinary aquarium), circa 1915.

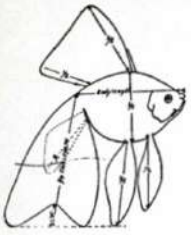


Dalphnia screen, circa 1915.

Poyser put the case: "It is a mistake to organize a society and adopt a name that creates the impression that it is national in scope. No one society can hope to be national *in influence*. It has been tried and found a failure. Most anywhere the field, locally, is sufficiently large to make work in a restricted area attractive. There can be no doubt of the desirability of a national body, but this organization must be composed of existing societies as bodies, and not of individuals. Only through such a body can subjects of national interest, such as a uniform standard goldfish standard, be decided with general satisfaction".

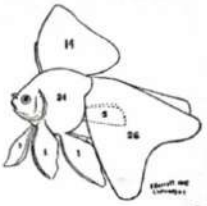
An event of tremendous historical significance to the hobby occurred in October 1915, when William L. Paullin published (in AQUATIC LIFE) the account of the first breeding of the angelfish in America. We reproduce it here in its entirety.

"After losing several lots of spawn, I have at last succeeded in rearing the scalare—the first time it has been bred in America. I obtained my pair when quite young, and have since kept them in large aquaria, holding 100 gallons or so. Contrary to other writers, I have found them very docile, and at times, though I do not recommend the practice, have kept goldfish in the same tank. While generally slow and stately, they are graceful swimmers, and can dash across the tank about as fast as any fish I have seen. In color the scalare is warm brown, the body and fins traversed by dark stripes. The long, slender rays of the pectoral fins



Brooklyn Aquarium Society, Inc. Standard

Jap Goldfish Standards



Philadelphia Aquarium Society Standard

The conflict in goldfish standards, 1915. Note the difference between the "Philadelphia School" (right), and the Brooklyn proponents (left).

are clear yellow. These extensions and those of the tail are easily broken, but soon grow again. Pterophyllum comes to us from the Amazon River, Brazil.

"Scalare seems to be able to stand quite a variation in temperature. I have had it as low as 65 degrees Fahrenheit, and as high as 95 degrees, 82 degrees seems best, and is the temperature at which it is bred. While it will eat *Daphnia* and the dry prepared foods, it seems to prefer mosquito larvae, dragonfly larvae, water tigers, water boatman, and all the larvae that we fish breeders consider pests when found among *Daphnia*. It will take earthworms, but demands that the pieces wriggle, and be not more than half an inch in length.

"On the day previous to spawning a leaf of sagittaria is selected and both fish make every effort, but without success, to make it stand upright. The next day the female protrudes an ovipositor half an inch long, just in front of the sweeping anal fin. The organ of the male measures about an eighth of an inch. Both are retracted when spawning has been completed. Turning upon her side, the female deposits the first egg at the base of the leaf. The male with a similar movement fertilizes it. Egg after egg follows, until the leaf is well covered with a single layer. In the operation, the female after each egg descends to the base of the leaf, then arises and deposits the next egg immediately above the last, the male following in like manner. Thus a trip was made by each fish up and down the leaf for each egg deposited. Why the female thus proceeded is not clear, but this action by the male would have been to

A pipe-iron aquarium stand, circa 1916, manufactured by the Jacob Cassel Co. of Philadelphia.

make doubly sure the fertilization of each egg. If, while the eggs were being deposited, one dropped to the bottom of the tank, it was greedily eaten by the first parent to reach it.

"The eggs hatch in about two and a half days. The fry seem to merely protrude head and tail, and to retain connection with the egg. The young are now removed by the parents from the leaf and attached to another by means, apparently, of a tiny filament—a growth from the head. This operation is repeated daily. The young, while attached, keep up a constant wriggling. Should one fall it is replaced at once. While during this period the fry are carefully tended during the day, I found that at night the parents had a tendency to make an occasional meal of them. I prevented this by burning a 40-watt electric light just above the tank. After seven days the young having reached the free-swimming stage, I removed them to a smaller tank that had been standing for two months without fishes. This aquarium was teeming with infusoria. As they grew I fed *Daphnia* and mosquito larvae. At the present time the surviving young are about the size of a silver dollar, not including the fins."

Editor's Note: As old as this account is, the electric light technique may be of some help to some breeders even today. Note that when Paullin spawned his angelfish, brine shrimp were unheard of.

In 1915, Charles E. Vissel was winning prizes in eastern shows for his goldfish. It was to be another 19 years before his fame as the developer of the first fancy guppy would set him apart as the "Father of the Fancy

A Deluxe aquarium, manufactured circa 1915.

Guppy". In 1916, AQUATIC LIFE published the first color photograph of an aquarium fish ever to appear in a US magazine (a calico telescope goldfish—February 1916). The aquarists of the hour included C. Schenk, Christian Heede, George Smith, Dr. R. W. Shufeldt, Walter Brind, John Treadwell Nichols, William L. Paullin, George Price, Harry P. Peters, Frank J. Myers, Frank L. Tappan, W. H. Heimbach, Jacob Merget, Charles H. Rohrbach, Rev. Paul W. Roth, Perry Bruce Clark, Ernest Leitholf, and William E. Meehan, in addition to the others we have previously mentioned. They were too numerous to mention them all and few, if any, are remembered today.

In 1916, killifish was spelled with a hyphen (i.e., Killi-fish and referred mainly to *Fundulus*, particularly *Fundulus heteroclitus*), aquarist was sometimes spelled "aquarian" (Poyser used this spelling frequently), the zebra fish was *Leporinus fasciatus* not *Brachydanio rerio*, and aeration and heating were still rudimentary. Although goldfish standards were actively being developed, tropicals began to steal the "thunder" from that fish. At the *New York Aquarium Society* show (featuring over 100 tanks) held August 28-30, 1916, the following fishes were exhibited: Jewel fish, Egyptian mouthbrooder, butterfly fish, dwarf paradise fish, climbing perch, dwarf gourami, thick-lipped gourami, blue gourami, zebra danio, spotted danio, pearl danio, giant danio, rosy barb, half-banded barb, medaka, *Aplocheilus lineatus*, *Aplocheilus panchax*, *Epiplatys sexfasciatus*, *Aphyosemion australe*, *Rivulus tenuis*, *Rivulus*

One of the first aquariums in America to be heated with electricity. The tank belonged to Mr. Robert W. Chanler, of New York City in 1916. Although the tank was designed to employ solely the water heater attached directly below the tank, this was not sufficient. Accordingly, light bulbs were mounted below the aquarium cover.

ocellatus, *Rivulus cylindraceous*, *Fundulus chrysotus*, swordtail, platy, *Gambusia holbrooki*, guppy, *Heterandria formosa*, and species of native fishes of the sunfish and dace groups. Also in this year, a section of the *New York Aquarium Society* conversing entirely in German was formed, with Dr. E. Bade as its presiding officer.

Of greater significance, however, was the first American spawning of a *Corydoras* species. The breeder was Frank Dungan, and the species in question was *Corydoras paleatus*. His account of the accomplishment is as follows:

"When I first saw a Brazilian catfish, the panzerwel, as our German friends call it, I was rather fascinated, and this regardless of its somewhat somber color scheme of browns. Interest in a species, especially among aquarists, usually promotes a desire to breed it, more so if its habits be known, and in this respect I am not an exception. My friends could tell me little of the panzerwel, other than that it was an inoffensive and rather shy little fellow, and that it might be kept with goldfish. I was obliged, therefore, to proceed along lines that in my estimation were favorable to the desired end—propagation.

"Specimens gradually were added at intervals to my collection, and I now have three males and two females. The species seem to be *Corydoras paleatus*. The coloration can be briefly described as yellowish-brown, with dark or blackish markings, the fins speckled or spotted. The sexes may be distinguished by the relative shapes of the fore-dorsal. The first ray of that of the female is noticeably shorter than the next, whereas, in the male the first ray is nearly as long as the next. The males

are more slender than the females.

"The panzerwel is a bottom fish, prowling timidly on the sand among the plants, and seldom rising. The tank in which mine find a congenial home contains a considerable accumulation of humus or sediment, the value of which will become evident later, and is sparsely planted with *Sagittaria*. It is in a rather sunny part of my conservatory, which promotes the development of algae upon the glass and plants—to the detriment of the latter.

"Spawning occurred on November 8, the day following the Presidential election [*Editor's Note:* At which time Wilson was re-elected to his second term], at 5 a.m., and continued for about three hours. The pair proceeded like goldfish, but the male 'drove' the female much more rapidly, the spawn being scattered about promiscuously in a like manner. The eggs were pearly white, remarkably adhesive, and stuck tenaciously to the glass; none seemed to become attached to the plants. I counted 112 on the front glass alone. The aquarium was maintained at an average temperature of 70 degrees fahrenheit, and in five days the eggs hatched; the fry dropped to the bottom and were lost to view in the feathery humus. Where each egg was attached to the glass a tiny white circle remained, and now, after two months, some may still be seen.

"The value of the deposit of sediment upon the bottom of the tank will now become evident, because, after the yolk-sac was absorbed, the youngsters found amongst it the much-needed infusoria. At this time they may be said to resemble tadpoles. I made no microscopical examinations, but as soon as they were large enough to be easily seen, they resembled closely the parents in shape and markings. Other than the minute animal and vegetable life naturally present in the aquarium, I have fed nothing but daphnia and the cyclops that were collected with it. I have not been able to observe them eat the live water-fleas, and it may be that the dead ones falling to the bottom are more acceptable. In any event they spend most of the time wiggling and wriggling about, sometimes standing on their heads with tails aloft, rooting vigorously in the humus. At intervals one may wriggle up the side of the tank and nibble algae, but mostly they are upon the bottom.

"The youngsters seem to be quite adaptable to changes in temperature, as at the time the thermometer in their tank has registered as low as 58 degrees, yet they seemed as lively as when much warmer.

"I do not know just how many eggs were expelled, but surely more than the 112 counted. After the spawning the parents remained in the tank for two days, and during this time they possibly ate such as had fallen to the bottom, but they did not molest those attached to the glass. The heaviest mortality occurred during the third and fourth weeks. How many are still alive is problematical; possibly twenty-five, or even fifty."

To be continued.

***SOCIETIES:* continued from page 28**

column *Hal's Digest,* a regular feature of *Aqua Jewels* (August issue), published by the Aquarium Society of Broward County. Many hobbyists are successful in breeding bettas and gouramis but by the third week commence to lose their baby fish. This is the most critical period for these youngsters, for it is during this stage the labyrinth or accessory respiratory organ, develops which will enable them to obtain oxygen from the atmosphere. This period is frequently discussed in articles on breeding the labyrinth fish. Author Storick, however, not only points out the importance of keeping the water temperature and the air temperature between the water's surface and the aquarium cover the same, but offers a way by which this can be accomplished. He recommends buildings a wooden frame that will serve as a superstructure for the average 10-gallon tank. This is equipped with a light socket with a snap or "push" switch. The wooden superstructure, or frame, can be covered either by a piece of glass or plywood. The author gives instructions for building the frame and any do-it-yourself handy hobbyist will find them easy to follow. This type of frame equipped with a bulb of the proper wattage will prevent the air space between the aquarium cover and the water's surface from chilling and will help the hobbyist to carry the betta or gourami fry through their most critical stage. A well-executed line drawing accompanies the piece. In this issue, too, Kappy Sprenger discusses candidly the danger of releasing some tropical fish in native waters, risking the wrath of many hobbyists who feel that such regulations are an infringement on their personal liberties. She ends her comments by saying, "The rights of personal property are part of our American heritage. But along with the rights must go the responsibilities of teaching our people to use those rights wisely."* This is a thoughtful commentary and reminds the reader of the many creatures who have become extinct because of thoughtless importations of predators from which the native wildlife had no natural defense. *Aqua Jewels,* published by the Aquarium Society of Broward County, is edited by Doris Vilda who believes in what she calls "looking wider" and practices it by inviting members of other societies to participate in the writing chores of the bulletin she so ably directs and by encouraging corresponding membership and patrons. Write to the Aquarium Society of Broward County, P. O. Box 115, Fort Lauderdale, Florida 33302 for information regarding the society and its publication.

The August issue of *The Tropical Topics* announces a change in the name of the publishing society, formerly The Aquarium Hobby

**Editor's Note: It is the editorial policy of this magazine to condemn all unauthorized releases of exotic fishes into public waters. A.J.K.*

Club of Indianapolis, and now the Indianapolis Aquarium Society, Inc. This issue begins a feature entitled *Life Member Series* and Mrs. Ethel Coy is its first subject, a native of Indianapolis. She is in her 83rd year, maintains some 20 aquariums, and is on hand at the meetings of the Indianapolis Aquarium Society to greet visitors and to make them feel welcome. She has lost count of the number of species of fish she has bred and is still adding to the many. She and another hobbyist, Margarite Wilson, were instrumental in founding the society (then known, of course, as the Aquarium Hobby Club of Indianapolis) some 18 years ago. Anyone planning a trip to England will welcome Jim Kelly's *Everything Stops for Tea*, appearing in this issue. "Fish clubs," he says, "are as numerous as Israelis in the Sinai Desert" but they don't advertise. Any shop displaying aquariums, however, will have a clerk who can direct one to where the action is. Have English money if possible — Britains prefer it to American currency. *The Tropical Topics* is a well-produced lively bulletin, reflecting a lively society. Write to the society at P. O. Box 18246, Indianapolis, Indiana 46218 for information.

There is a comprehensive article on plants in the July issue of *The Gaasette*, published quarterly by The Greater Atlanta Aquarium Society, by Lercy N. Phelps, Ph.D. The scope of the piece is extensive, and although the author does not go into the specifics of aquascaping, he keeps in mind the decorative value of plants, and his basics of aquatic plant culture accommodates this use of them. "Most aquarium plants," he tells us, "will grow under a rather wide range of conditions, and if the rules on the use of plants in aquascaping (underwater landscaping) are followed, the plants will grow." He advocates less than three species for small or average-sized aquariums, but up to six in large tanks. When selecting species, there are some requirements the hobbyist should consider. Some plants, such as the cryptocorynes, will not live in temperatures below 72 degrees F., while other species are essentially cold-water plants. Light preference should also be determined. He lists sword plants, saggitarias, valisnerias, etc. for strong light (never direct sunlight), and the crypts for weaker light situations. He prefers using fish and plants from the same geographical areas. His reasons for using live plants in an aquarium are given in this order: (1) Plants serve as the basis for aquascaping, (2) they offer security to fish and fry (places to hide), (3) biological balance (plants utilize waste products), (4) they give the hobbyist a sense of accomplishment when they thrive and do well, and (5) beauty. For hobbyists interested in learning the fundamentals of aquascaping, Dr. Phelps recommends Dr. Wm. Dewhurst's *Enjoy Planting Your Aquarium*.

This is notebook material for the serious hobbyist. Another excellent piece on plants appears in this issue by Don L. Jacobs, Ph.D, entitled *Emperor of the Swords. Echinodorus martii* is the Doctor's choice of the species of swords popularly referred to as the ruffled sword plant. In his description of this handsome aquatic, the author points out that the leaves are sturdy and defy attack from loaches. This characteristic makes them ideal for angel spawn. The species has a wide pH range and likes a temperature between 70 and 80 degrees F. It likes a good light from side or top but not direct sunlight. Propagation is gone into as well as treatment for a fungal leaf rot to which the species is subject. Write to Greater Atlanta Aquarium Society, P. O. Box 13212, Atlanta, Georgia 30324 for information regarding the society and its quarterly publication.

The East Bay Aquarium Society introduced the first issue of its new publication *The Fish Fancier Magazine* in April 1968. We received our copy very late but only mention the tardiness by way of an explanation why we did not welcome it to the aquarium hobby scene earlier. Editor Falletti has garnered together some excellent material for his Vol. 1, No. 1 issue, including a brief history of the publishing society. The East Bay Aquarium Society formed in Oakland, California in 1933, and was founded by Ben Durdle with a modest membership of 18 hobbyists. The club now meets at the Brookdale Park Clubhouse, 2535 High Street and Brookdale Avenue, in Oakland, California at 8 p.m., on the first Friday of each month. For membership information and information regarding its publication, *The Fish Fancier*, write to the society at P. O. Box 435, Oakland, Calif. 94612.●

NEXT MONTH – A NEW FISH FOR THE NEW YEAR – THE MARBLE ANGEL!

VIEWS & REVIEWS: continued from page 31

would in no way affect fertility, temporarily or otherwise.

Under "swim-bladder troubles" (p. 197) there is no discussion of belly-sliders, a common affliction of premature annual killifishes and prematurely released mouthbrooder fry.

In his discussion of chlorine toxicity (p. 258) there is no mention that some municipalities use chloramine rather than chlorine, and that this compound is rather stable to standing. There is no mention of the use of chlorine neutralizers (sodium thiosulphate).

Under the discussion of artificial light (p. 262) the author is back in the warm-white days, and there is no mention of plant-stimulating bulbs such as GRO-LUX® or PLANT-GRO®. This is inexcusable in a 1967 text.

In "embryonic deformities" (p. 268) there is no mention of missing fins, incomplete opercula, belly-sliders, etc. Nor is it pointed out that many cases of deformity are due to environmental conditions such as handling and premature hatching, and that such deformities have no effect on future generations, i.e., they are non-hereditary.

The copepod section is brief, and there is no mention of using potassium permanganate for treatment (widely used in public aquaria). Isopods are not even covered. The *Ergasilus* drawings are poor.

The treatment of flatworms should have been far better; he had 11 years to bring it up to date and eliminate archaic terms. On p. 200 the description of larval production in Digenea is incorrect; only the sequence is correct. He states (p. 201) that quarantine of snails for a few weeks will result in their eventual expulsion of all larval digenea, and this too is incorrect. Many snails retain many infections (and infectivity for fish) throughout life. Thus, wild snails

should *never* be used in aquaria (unless they are *known* to be "clean"), but should be allowed to breed in fishless aquaria, and their *offspring* used with fishes. On p. 203 ". . . *Ligula simplicissima* Creplin . . . is a larval stage of [several species]." This is biologically illiterate! It should be (but was not) mentioned that tapeworms lack a mouth and intestine. Now for a few biological odds and ends: the generic name *Cryptobia* (p. 222) is misspelled the only place it is used. Pancreatic necrosis (p. 227) is now known to be a viral disease (*Annals of the N.Y. Academy of Sciences*, see below). There is no mention of chironomid larvae occasionally eating their way out of fishes (chapter 9). Blood worms (pp. 190 and 207) are called "red mosquito larvae". This is totally incorrect. They are larvae of chironomid flies, not mosquitoes. (Van Duijn knows this, and this is in part sloppy writing.) But also on p. 207 he uses the term "bloodworm" to refer to *Sanguinicola*, a digenetic trematode. He fails to distinguish this from *Chironomus* (a fly). The use of the same colloquialism in the same paragraph for animals of two different phyla is ill-advised at best. But most reprehensible of all is the fact that *Sanguinicola* is discussed under the heading "Nematoda (roundworms)", which are in yet another phylum!

On p. 243 the top photo is upside down. On p. 196 there appears the sentence: "*. . . it seems that . . . may sometimes . . . to a greater or lesser extent.*" It seems to me that this may tend to be a somewhat more or less extreme example of the art of hedging. On p. 174 "*Sargus*" probably refers to the sargassum fishes of the genus *Histrio*.

An occasional analogy leaves me befuddled. On p. 175: "*In very bad cases the fish may have the appearance of having been immersed in stearin.*" On p. 173 is a brief discussion of Lymphocystis virus. There is now a great deal more information available. See *Annals of the New York Academy of Sciences*, volume 126, article 1, 1965. Other fish viruses are covered in this monograph as well, and it updates the entire field of fish virology. The taxonomy of *Ichthyophonus* or *Ichthyosporidium* is discussed (p. 219), but the conclusions are not necessarily well-founded. At present the best solution appears to be to reserve *Ichthyophonus* for fungi which originally were placed in either genus, and *Ichthyosporidium* for those organisms shown to be microsporidian sporozoans. The two are easily distinguished in sections stained with the PAS technique. The sporozoan section might be updated with the following references: *Journal of Protozoology*, vol. 12, number 2, pages 228–236 (for *Plistophora*); and vol. 12, number 3, pages 319–332 (for *Myxosoma*), 1965.

Now, as to the editorial comments. First of all, I repeat that I would have preferred a phyletic treatment. Second, there is too much repetition throughout. There should be a glossary to terms and colloquialisms in the back, but this is lacking. I was starting to tap my feet every time I saw "Tench (*Tinca tinca*)". The book *ought* to have included diagnostic characteristics of the relatively few important fish bacteria, similar to the arrangement in *Bergey's Manual*. This would only have taken a few additional pages. Non-biologists will undoubtably be confused by the lack of consistency in terminology. For example, cilia and flagella are exactly the same things in bacteria. But on p. 160: "*The organism usually has one polar flagellum, but in some cases two polar cilia may be found*".

References are given as footnotes rather than arranged alphabetically in the back. This is the most useless form possible, and is used nowhere in scientific literature. The use of italics for latinized disease names may confuse readers who expect to see it only for emphasis or the names of organisms. I recommend that in the next edition he use caps and small capitals, e.g., "LEPIDORTHOSIS CONTAGIOSA is caused by *Bacterium lepidorthosae*".

On p. 33 the terms "grey pearl disease" and "ink spot disease" may be strange to Americans (and Europeans?). Anyway, these are both metacercarial trematode diseases and should have been covered together with "yellow grub" (*Clinostomum*). Instead, one finds that they are separated by a section on flukes (Monogenea). This is editorially sloppy.

The section on drugs could be improved. Structures would be most helpful. Generic names are preferred to brand names. There is no point in having dosages given throughout the book and repeated in the drug section. The *propylene* derivative of phenoxethol is cited as an anaesthetic. They are almost certainly *all* anaesthetics. The correct name of the drug, anyway, is phenoxythanol.

Finally, the book seems to rely almost exclusively on diseases of pond fish of Europe and game fish of the USA. There apparently has been no search through the parasitological literature for natural diseases of exotic aquarium fishes in their native habitats, judging by the lack of references to Indian journals or the *Journal of Parasitology*. The author has ignored a large body of (admittedly scattered) literature, and this is not acceptable. I find the book much enlarged, much better illustrated (many drawings are redrawn far better), but disappointing in format, its lack of updated materials, its use of archaic English and biology, and the sloppy way the sections were put together. Van Duijn could have done much better (he is able and talented), but has not met the responsibilities of a writer in doing a revision. In my opinion, if the average aquarist already has edition 1, there is no point in picking up edition 2. If he has neither, then I suggest he pick up whichever one he can get a better bargain on, for to be sure a copy of Van Duijn is still essential to every aquarist's library. There is nothing better. Being best, however, is not and should never be good enough if the author is capable of doing even better. *Robert J. Goldstein, Ph.D., Biology Department, Emory University, Atlanta, Georgia.* ●

EDITOR'S NOTE: Bob Goldstein's review of "Diseases of Fishes" is perhaps the finest aquarium book review we have ever seen. It pulls no punches and it is detailed in its documentation. It may be that it is a soapbox item with us, but we feel that most all book reviews seen in the aquarium literature today are insipid "whitewash" jobs. We believe that such reviewers are abdicating their real responsibility to our hobby. Literature is important to our hobby. It should be discussed, ingested and digested, not merely mealy-mouthed by the wispish. Of course, turnabout is fair play and the pages of our *Adversaria* column are open to all who might not agree. AJK.

AUTHORS: continued from page 18

work first came to the attention of American aquarists in the pages of *Aquarium Illustrated*. In due time, he gained the post of Associate Editor of that publication, and currently is a Contributing Editor of THE AQUARIUM. ●

PROBLEMS: continued from page 20

mixture deeply enough so as to reach the first layer of peat. The plant likes slightly acid water and a temperature not over 71 degrees F. Subdued daylight suits it fine and artificial light can be used if daylight does not reach the aquarium. Once a year the bulb should be rested. This entails cutting the leaves off and allowing the bulb to dry out for a month or so.

From: Mitchell Tannenbaum, Merrick, New York

In my 55-gallon aquarium I am planning to keep several fancy goldfish with two 8-inch tinfoil barbs and two large silver dollars. Will these fish live together?

Answer: Goldfish are cold-water fish and for best results, should not be kept with tropicals. It can, however, be done more successively when the goldfish are of the "fancy" variety, used to higher temperatures.

From: Michael Saunders, Virginia Beach, Va.

Recently I purchased a pair of silver hatchetfish. I keep them in a 15-gallon tank and would like to

know as much as possible concerning the spawning of the adults and care of the young.

Answer: This species should be kept in a well-covered aquarium. The water should be slightly acid with a temperature in the low 80's F. They like live food and insects such as fruit flies are relished. A raft of floating plants may be used as well as rooted plants but swimming space should be ample. Spawning data is scarce but some species of hatchetfish have been bred in captivity. A courtship of swimming side by side is followed by the female expelling her eggs which are highly adhesive and cling to plants. These hatch in about 30 hours and the young take infusoria when free-swimming and newly-hatched brine shrimp when a week old. Aged soft water is best and filtering through peat helps. It is said that the young are not difficult to rear.

From: Patricia K. Martin, Monroe, New York

I have two turtles that I found in the road and I keep them in a pool with a rock and water in it. One has been laying eggs—about one egg every two or three days. I read that after they laid them, they place them in sand in the sun. So I put them in the sand in the sun. Is there anything else that I should or could be doing and how long before they hatch?

Answer: It is difficult to answer your turtle questions because you do not say what kind of turtles you have. In that you found them in the road, I wonder if they are aquatic turtles or land turtles. If they are land turtles, it isn't right, of course, to keep them in a pool. Land turtles (more properly termed "tortoises") such as you find in your part of the country are usually the common box turtle and have a shell both on top and underneath. If yours are this type, they should be kept in an enclosure with access to water. They also should have a shady spot to go if the sun is too hot. The box turtle can pull back into its shell and clamp it so tight no enemy can hurt it. They can swim but they spend most of their time in damp wooded sections on land. It would be most unnatural to confine them to a pool. They eat fruit, vegetables, meat, fish, and can be fed dog food. This should have bone meal or calcium added to it. Cod-liver oil also should be added in small amounts—perhaps a quarter of a teaspoon at least once a week. The vegetables might include chopped lettuce, tomatoes, carrots, and spinach. The fruit can be bananas, apples, pears, peaches, and even a strawberry or two now and then. When the summer is over, it might be kind to release your pets. Whether your turtles are land turtles or aquatic turtles, the above feeding suggestions will be appropriate.

CREDITS

PHOTOS:

W. Tomey, P. 4-5, 10-15, 34-40, Bottom 41, 42; THE AQUARIUM, A. Roth, P. 6-7, Top 41-42, 45; E. Symmes, Jr., 8, 77-78; B. F. Chhapgar, P. 43-44, 46-47.

FISH:

THICKLIPPED GOURAMI supplied by Grassy Forks Fisheries, Saddle River, N. J.; REDTAILED BLACK SHARK and BLACK SHARK supplied by Dade County Fisheries, Bronx, N. Y.

Turtle eggs have different incubation periods, depending on the species. The box turtles lay their eggs in late May or early June, and the babies hatch out in late August or early September. The female usually digs a hole and covers them carefully and then goes on about her business. When the baby turtles hatch, they are on their own.

Question: I have leeches in one of my aquariums. How do you rid a tank of them?

Answer: The fish should be bathed in salt water. Mix two ounces of salt to a gallon of water and bathe the fish in this solution for about 15 minutes. The salt will paralyze the leech and it will either fall off or can be removed with tweezers. When taking down an aquarium to rid it of leeches, plants as well as any tank furnishings should be soaked in salt water. The salt does not kill the leeches, it merely paralyzes them. They should be disposed of in this paralyzed state in a way that they dry out. Placing them back in water will revive them.

From: Mrs. Lynne E. Field, Battle Creek, Michigan

My husband and I recently purchased two albino *Clarius*. They are now in a tank with one Oscar, six green severums, a *Plecostomus*, one bumblebee catfish, and a *festivum*. We do know that they will attain quite a large size; however, since they are such an interesting and seemingly well-dispositioned fish, we should like to know a little more about their background.

Answer: Albino *Clarius* falls into what hobbyists consider "oddball" fish. Aquarists are attracted to them because of their graceful movements, their bizarre design, and their apparent good disposition. *Clarius batrachus*, the most available species in this genera, comes from Thailand. Accounts of this species indicate that it is an escape artist extraordinary, and precaution should be taken that it is prevented from leaving its aquarium when the notion strikes it. Because it often leaves the water in its native habitat, being equipped with an accessory air-breathing organ, it is prone to do so when confined to a tank but usually dies during the venture in that it cannot find its way back to the aquarium. When two individuals are kept in an aquarium together, one often takes a bad beating from the dominant or larger of the two. Feeding is not difficult, for almost anything from worms to lean raw beef is accepted. Water temperature should be in the mid 70's F, but pH or hardness is no problem. The species grows rapidly and the owner who becomes attached to his specimen should be prepared to supply larger quarters as the fish grows. They should not be kept with small fish and as they reach the respectable length of 15 inches, it is well to keep them to themselves. As it is inevitable that one dominates its tankmate of the same species, it is best to keep only one.

From: David Telier, Winnipeg, Manitoba

I am attempting to spawn the albino paradise fish (*Macropodus opercularis*) and would like to have the following information:

Question: What size should the spawning tank be and at what age do these fish spawn?

Answer: *Macropodus opercularis* requires a 10-gallon tank for spawning. They are usually ready for spawning at 10 months old.

Question: What should the hardness and pH be?

Answer: Recommended hardness is 150 to 180 ppm; pH 6-8 to 7-2. However, the species is not too fastidious as to hardness or to pH.

Question: What is the best lighting for the tank size recommended.

Answer: A 25-watt bulb might be kept on during spawning and the period in which the male tends the eggs.

Question: What size tank should the young be kept in?

Answer: A 10-gallon tank is a good size for normal spawning of these fry. However, if tank space is at a premium, the parents could be removed from the spawning tank to smaller temporary quarters and the youngsters can be allowed to remain in the aquarium in which they were born.

Question: Should plants be used in the spawning tank?

Answer: Floating plants should be used but some rooted plants may be used also. The plants serve several purposes. The floating plants serve to keep the eggs in one area at the surface of the water and both floating and rooted plants will serve as a hiding place for the female should the male become too aggressive.

KLEE: continued from page 22

fishes. Catostomidae is of little interest to aquarists.

Finally, we complete our overview of the Ostariophysi with a look at the Order Siluriformes (see Table IV and Figure 3). Of the 31 Families of catfishes, 17 are considered to be aquarium Families. The catfishes supply about 13% of all aquarium species but of course we are talking about a goodly number of Families. About 37% of these catfishes come from the Families Callichthyidae and Loricariidae, however. Catfish Families of moderate importance include the Siluridae (Asian glass cats), Schilbeidae (African glass cats), Mochokidae (upsidedown cats), Doradidae (talking cats), and Pimelodidae ("graceful" cats). The Malapteruridae (electric catfish) and Clariidae are of interest to catfish specialists and the others provide occasional species for the aquarium.

To be continued.

TABLE I

ORDERS AND SUBORDERS OF OSTARIOPHYSI

Order Cypriniformes	*Typical Fishes*
Suborder Characoidei	Tetras
Suborder Gymnotoidei	South American knife fishes
Suborder Cyprinoidei	Carps, barbs, minnows
Order Siluriformes	Catfishes

TABLE II

FAMILIES OF SUBORDER CHARACOIDEI

	Pronunciation	Typical Genus
*Characidae	KAR-RAS'-SEH-DEE	*Hyphessobrycon*
*Erythrinidae	ER-REH-THRIN'-EH-DEE	—
Ctenolucidae	TEN-OH-LEW-SYE'-EH-DEE	—
Hepsetidae	HEP-SET'-EH-DEE	—
Cynodontidae	SYE-NO-DON'-TEH-DEE	—
*Lebiasinidae	LEB-BEE-AH-SIN'-EH-DEE	*Nannostomus*
Parodontidae	PAR-OH-DON'-TEH-DEE	—
*Gasteropelecidae	GAS-TERO-PEL-LESS'-EH-DEE	*Gasteropelecus*
*Prochilodontidae	PRO-KYE-LOW-DON'-TEH-DEE	*Prochilodus*
*Curimatidae	CURE-AH-MAT'-TEH-DEE	*Curimatus*
*Anostomidae	AN-NOS-TOM'-EH-DEE	*Anostomus*
*Hemiodontidae	HEM-ME-OH-DON'-TEH-DEE	*Hemiodus*
*Chilodontidae	KY-LOW-DON'-TEH-DEE	*Chilodus*
*Distichodontidae	DIS-TEH-KO-DON'-TEH-DEE	*Distichodus*
*Citharinidae	SITH-THA-RIN'-EH-DEE	*Citharinus*
*Ichthyboridae	IK-THY-BORE'-EH-DEE	*Phago*

TABLE III

FAMILIES OF GYMNOTOIDEI AND CYPRINOIDEI

Suborder Gymnotoidei

*Gymnotidae (JIM-NO'-TEH-DEE)
*Electrophoridae (ELEK-TRO-FOR'-EH-DEE)
*Apteronotidae (AP-TER-OH-NO'-TEH-DEE)
*Rhamphichthyidae (RAM-FICK-THY'-EH-DEE)

Suborder Cyprinoidei

*Cyprinidae (SY-PRIN'-EH-DEE)
*Gyrinocheilidae (JYE-RIN-OH-KYE'-LEH-DEE)
Psilorhynchidae (SYE-LOW-RIN'-KEH-DEE)
*Homalopteridae (HOMA-LOP-TER'-EH-DEE)
*Cobitidae (CO-BYE'-TEH-DEE)
Catostomidae (KAT-TOE-STOW'-MEH-DEE)

TABLE IV

FAMILIES OF THE ORDER SILURIFORMES

Diplomystidae (DIP-LOW-MIS'-TEH-DEE)
Ictaluridae (IK-TAL-LUR'-EH-DEE)
*Bagridae (BAG'-REH-DEE)
Cranoglanididae (KRAN-OH-GLA-NYE'-DEH-DEE)
*Siluridae (SILL-LUR'-EH-DEE)
*Schilbeidae (SHIL-BEE'-EH-DEE)
*Pangasiidae (PAN-GAS-EYE'-EH-DEE)
Amblycipitidae (AM-BLEE-SIP-PIT'-TEH-DEE)
Amphiliidae (AM-FILL-EYE'-EH-DEE)
Akysidae (AK-KYE'-SEH-DEE)
Sisoridae (SYE-SORE'-REH-DEE)
*Clariidae (KLAR-RYE'-EH-DEE)
*Heteropneustidae (HET-TER-OH-NEWS'-TEH-DEE)
*Chacidae (KA'-SEH-DEE)
Olyridae (OH-LYE'-REH-DEE)
*Malapteruridae (MAL-LAP-TER-REW'-REH-DEE)
*Mochokidae (MOE-KOW'-KEH-DEE)
Ariidae (AR-RYE'-EH-DEE)
*Doradidae (DOOR-RAY'-DEH-DEE)
*Auchenipteridae (AW-KEN-NEH-TER'-EH-DEE)
*Aspredinidae (AS-PREH-DIN'-EH-DEE)
Plotosidae (PLO-TOE'-SEH-DEE)
*Pimelodidae (PIM-MEL-LOW'-DEH-DEE)
Ageneiosidae (AH-GENE-EE-EYE-OH'-SEH-DEE)
Hypophthalmidae (HY-POF-THAL'-MEH-DEE)
*Helogeneidae (HEL-OH-GEE-NEE'-EH-DEE)
Cetopsidae (SEE-TOPS'-SEH-DEE)
*Trichomycteridae (TRI-KO-MICK-TER'-EH-DEE)
*Callichythyidae (KAL-LICK-THY'-EH-DEE)
Loricariidae (LOR-EH-CARE-RYE'-EH-DEE)
Astroblepidae (AS-TRO-BLEP'-EH-DEE)

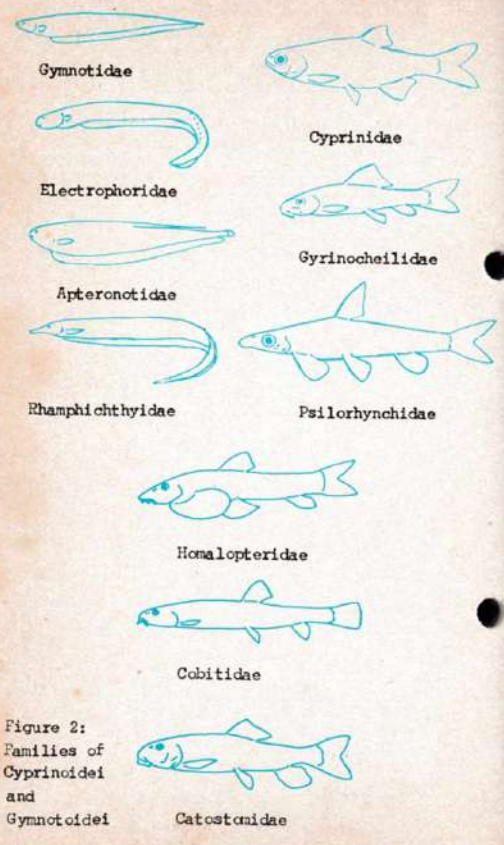


Figure 2: Families of Cyprinoidei and Gymnotoidei

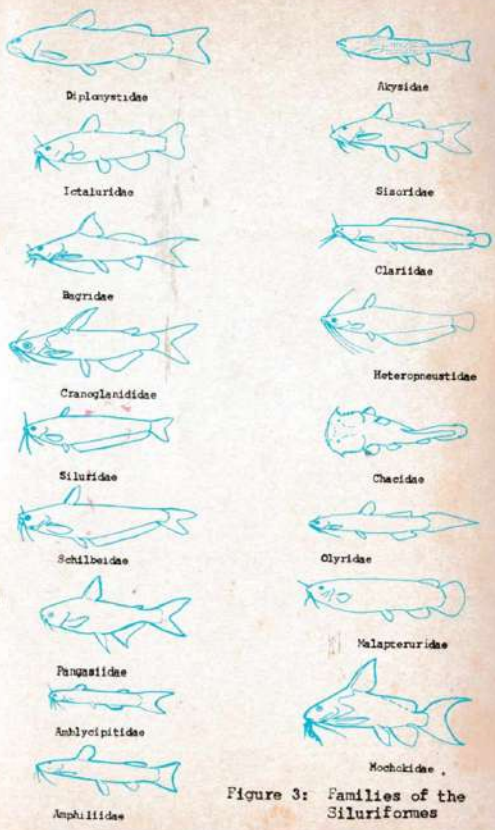


Figure 3: Families of the Siluriformes

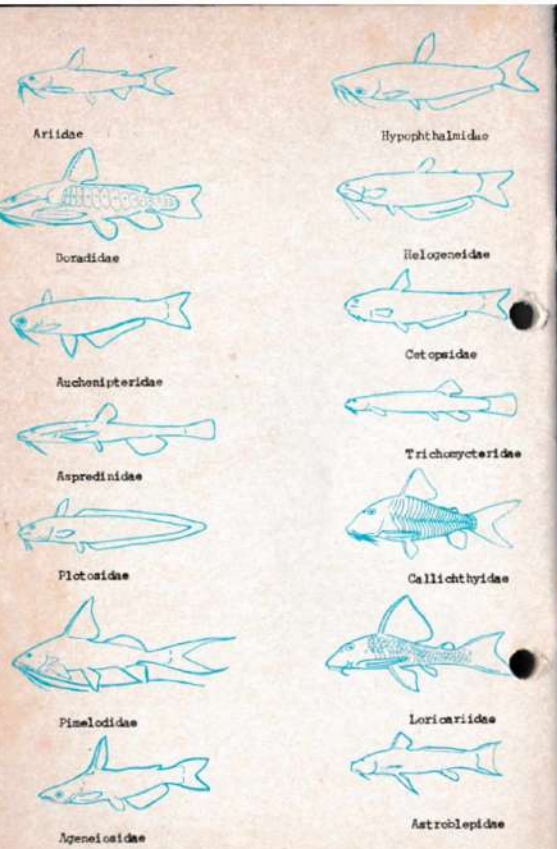


Figure 3 Continued.

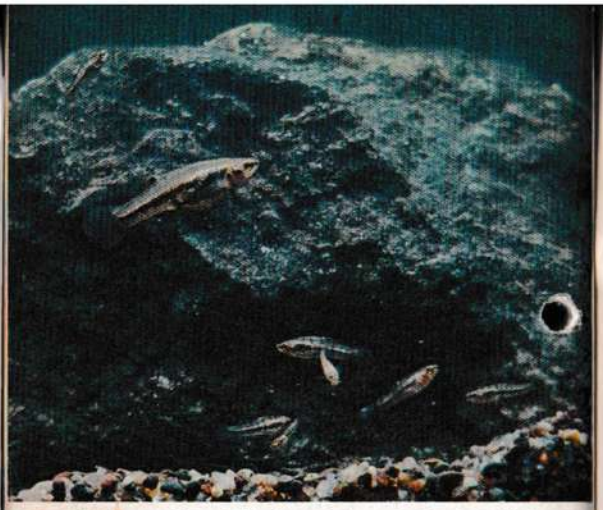
A male mosquitofish. There is quite a disparity between the size of the two sexes. The vertical black markings on the body of the male, as opposed to the female, are very distinct.

ROBISON: continued from page 9

at 65°F, they live and reproduce quite successfully. pH is not of great importance, although extremes are to be avoided. Some argue that slightly alkaline water is best and I tend to agree.

The reproductive cycle of *Heterandria formosa* is quite interesting and differs from other livebearers. In most livebearers, several eggs are fertilized at a time and develop together into young which are born simultaneously, followed by a repitition of the same cycle. *H. formosa*, however, develops numerous embryos of different ages. Broods of two or three young appear regularly at intervals of four to six days. With sufficient feeding, females will bear young every four to five weeks.

The young are approximately 5–7 mm long when born. They show the characteristic horizontal stripe and black spot at the caudal base. Growth is slow and if well-fed with newly-hatched brine shrimp and powdered foods, sexes can be distinguished at six weeks. It is about this time that the anal fin of the male develops into the gonopodium. Fry mature within five to six months and from my experience, females never molest their young.



A family group of mosquitofish. In general, the parents do not molest their young.

Heterandria formosa is a hardy, aggressive fish, the males constantly pursuing the females. Females usually hide in the thick bunches of fine-leaved plants which should be provided for this fish. Sometimes a rather excited activity occurs when two males meet. This phenomenon has been observed by many investigators and results in a quivering action lasting only several seconds with no change in the distance between the two males. The writer has witnessed actual battles between males, but no permanent damage has ever resulted in either fish.

This hardy little fish has not received the publicity it rightfully deserves; it rates a better fate. It could become a welcome addition to the hobbyist who has a small, extra tank handy and would more than repay any effort expended on it. This tiniest of livebearers is truly a remarkable fish—give it a chance, won't you? ●

EDITOR'S NOTE: The title for this article was suggested by Ed Symmes, Jr., a leading Atlanta aquarist who has had considerable experience with this species.