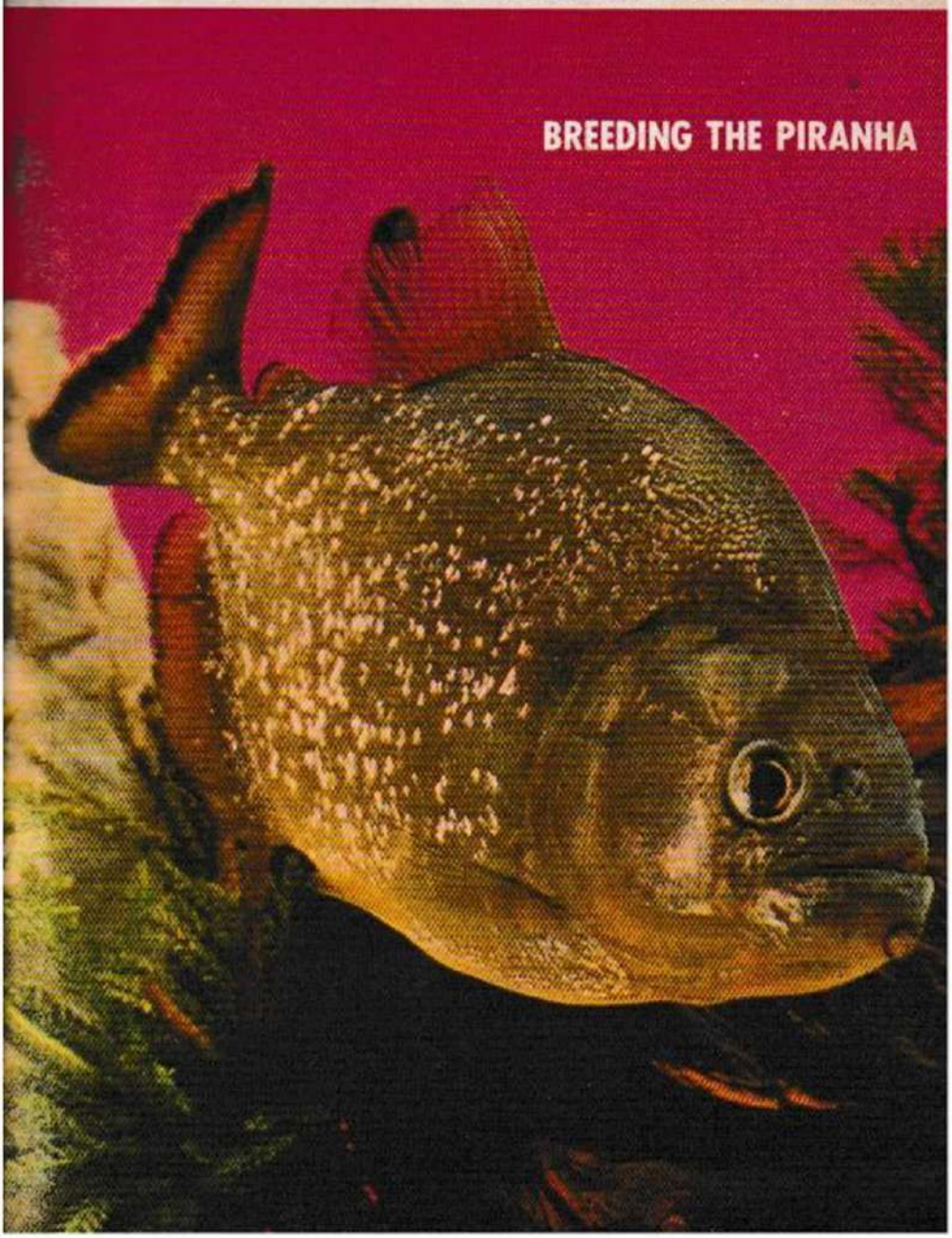
AQUARIUM

British Isles 2/6 DOMESTIC 35¢

BREEDING THE PIRANHA



FEBRUARY, 1969
VOL. II NO. 4

THE AQUARIUM

founded in 1932 by Dr. William T. Innes

contents

cover

The excitement generated by this beautiful Piranha was captured by The Aquarium photographer Andrey Roth using a modified Nikkromat camera with a Micro-Nikkor lens on high-speed Ektachrome film. (Additional credits appear on pg. 69.)

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SPAWNING THE PIRANHA

by RAY LEPPERT

FOR THE PAST THREE YEARS I HAVE BEEN IN CHARGE of the Fleischmann Aquarium, a part of the Cincinnati Zoo. On December 10th, I noticed that our pair of spotted piranhas, *Serrasalmus spilopleura*, were spawning in their usual place (they had spawned numerous times previously) in the floating plants at the front of their 280-gallon tank. This tank is part of a circulating water system in the Aquarium. I watched for a few minutes and then checked the other fish in the tank — fourteen medium to large piranhas of the spotted and red varieties, one unidentified species of piranha and about twelve *Pelmatochromis kribensis*. In the rear of the tank on the bottom, two large red piranhas were swimming in circles, belly to belly, next to the gravel. After watching for a while longer I returned to work.

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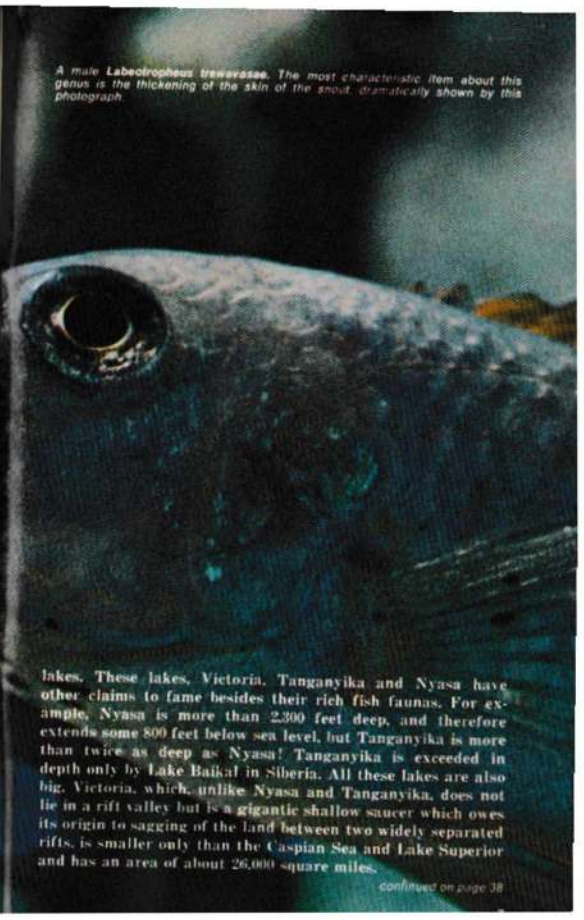
In addition to showing the triangular teeth of the piranha, this photograph clearly shows how the bones of the head show through the thin skin of this fish. The piranha is "thinskinned" in more ways than one.

SOME LAKE CICHLIDS OF AFRICA

by G. FRYER



A male **Labeotropheus trewavasae**. *The most characteristic item about this genus is the thickening of the skin of the snout, dramatically shown by this photograph.*

AQUARISTS HAVE FOR LONG been familiar with a small selection of African cichlid fishes, and the number of species now available is gradually increasing as the continent becomes better explored from a faunistic point of view and the requirements in captivity of species new to aquarium enthusiasts become known. In spite of this the percentage of African cichlids familiar to most aquarists is quite small, for the cichlid fauna of the continent is extremely rich, especially in the great lakes of its eastern and central parts. Here in fact, from the point of view of the number of species of fishes which they contain, are to be found the world's three richest lakes. These lakes, Victoria, Tanganyika and Nyasa have other claims to fame besides their rich fish faunas. For example, Nyasa is more than 2,300 feet deep, and therefore extends some 800 feet below sea level, but Tanganyika is more than twice as deep as Nyasa! Tanganyika is exceeded in depth only by Lake Baikal in Siberia. All these lakes are also big. Victoria, which, unlike Nyasa and Tanganyika, does not lie in a rift valley but is a gigantic shallow saucer which owes its origin to sagging of the land between two widely separated rifts, is smaller only than the Caspian Sea and Lake Superior and has an area of about 26,000 square miles.

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Orbicular jasper

Microcline (Feldspar)

Semiopal, Nevada

Dolomite

Fluorite, New Mexico

Galena, Missouri

AQUARIUM MINERALOGY

by ROBERT C. MCGUIRE

A BASIC UNDERSTANDING OF "Aquarium Mineralogy" is essential for the hobbyist who wishes personally to collect his aquarium decorations. However, few hobbyists possess the knowledge or have the experience required to make positive identifications of even the more common mineral types. Fewer yet are able to predict accurately the possible dangers which exist if certain minerals are introduced into aquaria.

The purpose of this article is to give a simple but accurate introduction to mineralogy for aquarists. In order for a substance to be classified as a mineral the following criteria must be verified: it must be naturally occurring, it must be of inorganic origin, and it must be an element or a compound (i.e. have a definite fixed chemical composition). In other words, a mineral may be described as "a naturally occurring chemical element or compound formed as a product of inorganic processes".

Any mixture of minerals in the same "stone" is called a rock. To judge the suitability of a rock for aquarium use, therefore, one must appraise each of its mineral constituents. One might say, generally, that mineralogists are more interested in minerals, and geologists are more interested in rocks, although the two sciences do overlap and each encompasses more than merely the study of minerals and rocks.

There are three major classifications of rocks. First, there are the "igneous" rocks, which result from the solidification of molten rock. The grain size of the minerals comprising an igneous rock indicates the relative speed at which the parent molten rock cooled. Lava (molten rock which has been spewed forth from a volcano) cools very rapidly at the earth's surface, thereby forming very fine-grained rocks. Obsidian, an example of a volcanic glass, actually cools so fast that the minerals comprising it do not have time to group together or "crystallize". A specimen of obsidian, therefore, shows no grains. Granite, on the other hand, results from a slow-cooling molten rock, usually buried in the earth, and is usually large-grained.

When wind and water abrade or otherwise break down rocks, the grains may later be consolidated, or cemented together, to form "sedimentary" rocks. Common examples of sedimentary rocks are shale, limestone, and sandstone. "Metamorphic" rocks, such as slate and

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The fine-leaved form of watersprite is sometimes known as the Sumatra fern.

*The watersprite, **Ceratopteris thalictroides**, floating form.*

WATERSPRITE

by WILLIAM A. TOMEY

ONE OF THE MORE WIDELY USED PLANTS in the aquarium is the watersprite, *Ceratopteris thalictroides* (pronounced SERA-TOP'-TER-IS THAL-ICK-TROY'-DES), which belongs to the family of waterferns. Although capable of extremely rapid growth, they have been somewhat neglected due to the importation of more exotic forms of late. Watersprite, the only one of the fern family that lives in the water, is a remarkable plant. Depending upon the level of the water, they grow floating, with some leaves reaching above the water's level (there is also a rooted form). This is in contrast with many other true ferns which grow mainly on the banks of streams or other water courses in an atmosphere of high humidity. For comparison's sake, we have pictured a brand new fern of the genus *Trichomanus*, from Borneo, so that aquarists may see the differences between a typical tropical fern and watersprite.

The broad-leaved form can also be rooted. If this is done, the leaf looks like this after a while.

When the leaves of the broad form grow above the surface of the water, they become stronger and thinner.

If the humidity and temperature are high, the emersed leaves alter their shape and become much like the antlers of a deer. This is a prelude to a different kind of reproduction.

The origin of watersprite is tropical southeast Asia, but due to artificial introductions, they are now found in almost any tropical climate, where they grow in slowly running water, bogs and flood areas along rivers. The rooted form, as well as the floating form, needs bright light. Indeed, in nature they require very much sun.

One can keep watersprite very satisfactorily in the aquarium rooted in the gravel, but if the gravel is mixed with compost (or if grown in pots in compost underwater), the plant becomes much too robust and vigorous for the aquarium, a complaint one doesn't make about many aquatic plants!

The plant requires a somewhat high temperature, somewhere between 73 and 86°F, and since it is mainly a plant consisting of rosettes of long-stemmed leaves, it needs plenty of space to grow. If the air above the aquarium is of sufficient humidity and high temperature, the leaves of the watersprite will rise above the water's surface where they change form and present a most beautiful impression. As a rule, they are one-year plants, producing young in a viviparous fashion from the edges of their leaves.

Hobbyists distinguish two varieties; the coarse-leaved and the fine-leaved, the last popularly called the Sumatra fern. The latter is the most suitable form for the aquarium, and is graceful even in the averaged-sized tank.

The vegetative reproduction of watersprite is quite simple; the young

Spore pods are formed on the backs of the leaves and the antler-like leaves curl back, forming a protective envelope.

*A non-aquatic fern, but tropical, is the glass fern, **Trichomanus**. This plant forms young plants on the tops of its leaves through a process of spore reduction.*

A closeup of the young plant of ***Trichomanus.***

plants merely let loose of the parent plant and grow on their own in a normal manner. There is another manner of reproduction for the water-sprite in the aquarium, the conditions are lacking for this to take place so aquarists never see it. However, if we have a paludarium or a greenhouse, and if the plant grows above the waterline, then we can observe a gradual alteration in the structure of the leaves.

The first leaves, somewhat broadly-shaped, now slowly form a more divided structure much like the antlers of a deer. Further development produces sporebearing leaves which are still finer in structure and form. Upon close inspection, we can observe the presence of the spores on the backs of the leaves.

These spore-bearing leaves are curled, and contain the spore pods within this protective envelope (see photograph). Initially the spores and the leaves are green but as the spores ripen, both become brownish. If now the humidity is decreased, the leaves curl back, revealing millions of spores in the form of what looks like a very fine powder. In this form, of course, they are easily spread by the wind.

Under favorable circumstances, the spores develop an organ called a prothallium, from which the young ferns are fed and protected. The young fern stays hidden in the prothallium for some time but after a while, starts an independent life. At this point, the prothallium loosens and dies.

Because of its many interesting features, the watersprite is a useful, pretty aquatic plant. It matters not whether the aquarist keeps them in clumps or as solitary specimens, they are tropical jewels in every respect.●

THIS IS MY PROBLEM

by HELEN SIMKATIS

From: George R. Pirie, Danbury, Con.

I have several artificial plants in a 20-gallon aquarium and have found what looks similar to cobwebs on two of these plants near the filter. They have been washed with hot water and a strong solution of salt but they have reappeared. Can you tell what this condition is and how to remedy it?

Answer: Very often algal growths form on plastic articles in aquariums such as tubing, etc. Fungal growths appear, also, and sometimes a slime which is attributed to bacteria. In that these formations come from the aquarium water and do so even after the plastic material has been thoroughly cleaned and made sterile indicates that cleaning them periodically is necessary. This is an additional chore which comes under the heading of aquarium maintenance. The only precaution one must take is to be sure the cleaning agent can be removed completely before returning the item to the aquarium. Some hobbyists use Clorox which is difficult to rinse from plastic material. Only a good rinsing and allowing the items to air in sunshine seems to remove the last traces of Clorox. Your own method is quite adequate but, as you have found, is not a permanent treatment.

From: Susan Dobik, Granby, Massachusetts

A few months ago I acquired two tetras which seemed to be in ill health after a few days in my tank. My male swordtail bit one of them to death and continued bullying the other one constantly. The advice I received from a dealer was to cut off a bit of the swordtail's tail, but I neglected to do this. About a month later, I found the tetra on his side at the bottom of the aquarium with some slime starting to accumulate on its belly. Soon after, he died. I do not think the swordtail caused this. What do you think?

Answer: Keeping an aquarium requires knowledge as to how to set it up, how to care for specimens, and the day we buy our first fish, we become the high official of a small world. Actually, an aquarium with fish living in it is a small world. The owner of this small world is the health department, the police department, and the judiciary. The tiny life we have purchased is completely dependent on our knowledge, our judgment, and our mercy. We are not dealing with creatures, however, that are taught right from wrong. Each fish does what comes naturally and if one abuses another, it is our responsibility to do something about

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A New Approach To Treating And Feeding Fish

by HELEN SIMKATIS

FISHKEEPING, WITH VERY LITTLE ABRASIVE, slips into the scientific field, and ever since the inception of the hobby, aquarists have found themselves exchanging ideas and information with professionals faced with similar problems to which the maintenance of aquatic animals in a contrived environment is heir. It is a two-way street, and frequently one finds aquarium literature cited in scientific papers along with impressive treatises by scientists who have devoted numbers of years to a single problem.

One such problem that has confronted and confounded both scientists and aquarists alike is to manage the oral treatment of aquatic animals with drugs, antibiotics, and vitamins. Although soluble capsules containing any or a combination of these would prevent the water from becoming contaminated or turbid, the chore of persuading a fish or turtle to swallow a capsule would be most difficult. The idea of using animal gelatin to bind mixtures for treatment of aquatic animals, or merely to feed them, has been discussed theoretically for some time, but now reports of practical application are beginning to surface in literature stemming from work conducted by scientists in the Fish and Wildlife Service of the U.S. Department of the Interior, where such matters are constantly considered.

Anyone who has mixed a package of Jello is familiar with the method now being employed at the National Aquarium for enticing fish to eat what is good for them. Of course, the gelatin must be flavored to appeal to the subject and when Knox, or unflavored gelatin is used, this can be done by using water in which shrimp or some other kind of shellfish or fish has been cooked. A pink food coloring might be added to the water so that the congealed mixture will have color. Only enough of such liquid should be used to achieve a finished product that has a rubbery consistency.

For a feeding program, beef liver, clams, shrimp, crabmeat, or meals can be mixed in a blender. The gelatin should be dissolved in a small amount of warm water in which shrimp or some other shellfish or fish has been cooked. The blended material then should be added, mixed, and then followed by the rest of the flavored water that has been heated to a boiling point. This should then be refrigerated. The finished product, a rubbery mass, can be cut in small chunks for feeding and, of course, the remainder should be kept refrigerated. A trout diet that has been used consists of whitefish meal, pulverized oat hulls, shrimp meal, dried skim milk, steam-dried brewer's yeast, dried condensed fish, defatted soy flour, corn fermentation solubles, dehydrated alfalfa meal, blood flour, dried kelp meal, and vitamins. No hobbyist will want to develop such a sophisticated mixture as this, but we offer these ingredients here to illustrate what some tropicals have been enjoying at the National Aquarium. *Osteoglossum bicirrhosum*, *Astronotus ocellatus*, *Cichlasoma Severum* and *Tilapia mossambica* are some of the species that have thrived on the trout food containing the above ingredients there.

When medications, antibiotics, or vitamins are to be combined with food, it is a good idea to add them after the boiling water has cooled down to room temperature. The gelatin will still be of a consistency that will allow these to be mixed in, and they will not lose their value by having been exposed to temperatures that might deplete them.

The advantages of feeding fish using the gelatin method are obvious but we might summarize them as follows: (1) Aquarium water is kept from becoming cloudy as it often does when liver is used as a food. (2) The fish receive the nutrients and medications in a form that both can be ingested. (3) The gelatin mix is easy to prepare, handle, and store. (4) This food decreases the necessity for live food. (5) The formula can be modified for the hobbyist's specific purpose.

Recently we visited a home where a child's swimming pool has been set up for a number of turtles, indoors. The turtle fancier was at a loss as to how to supply enough calcium in the food he served his aquatic pets to keep their shells from softening. The gelatin approach solved this problem for him.

When we formulated our first food for our fish, we had trouble dissolving the gelatin. It had sunk to the bottom of the container we were using and formed a tough layer of rubbery material. Needless to say, the fluid above had not jelled and we realized it never would because most of the gelatin was on the floor of the container. We poured the whole mixture into our blender and the gelatin layer along with it. A few minutes of mixing did the trick and after an hour or so in the refrigerator, our gelatin mixture had the desired rubbery consistency. ●

ABOUT OUR AUTHORS

RAY LEPPERT

About six years ago, Ray Leppert and his wife went shopping and bought a 2-gallon brandy snifter fish bowl with the object of setting it up with a few goldfish for their children. The next day Ray returned for the goldfish, and wound up instead with a 10-gallon tank, a pump and filter, guppies and an assorted variety of other fishes. Life has not been the same for the Lepperts since. One tank led to another until the count reached nearly 150. But, as Ray puts it, he has now pared it down to a bare minimum — about 50.

A few years ago Ray, who is 35, joined the Greater Cincinnati Aquarium Society and, as a member of the club, learned of an opening at the Cincinnati Zoo for a keeper at the Aquarium. He got the job and, after one year, was put completely in charge of the operation. In addition to his membership in the Cincinnati society, he is a member of the Queen City Guppy Breeders and the Southern Ohio Dog and Game Protective Association. Just so he doesn't become bored, Ray is also in the process of starting a betta club in the area.

ROBERT C. MCGUIRE

Born in 1943, Bob's first entry into the aquarium hobby occurred at the age of nine when he received a bowl of guppies to occupy his time while recuperating from a bout with scarlet fever. Today, he seems to have settled mostly on the cichlids, particularly discus. Recent research on his part concerns controlled spawning inducement studies of various fishes through hormone

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WHaT's NEW?

The descriptions in our New Products Department are written by the staff of The Aquarium magazine, based upon information received by us from the manufacturers of the products mentioned. Firms are encouraged to keep us informed of any new products they may develop. The entries in this Department do not necessarily constitute endorsements since we do not evaluate quality, reliability or economic aspects of these items. However, we may occasionally comment upon a new product's relevance to the aquarium hobby and provide suitable background information whenever it might be helpful to the reader. Exaggerated, misleading or false claims wind up in the appropriate place, i.e., the "round file".

The award for "Clever Of The Month" in new aquarium product introductions must go to Douglass Filtration Systems Inc. (148 Winckles Street, Elyria, Ohio), for their "Douglass Water Blanket". This device consists of a clear sheet of polyethylene having on its surface many encapsulated air bubbles that keep the device afloat. The water blanket serves the same purpose as a cover glass but is, of course, unbreakable, lighter, safer to handle, cheaper and easier to store. After usage the blanket is simply rolled up, tied with a rubber band and stored away in a minimum of space. The two samples we have examined contain air bubbles of diameters ⅜ inch and 1¼ inches, respectively. They are quite sturdy and should give long service. At present, the blanket is sold in these two bubble sizes only, in 25-foot lengths, 48 inches wide. It should be of great interest to hatcheries, dealers and hobbyists with extensive set-ups.

We received an interesting letter recently which read as follows: "I am a Union Plumber by trade and have constructed a unique aquarium with glass pipe. The glass pipe is mounted on the wall or could be hung from the ceiling with light cable. This glass pipe aquarium has proven to be quite a conversation piece for us with the colorful fish swimming through the pipes. An air stone in the cleanout portion of the trap bubbles up through the two open ends. An increaser from 2" to 3" see serves as a feeder. Three plumbing fittings and one short piece of pipe coupled together makes up this unique aquarium. It holds less than two quarts of water but could come in larger size piping. The 2" complete package including wall brackets and instructions sells for less than $100.00. Any interested readers should please write to: Bob Lee, 7400 Sportsman Drive, Falls Church, Va. 22043".

* * * *

The Deodor-Lite.

Some aquarists have complained of a musty odor in their fishrooms; the "Deodor-Lite", obtainable for $19.95 from Deodor-Lite, 67 East 161 Street, New York, N. Y. 10451, may be the answer. This is a stainless steel device that is plugged into an ordinary 110 volt electrical outlet. You then forget it. The electrical consumption is but a few cents a month. It destroys odors and controls an area of about 1800 cubic feet (i.e., a room of about 15' x 15').

* * * *

Aquarium Systems, Inc., of Wickliffe, Ohio has announced an improvement in their packaged "Instant Ocean" synthetic sea salts. The announced improvement makes possible salts that are "dry". Anhydrous salts offer user advantages in that they are easier to handle, dissolve more easily and provide an initial pH much closer to that of natural sea water. In addition, they equilibrate with the atmosphere very quickly. Other advantages of "dry" salts are the elimination of organic materials from the salts, and the inclusion of a vanadium salt which is required for the growth of certain tunicates.

* * * *

The oval aquarium marketed under the name "Aqualite".

British firms are actively pursuing markets in the United States, and at New York's Pet Industry Show this Fall, a number of British products were on display. One of these was an "oval aquarium for the avant-garde guppy", pictured here. Its actual name is the Aqualite, and is made by J & K Plastic Co. Ltd., Norfolk, England. The Aqualite is of acrylic sheet, processed to ensure clarity. The back of the aquarium is blue, its front surround is silver and the top shield is available in blue, gray or mustard. It is supplied with light fittings. In approximately 3 and 12-gallon models, the Aqualite may be wall-mounted or fitted into a cabinet to look like a television screen.

* * * *

The Air-O-Vac cleaning device.

Another British device exhibited was the plastic Air-O-Vac which attaches to an aquarium pump, forming a gentle vacuum that picks up mulm from the tank bottom without disturbing gravel or plants. The waste is deposited in a self-contained nylon filter bag. Its scraper end removes and picks up algae in one operation, and the filter bag (like most other similar devices) is cleaned with tap water. The price is $3.00 postpaid from A. E. Hobari, Box 7526, Pittsburgh, Pa., 15213. Although with this de-

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ViEWS AND REViEWS

UNUSUAL AQUARIUM FISHES by Alan M. Fletcher. J. J. Lippencott, Philadelphia/New York 1968, 143 pages, $4.50. Approximately 60 illustrations.

The author of this delightful little book sets as his goals the following: ". . . to tell the aquarist some of the unusual facts about their pets, and to inspire others to take up a fascinating hobby". Mr. Fletcher, in our opinion, succeeds in attaining both.

It is a rather remarkable accomplishment indeed, that this small book *does* succeed, as it might be imagined that what is of interest to the layman could scarcely be of much interest to the hobbyist, and vice versa. Yet, the material is not only written with infectious enthusiasm, but it is woven of sturdy fabric as well. The vignette on piranhas, for example, is one of the more balanced accounts this reviewer has ever seen. Many authors position themselves at extremes on the subject, i.e., either piranhas are the most formidable creatures in history, or they are vastly overrated. Mr. Fletcher tells it "like it is".

Unusual Aquarium Fishes discusses 35 species of aquarium fishes, devoting on the average some three or four pages and two illustrations to each. The photography is mostly the work of Arend van den Nieuwenhuizen and Gene Wolfsheimer, certainly two of the very finest fish photographers in the world today. Some of the fishes discussed include the electric eel, halfbeak, annual fishes, archer fish, upside-down catfish and guppy, among others. Technical errors are virtually non-existent; indeed, one would have to use an electron microscope to find one, a clear indication that the author has done his homework well (there are one or two minor nomenclatural matters of no great concern).

Although perhaps this reviewer would have selected the American flagfish over the chaetodon as an example of a native fish popular with aquarists, one's main com-

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adversaria

ADVERSARIA is a column of controversy, dedicated to the uninhibited exchange of relevant opinion. Contributions to *ADVERSARIA* from readers is encouraged.

"When a thing ceases to be a subject of controversy, it ceases to be a subject of interest". William Hazlitt.

To The Editor:

Recently the front page of the *Tallahassee* (Florida) *Democrat* reported that a six year-old boy, while fishing in a local pond, had caught a 12-inch "member of the bloodthirsty piranha family of South America". The fish, subsequently was identified as the somewhat-less-than-dangerous "false piranha", *Colossoma nigripinnis*. A survey of the fish population of the pond indicated that the youngster's catch was probably the only specimen present in the lake. It was undoubtedly placed there by an aquarist.

The incident renewed speculation as to the possibility of the establishment of a breeding population of piranha in the southern United States. This may not be just idle speculation! Earlier this summer, more than 3,000 *Clarias batrachus* were captured by the Florida Game and Freshwater Fish Commission in waters near Ft. Lauderdale, Florida. The presence of juvenile *Clarias* in these collections indicates that the fish are breeding in the wild. Control of this voracious predator is virtually impossible since it moves overland or burrows in the mud, thus thwarting efforts to destroy it by poisoning or draining. The Commission is fearful that *Clarias* will soon reach the Everglades. As with the "Tallahassee" piranha, the aquarium hobby was probably the source of the Asiatic catfish.

Over the years, various pieces of legislation have been proposed to limit the importation of certain dangerous fishes into the United States. Most of these restrictions have been defeated or, if passed, have been unenforceable. The pendulum may be swinging the other way, however. The appearance of an exotic tropical in the natural waters of the United States receives considerable attention from the news media. Indeed, the *Clarias* discovery was reported by many Florida newspapers, the national wire services, Sports Illustrated and Time Magazine. In a report by the Florida Game and Freshwater Fish Commission, a recommendation has been made that the "importation of all members of the family Clariidae should be prohibited". This recommendation was based on the prediction that "the Clariids may have a more detrimental effect on the ecology of Florida than any other group of fishes including the piranhas."

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Societies at Work

By
HELEN SIMKATIS

WHO READS EDITORIALS? We do, and so do many other people, and isn't it wonderful! Especially when an exciting stand is taken like that delineated by Executive Editor Gerald F. Currier in the October issue of *Anchor*, published by the San Francisco Aquarium Society. He begins by pointing out briefly the highlights of the history of the San Francisco Aquarium Society, and highlights they are in every sense of the word. The society boasts a membership of 300 or more; its publication, *Anchor*, is read by hobbyists in 15 countries besides the United States; it "presented the brine shrimp to the aquarium world;" it published the well-remembered *Aquarium Journal* for 30 years; and has sponsored both scholarships and scientific research. After this remarkable summary of achievement, Editor Currier asks, "Where do we go from here?", and then points out the way. The standard he carries bears the word *Service*, and service in his words means "We must commit ourselves, now, to the struggle to make and preserve a livable world." His theme is conservation although he doesn't use the term. "Our world is being raped in the most vicious way by unthinking, uncaring, unscrupulous men. We must speak now; act now; get up on our haunches and fight now!" It would be difficult to pass along his message here as vividly and dramatically as he has presented it, but it seems germane to us that if we are bent on leaving future generations the means for a better way of life than has been ours, we can best begin by leaving them a green and forested world with unpolluted streams and air. Because we, as hobbyists, are close to living things it seems appropriate that we as a group assign our concerted attention to the challenge of keeping America more than superficially beautiful. We hope editors of society bulletins reprint Editor Currier's editorial and work on a national basis to find effective ways to undo the damage already perpetrated on our naturally lovely country and to promote means for the prevention of spoiling that which still remains intact from the ravages of "civilization." Appearing in this issue, too, is Trevor W. Lambert's description of the *Australian Blue-eye*. Mr. Lambert of New South Wales wonders why the Australian Blue-eye *(Pseudomugil signifer)* is relatively unknown in America and Europe and then proceeds to tell us why he considers this a serious oversight. The species attains a length of 2½ inches, has good coloring, and is exceptionally hardy. The male's sky-blue metallic eyes make the fish especially attractive. Maintenance of *Pseudomogil signifer* is not difficult and it does well in an aquarium. Breeding the species and raising the young are gone into and perhaps Author Lambert's praise of the little fish will persuade a dealer or two to introduce it to American hobbyists. Write to *Anchor*, San Francisco Aquarium Society, California Academy of Sciences, Golden Gate Park, San Francisco, Calif. 94118 for information regarding the publication and the publishing society.

When uninitiated wives break into print about the hobby, we aren't too sure whether or not they should be suppressed, and this is from a writer who has been known for her hostility toward censorship. Kathy Salzberg, however, states her cases so hilariously in the September issue of the *Boston Aquarium News* in her *A Word to the Wives*, that suppression would be a crime, and let's face it, the starry-eyed novice can be a threat to the order of any household. Read aloud, this piece would bring a chuckle at any jaded aquarium society meeting and outside of the fact that Mrs. Salzberg inadvertently broke the glasses of her husband's new acquaintance when he, to make conversation, offered warmly: "Your husband tells me you have a very unusual pair of *Barbus titteya*," and that she almost broke her back and marriage when she helped her spouse carry a 60-gallon all-glass aquarium into the house, she has fared rather well. And, because she is an unusually adept writer, we look forward to reading more of her material, and won't be at all surprised if it isn't slanted from a hobbyist's point of view. The last paragraph of her piece indicates she's nibbling at the hook. This is a fun article well executed and would brighten up any publication. *The Boston Aquarium News* is a nicely produced bulletin containing society news, thoughtfully selected reprinted material, and original articles. It is published by the Boston Aquarium Society and information regarding the bulletin and the society may be

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A HISTORY OF THE AQUARIUM HOBBY IN AMERICA PART 15

by ALBERT J. KLEE

TURNING NOW FROM BACKGROUND TO THE CHANGES that occurred with time in our hobby, we focus our attention on the appearance of a new aquarium magazine in October 1917. Named *The Aquatic World*, it was published by August M. Roth who, at that time, owned a printing and publishing firm in Baltimore, Maryland. For some years prior to this date, Roth published *Pet Shop News* and *The Pet Stock World*. In the latter magazine (which, by the way, was the first pet trade magazine in this country to publish fish news), a regular column appeared under the name, *The Aquarium World*. Roth decided to expand the column into a complete magazine and to this purpose, secured the services of S. Chichester Lloyd, of St. Louis, as editor. Lloyd, readers will recall, was the founder and president of the so-called *National Aquarium Society of America* which had been taken to task previously by the editor of *Aquatic Life* for its misleading name. This was evidentially characteristic of Lloyd as his earlier organization, *The American Federation of Goldfish Fanciers*, was, in reality, merely another Brooklyn society. *The Aquatic World*, a monthly, consisted of 18 pages, and sold for 5c a copy or 75c for a year's subscription. In addition to that written by Lloyd, material was supplied by J. Henri Wagner, a Washington D.C. dealer, and articles from the notables such as Heede and Brind also appeared. The magazine devoted a good deal of space to society affairs and questions & answers, its theme quickly being set in the first issue by the following editorial entitled, *A Little Difference in Magazines:*

"Magazines devoted to the study or interest of aquatic life seem to be in two classes. The Advanced or the Useful. There does not seem to be any alternative.

"A magazine which devotes its columns to descriptions of new fishes of tropical varieties or other sorts not needed or known in this country, has its purpose in arousing interest in the different exotic forms, but the real *need* these days with a population of a hundred million people (only about one-thousand percent of which knows anything about the care of fish), is a magazine devoted to the newcomer in the fish fancy. It is our endeavor to make this magazine a 'melting place' for all these newcomers,

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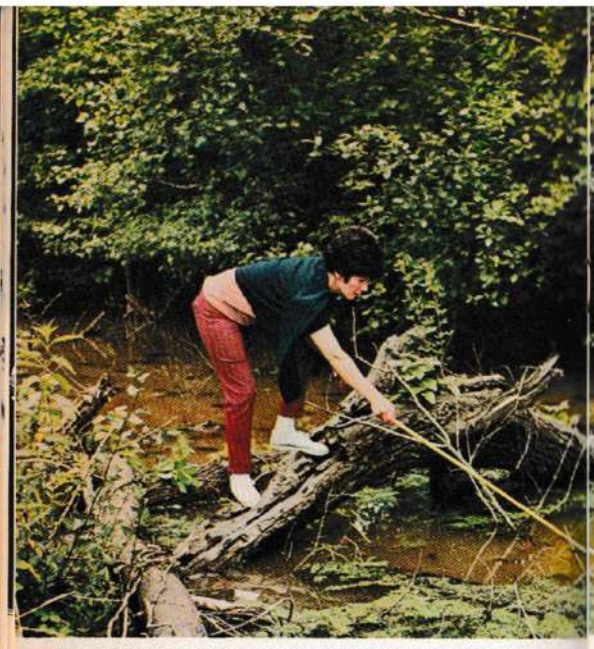
HAPPY BIRTHDAY

February is a month of many memorable occasions, but to fish hobbyists throughout the world, the date February 2nd should be circled in red. It was on this day, in the year 1874, that William T. Innes, the Dean of Tropical Fish was born.

Dr. Innes' past achievements speak for themselves. His were the photographs that first captured the beauty of tropical fish for hobbyists everywhere and his writings recorded, in plain, readable language, the requirements these fish needed for life in captivity. His book EXOTIC AQUARIUM FISHES has established itself as a guideline for those who write on the subject now and in the future.

Upon a recent visit with Dr. Innes at his home, which is located on the campus of Temple University, we found the spirit that enabled him to accomplish such immeasurable deeds in the past still burns brightly. Dr. Innes' interest in the hobby has not waned over the years and his opinions and advice are still taken to heart.

We, the staff of The Aquarium, join with hobbyists worldwide in wishing Dr. Innes continued good health and congratulations on this, his 95th birthday.



The actual collecting process doesn't exactly resemble the Royal Ballet! As the reader can see, however, it's not that hard, either.

WHEREFORE ART THOU DAPHNIA

by GIMMIE LU COX

(Above) Here is the sight that gladdens the heart of any good fish man (or woman) — a jar full of daphnia, ready for your fish.

(Below) The basic equipment for collecting daphnia: jug, hand-nets, long-handled net, bucket and a pretty girl!

DAPHNIA HAVE LONG BEEN SOUGHT AS a food for aquarium fishes. Universally distributed, they may be found in farm or dump ponds, channels or lakes, provided the proper environment exists. The water, stagnant or semi-stagnant, must be rich in bacteria and single-celled algae since these are the food of daphnia. So, if you plan to seek out daphnia, look for a quiet body of water with an abundance of decaying vegetation, or one that receives manure, garbage or sewer drainage. Although foul smelling, the decaying and rotting process assures vast amounts of bacteria and, in turn, daphnia.

This is what daphnia looks like in the net. Note the especially rich color of this clump.

Finding a satisfactory place to collect daphnia can be most difficult, especially if you live in a large city. But once located, chances are that they can be found there in the future although, within any specific body of water, the color, size, amount and location of the daphnia will change from time to time.

In areas where the seasons change, daphnia will be found in greater abundance during the Spring and Fall. Spring is the most desirable time because the aquatic vegetation has only started to grow, the mosquitoes and other biting insects are still at a minimum, and the plant life along the shores is young and low. The best time of day to find daphnia is in early morning. At this time, they can be found near the surface close to the water's edge. Surface daphnia are pushed by the slightest breeze, so look first along the shoreline where you will face the wind. Check the area around the partially submerged sticks and stems of aquatic plants that rise out of the water. If daphnia are abundant they will gather in masses or mats. These masses may be only a few inches wide; then again, they may extend to as much as one or two feet. To aid in this visual search for daphnia, polaroid sunglasses are helpful. The polaroid lenses break up glare on the water's surface and permit better observation into the water.

Upon close inspection it becomes evident why daphnia has been labeled the "water flea". This crustacean, a relative of the crab and brine

*Along with the daphnia, however, occasionally comes an enemy. This is a water tiger (**Dytiscus** beetle larva), and could kill small fish if allowed into the aquarium.*

shrimp, has a hard shield-like exterior. Its size can be compared with the head of a pin, although it may range between two to four millimeters. Also, it can be recognized by its oval shape, single compound eye and compressed bent head. Under its almost neckless head, antenna branch out like oars and reach up to pull it through the water. This reaching and pulling cause it to move through the water with a jumping or jerking motion.

There are several species of daphnia, e.g. *Daphnia pulex*, *Daphnia longispina* and *Daphnia magna*, but specific species are difficult for the amateur aquarist to identify because they differ from time to time with environmental variation. Their shape, size and color will change due to shifts in season, temperature, type and availability of food, and the pH and turbidity of the water. Their color can range from shades of black, brown, green or red, to an almost colorless type. The color variations are attributed to the type of ingested food showing through their transparent bodies.

Once the daphnia are found the most interesting part begins—collecting. A fine nylon or cotton net is needed. The bottom of the net should be rounded, for daphnia are easily injured by their own weight. Some individuals use nets as large as a foot square. But, large nets are difficult to manuever around aquatic plants, submerged sticks and patches of floating algae and duckweed. With a net three or four inches

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A pair of unidentified Malawi cichlids. The term "Malawi" replaces "Nyasa" due to the recent creation of this independent State. "Nyasa", by the way, simply means "lake".

A closeup view of this pair of Malawi cichlids.

FRYER: continued from page 7

Although it is the fishes, and particularly the cichlids, of these and other great lakes in Africa that are our concern, it is necessary to mention one fact which is of great importance in the two deep rift valley lakes and in Lake Kivu, which has a direct bearing on the distribution of life within them, and is directly related to the facts already presented. Because they are very deep and located in tropical regions these lakes behave very differently from the more familiar temperate lakes which in general have a regular seasonal cycle. In a typical temperate lake the water becomes uniform in temperature from top to bottom twice a year, in spring and autumn, and when this happens the wind can thoroughly mix its waters, taking oxygen down to the greatest depths and bringing into circulation the nutrient salts which tend to accumulate in deep water during the summer as a result of the rain of dead and decomposing plants and animals, many of which are of microscopic dimensions, falling from the upper layers. In the deep African lakes this does not happen. Here the sun is continuously warming the upper layers of water, and therefore tending to make them always lighter than the cooler, deeper layers. Furthermore the great depth of water ensures that, even if the entire lake ever did become uniform in temperature from top to bottom, a prodigious wind would be required to cause complete circulation. The result of this

state of affairs, here greatly simplified, is that the water at the bottom of the deep lakes is "stagnant." Here the oxygen has long been used up, and furthermore, toxic materials—methane and hydrogen sulphide—sometimes accumulate. Methane is in fact present in vast, and commercially exploitable, quantities in the deep water of Lake Kivu, and its presence in such amounts shows quite clearly that the lack of mixing has been a long established phenomenon in this lake, for had even occasional mixing taken place the methane would have been dissipated.

The effect of such conditions on the fauna is profound. Fishes and other oxygen-demanding organisms are unable to penetrate very deeply in these lakes, whose profundal regions are in fact biological deserts. If one were to slice off the uppermost 400 feet of the water of Lakes Tanganyika and Nyasa these slices would contain virtually all the fauna of the lakes. Disappointing as the absence of fishes from deep water may be, this situation really makes it all the more surprising that, ichthyologically, of all the world's Lakes, Nyasa and Tanganyika should be the richest. Of the fishes found in these lakes it is the cichlids which make the major contribution to this paradoxical situation, for, although many families are to be found there, none is so richly represented as the Cichlidae. In fact in each of the three great lakes, Victoria, Nyasa and Tanganyika, the

A pair of ***Pseudotropheus zebra,*** *one of the white forms. In this particular variety, however, the female is mottled.*

A male specimen of the white form of ***Pseudotropheus zebra.*** *The species has four distinct color forms, including one in which both sexes are sky-blue.*

One of the most popular of all the Malawi cichlids, ***Pseudotropheus auratus.*** *The female is the top fish.*

A male specimen of ***Labeotropheus trewavasae.***

A male ***Pseudotropheus auratus.*** *Again, remember that when the fish are still young, the sexes are frequently impossible to distinguish.*

Pseudotropheus auratus *displays a characteristic sexual dimorphism. The female, shown here, is a brilliant chrome-yellow with two very prominent blue-black bands. It should be cautioned, however, that when the fish are not in the breeding stage, males are also colored much like the female and thus it may be impossible to distinguish them from each other.*

number of species of cichlids exceeds that of all other families combined. Lakes Victoria and Tanganyika each contain more than 120 different cichlids and the total for Nyasa is truly astounding, for more than 200 members of this family are now known to occur there. Exact figures are not quoted for the simple reason that work on these remarkable faunas is still in progress and some of the species known to occur, particularly in Lakes Victoria and Nyasa, are still undescribed.

In the sheer number of species which each lake contains, the situation is remarkable. It is seen to be even more remarkable when it is realised that each of these lakes has its own distinctive cichlid fauna and that hardly any of these fishes are common even to two of the great lakes! Each lake in fact contains a vast assemblage of cichlid fishes peculiar to itself, and found nowhere else in the world. In other words most of the cichlids of Lake Victoria are endemic to that lake and likewise most of the cichlids of Lakes Nyasa and Tanganyika are restricted to their respective basins. The cichlids of certain other African lakes, notably Edward, exhibit this same restriction, but not on the scale seen in the three largest lakes. This situation can mean only one thing: most of the cichlid fishes found in, say, Lake Nyasa, must have evolved there, within the basin of that lake, and the same is true of the cichlids of Victoria and

Tanganyika. This state of affairs, the truth of which has gradually forced itself upon biologists as these lakes have been explored during the century or so that they have been known to the outside world, is as it were one of the great showpieces of evolution, but by no means all biologists are yet aware of the fact.

Why this phenomenon, which has been graphically described as explosive evolution, should have taken place among the cichlid fishes of these lakes, and, equally important, how it took place, is a matter of the utmost biological interest. These questions can be answered only when we possess information on the fishes themselves relating to their structure, breeding and feeding habits, ecological requirements, specializations, and so on, and such knowledge is now gradually accumulating. Impetus to its acquisition has been given by the fact that several of these fishes, notably but not exclusively, those belonging to the familiar genus *Tilapia*, are of great economic importance and are caught in large numbers for use as food. For example the main fisheries of both Lakes Victoria and Nyasa are based on species of *Tilapia*. Other cichlids, often quite small in size, are also important as a source of human food. In Lake Nyasa special fisheries, employing unique indigenous methods of capture, exist for the exploitation of several shoaling species of *Haplochromis*, and in

A pair of ***Pseudotropheus zebra*** *of the normal color variety.*

Lake Victoria certain beaches which are fished by means of seine nets may each produce several million individuals of *Haplochromis* in the course of a year. The fish which brings enjoyment of one kind to the aquarist may therefore bring satisfaction of another, and equally important kind, to an African fisherman. Cichlid fishes indeed play an extremely important part in supplying food, and more particularly proteinacious food, to the expanding human population of wide areas of Africa.

Faced by such a welter of species it is possible to do no more than select for discussion a few aspects of their biology, and even these can be dealt with in only the most cursory manner in a short article. It is perhaps logical to begin with structural diversity. In body form the range exhibited is perhaps less than might be expected considering the number of species involved, but is nevertheless considerable and includes predators of torpedo-like form, graceful deep-bodied herbivores, and a host of others which show small but important modifications of form for life among rocks, over sand, in stands of vegetation, or in open water. There are, however, no cichlids in the African lakes comparable in form with the South American angelfishes or *Symphysodon discus*.

Hand in hand with these differences in form go differences in size,

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Gypsum, variety Selenite, Canada

Halite, New York

Pyrite, Utah

marble, result when heat and pressure alter the chemical or structural makeup of igneous or sedimentary rocks.

Most hobbyists are aware of the important roles that pH, water hardness and toxicity play in aquarium ecology, and that certain rocks may alter the aquarium environment drastically. However, before one can talk of the pH of rocks, it must be specified which pH is being referred to; the pH of the parent molten rock (in the case of igneous rocks), or the pH change which will probably result if a given rock is introduced into the aquarium. Obviously the hobbyist is interested primarily in the effect a rock will have on the life in his aquarium. It does not matter to him that granite is an "acid" rock, or that basalt is a "basic" rock because neither of these will alter the aquarium pH measurably. However, limestone (calcium carbonate) and its alternate form, marble (same composition), will tend to produce a high pH in the aquarium. Of course, no simple generalizations can be made about the pH or any of the other environmental requirements of fish or plants; rather, one must learn the unique requirements of each species, and abide by them. Therefore, a given rock can be *neutral* toward all species, if it does not measurably affect the aquarium pH, hardness or toxicity; *harmful* to all species, if it has a very strong effect; or *questionable*, if the effect is harmful to some species yet beneficial to others.

Olvine, variety Dunite, North Carolina

Biotite (Mica), Canada

Quartz, variety Amethyst, Uruguay

There are many sophisticated testing techniques used with elaborate laboratory apparatus by which the modern mineralogist identifies minerals. Yet, with very little effort, the average hobbyist should be able to sort up to ninety per cent of his "finds" in the field. Following is a list of some necessary equipment for the mineral and rock collector:

1. Knife
2. Mineral hardness standards (quartz and fluorite)
3. Streak plate (unglazed porcelain)
4. Glass plate (about three inches square)
5. Hydrochloric acid (dilute—available at local drugstore)
6. Old towel
7. Digging equipment (if necessary)

A variety of diagnostic criteria may be used by mineral collectors, the most valuable identification tool being experience itself. The inexperienced rock hound often overemphasizes mineral color in the identification of mineral species.

With the above equipment, the collector is able to perform the following elementary diagnostic tests: hardness test, powder color comparison, carbonate test, and taste test. It should be noted that all tests performed on a mineral specimen should be made on a fresh surface. Some collectors include a hammer in their equipment bag, while others

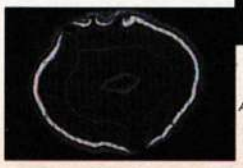
Quartz, small crystals

Rose Quartz, Brazil

Quartz Crystal

Calcite Crystals, England

Beryl crystal, Pennsylvania



Agate (Polished), Africa

Fluorite (cleavage octahedron)

Fluorite, Illinois

Hornblend (Amphibole)

merely crack one rock against another to yield a fresh surface on which to test. Many rocks possess a surface coat of another mineral, which may have entirely different physical properties than the bulk of the specimen. An example would be a mineral enclosed in an "alteration product" due to weathering. Although the basic mineral might be suitable for aquarium use, the outlined tests might not indicate this if performed on the altered mineral's coating. Thorough cleaning often makes such minerals safe for aquarium use. Since most geology and mineralogy texts refer to the Mohs hardness scale for minerals, a version of this scale has been duplicated on Table I. Close examination of this table will disclose the use of much of the equipment mentioned above.

When a person scratches one material against another, the harder substance usually abrades the softer material, thereby leaving a powder trail of the softer material's composition. Sometimes, however, the harder material may be chipped or cleaved by the softer material. An example is the mineral Pyrite (fool's gold) when scratched by a knife. An inexperienced person might not recognize the resulting grains as cubic cleavage fragments, and therefore might mistakenly believe that Pyrite is softer than a knife blade. Certain sedimentary rocks also present a problem for hardness testing. Sandstone, for example, is actually comprised of sand grains (SiO_2) which are cemented together by a "matrix" material. The grains themselves are harder than the knife blade, but the

matrix may be softer. Often the grains are pulled free of the matrix by the scratching motion of the hardness test. However, if these grains are rubbed against the knife blade, scratches in the blade metal may be observed. Sometimes when one mineral is softer than another, portions of the first will leave a mark on the second which may be mistaken for a scratch. It can be rubbed off, however, whereas a true scratch will be permanent. The collector should be careful not to mistake a metal trail from a knife blade on the mineral surface for a scratch in the mineral.

It is always advisable when making the hardness test, to confirm it by reversing the order of procedure; that is, do not just try to scratch mineral A by mineral B, but also try to scratch B by A. Minerals of nearly the same hardness may scratch each other.

The color of the fine powder of a mineral is known as its streak. The streak test is frequently used in the identification of minerals for although the color of a mineral may vary within wide limits, its streak color is usually constant. This property conveniently can be determined in the field by rubbing the mineral on a piece of unglazed porcelain known as a "streak plate". The streak plate has a hardness of 7, and thus cannot be used with minerals of greater hardness.

The carbonate test is undoubtedly the most important mineral identification criterion for aquarium hobbyists. There is, without a doubt, more limestone than any other "questionable" mineral, in unknowing hobbyists' tanks. A fresh mineral surface should also be provided for this test. The collector should first powder a bit of the mineral with a knife blade, then place a few drops of dilute hydrochloric acid on the powder. If the powdered mineral effervesces, then it is a carbonate. Some carbonates react so mildly that the collector must hold the specimen very close to his ear in order to hear the effervescence as the reaction might be too weak to be seen. Other minerals, such as limestone, react so violently that the specimen even need not be powdered before applying the acid.

Recently, a very coarse and decorative gravel was distributed for use in aquariums. The composition of this gravel is that of limestone ($CaCO_3$) and the rock is partially altered in form, hence the name "marble chips". It should be pointed out that this gravel is comprised of one of the aforementioned "questionable" minerals. The hobbyist, therefore, should be fully cognizant of the effects that it might have on the aquarium environment (it would raise the pH and the water hardness).

Touching one's tongue to a fresh surface may distinguish certain salty minerals which are very soluble in water. However, because of the high solubility of these minerals, the chances are remote that a collector would discover specimens on the earth's surface. Certain clay minerals may also be distinguished by the taste test because of their deliquescent

TABLE I

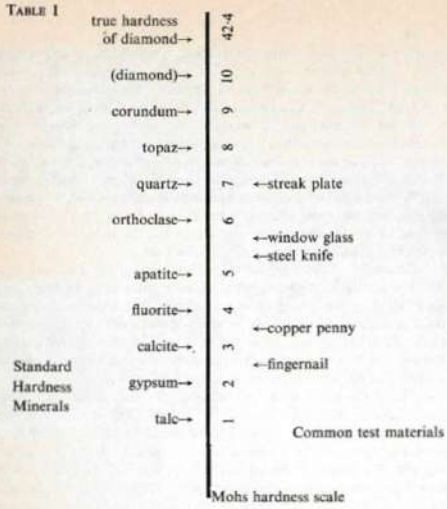


TABLE II

Mineral Name	*Hardness*	*Color of Streak*	*Effervescence*	*Affect on pH*
Agate	7	—	No	Negligible
Amethyst	7	—	No	Negligible
Aragonite	3½ to 4	White	Violent	Will Lower pH
Augite	5–6	—	No	Negligible
Basalt	—	—	No	Negligible
Beryl	7½ to 8	—	No	Negligible

NO!

nature. Such minerals tend to feel sticky, as moisture is drawn from the tongue's surface. It is important to note that if the taste test is to be performed, it must be performed before acid is placed on the mineral surface.

It should be emphasized that an experienced collector may recognize characteristic cleavages, partings, and fractures of certain minerals. Also, properties such as crystal habit (the external shape of a mineral crystal), tenacity (the cohesiveness of a mineral, i.e., whether it is brittle, malleable, sectile, ductile, flexible or elastic), specific gravity (a number which expresses the ratio between the weight of a mineral and the weight of an equal volume of water) and certain optical properties of minerals may serve to help identify them. As the hobbyist becomes more experienced, he should turn to Dana's book ("Dana's Manual of Mineralogy", by James D. Dana, 17th Edition, 1959) for information on these properties.

While it would be impossible to include a truly comprehensive table for diagnostic criteria in an article of this length, a few of the more common mineral types have been included in Table II below. The serious collector should acquire a copy of Dana's book for complete descriptions of many minerals.

As a final test, the aquarist should wash all collected specimens thoroughly in clean water to remove dirt and alteration products, then allow at least two hours for the specimen to soak in a tub of clear water. At the end of the soaking period, if the water is cloudy or colored, either the specimens were not cleaned well enough or they are unfit for aquarium use. If the aquarist would ever desire to display a "dangerous" mineral, he should be fully aware of the probable affect on the aquarium environment, and should never risk any prized fish. ●

Affect on DH	*Toxic?*	*Chemical Suitability for Aquaria*	*Remarks*
Negligible	No	Neutral	Sharp edges, a variety of quartz
Negligible	No	Neutral	Sharp edges, purple quartz
Will Harden	No	Questionable	
Negligible	No	Neutral	
Negligible	No	Neutral	Not a mineral; this very fine-grained rock contains predominantly pyroxene and feldspar
Negligible	Very slight	Neutral	Green variety known as "Emerald"

Mineral Name	*Hardness*	*Color of Streak*	*Effervescence*	*Affect on pH*	*Affect on DH*	*Toxic?*	*Chemical Suitability for Aquaria*	*Remarks*
Calcite	3	White	Violent	Will Lower pH	Will Harden Water	No	Questionable	
Chalcopyrite	3½ to 4	Greenish-Black	No	Negligible	Negligible		Neutral	Brittle, yellow
Corundum	9	—	No	Negligible	Negligible	No	Neutral	"Sapphire"
Dolomite	3½ to 4	White	Weak	Will Lower pH	Will Harden Water	No	Questionable	
Feldspar	6	—	No	Negligible	Negligible	No	Neutral	Mineral group including orthoclase, plagioclase
Felsite	—	—	No	Negligible	Negligible	No	Neutral	Not a mineral; this very fine-grained rock comprised chiefly of quartz and feldspar
Fluorite	4	White	No	Negligible	Negligible	No	Neutral	
Gabbro	—	—	No	Negligible	Negligible	No	Neutral	Not a mineral; this dark heavy rock comprised chiefly of pyroxene and feldspar
Gold	2½ to 3	Golden	No	Negligible	Negligible	Yes	Harmful	Malleable
Granite	—	—	No	Negligible	Negligible	No	Neutral	Not a mineral; this rock comprised chiefly of quartz, feldspar and mica
Gypsum	2	White	No	Negligible	Will Harden Water slightly	No	Questionable	Soluble in water
Halite	2½	White	No	Negligible	Although very soluble in water, apparent hardening is slight	Perhaps	Questionable	Salty Taste
Hornblende	5 to 6	—	No	Negligible	Negligible	No	Neutral	
Mica	2 to 2½	Varies	No	Negligible	Negligible	No	Neutral	A mineral group including muscovite and biotite; platy habit
Obsidian	—	—	No	Negligible	Negligible	No	Neutral	Not a mineral; this very fine-grained rock is dangerous because of sharp edge resulting from characteristic conchoidal fracture
Olivine	6½ to 7	—	No	Negligible	Negligible	No	Neutral	Green color
Opal	5 to 6	White	No	Negligible	Negligible	No	Neutral	Sharp edges
Pyrite	6 to 6½	Black	No	Negligible	Negligible	No	Neutral	"Fool Gold"
Quartz	7	—	No	Negligible	Negligible	No	Neutral	Ideal Aquarium mineral

NO!

KLEE: continued from page 32

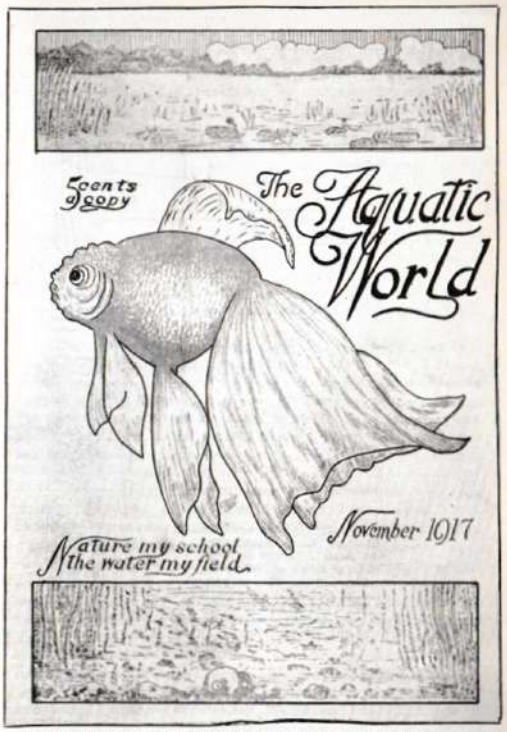
who will derive from any of its issues at least one or two grains of knowledge which will be of value to them in the actual keeping and care of the fish. After they have obtained a working knowledge of the fish-keeping pleasure it is time enough to become involved in the more expensive and rarer forms, the care of which is a thing not to be lightly undertaken.

"Out of the thousands of letters I have received from fish fanciers all over the United States asking for information regarding the care of their fish there are two points which stand out from all the rest. These are: The changing of water and the feeding. These two are the most important of all the points to be studied and yet they are the simplest of all.

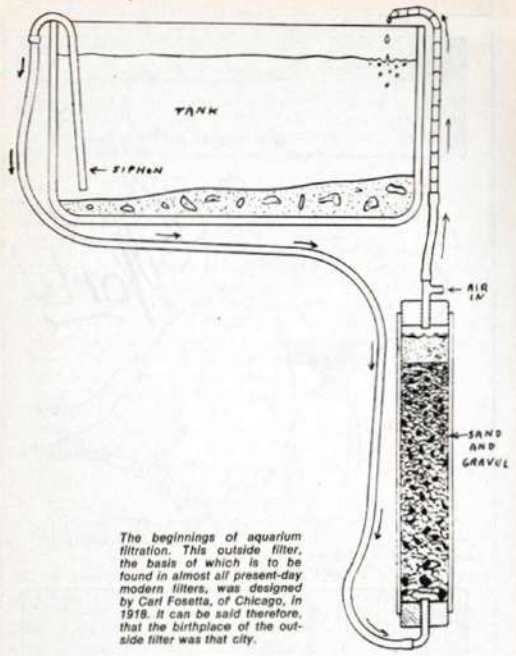
"While we shall devote these pages to hints and the answering of questions on fish and aquarium topics, we shall not lose sight of the interest arousing features of tropical and other rare forms of fishes; therefore, we suggest that any of our subscribers or readers who have forms of fish they have succeeded in keeping with pleasure and interest, write us a brief description of the fish, and telling us of their experiences. These will receive due space and it is not necessary to be an experienced writer in order to tell your story. The editorial end of it will be taken care of and your story presented in readable form. An exchange of ideas of this kind will do more to benefit the fish fancy than any technical article which we could print here.

"Remember that this magazine is written by you and for you, and the other fish fanciers of this country. It is just your magazine as my magazine, or the publisher's. Therefore, we ask you to contribute anything in the way of a story that you have in mind."

The magazine which Lloyd described as ". . . devotes its columns to descriptions of new fishes of tropical varieties or other sorts not needed or known in this country . . ." was, of course, *Aquatic Life*. It is clear that Lloyd never forgave Poyser for his criticism of the naming of the *National Aquarium Society*. True to his word, however, *Aquatic World* devoted much space to what would be considered "beginner's material" today. The editing, unfortunately, was clumsy and inept, and the concept of a magazine devoted to beginners did not meet with success. Ironically, in the first issue there appeared an advertisement for a "New Aquarium Book", i.e., the first of the numerous editions of *Goldfish Varieties and Tropical Aquarium Fishes*, by William T. Innes. As this book summarized the principles of fishkeeping as understood in 1917 quite adequately for the beginner, in a sense it reflected the inevitable failure of *Aquatic World* as a viable concept. Magazines are periodicals and as such, must represent a spirit of timeliness and news. Principles vital to the newcomer are best expounded in non-periodical literature. *Aquatic World* learned this lesson in December 1917, when it ceased publication after but three issues of life.



The front cover of The Aquatic World, November 1917 edition. This magazine marked the first serious appearance of August M. Roth in the aquarium publishing field. Unfortunately, the magazine failed after only three issues. Note the motto on the cover: (Nature my school, the water my field). This motto was to be used by Roth in a subsequent publishing attempt, one that met with considerable success.



The beginnings of aquarium filtration. This outside filter, the basis of which is to be found in almost all present-day modern filters, was designed by Carl Fosetta, of Chicago, in 1918. It can be said therefore, that the birthplace of the outside filter was that city.

Since we have mentioned the publication of *Goldfish Varieties and Tropical Aquarium Fishes*, a brief discussion of its history is in order. As time went on, Innes clearly saw the need for a revision of Wolf's book, *Goldfish Breeds and Other Aquarium Fishes*, which was published in 1908. What was needed now was an addition of material devoted to tropical fishes but Wolf, the old goldfish man that he was, would not agree to coauthorship of a revised edition of his book. Therefore, Innes bought

the rights from Wolf, paying for the copyright plus agreeing to a royalty. He then rewrote and reillustrated portions of the book, and contracted with Walter Brind for the latter to write a tropical fish section. This last fact is little known in the hobby. Brind, however, did not contribute to subsequent editions of the book which, in 1932, was to reach its 32nd edition. It was an outstanding reference work, reflecting the genius of both Wolf and Innes, and a cornerstone of the hobby for many years.

The hobby was, however, still in its infancy, and the matter of correct spelling of even basic terms was still in doubt. The following account, written by Ida M. Mellin in 1918, discussed the merits of "Aquarist" versus "Aquarian".

"What is the correct title for a person who understands the management of aquaria? For some years this has been a vexed question. Aquarian, aquarium-keeper, aquarist, and other names have been given. A similar difficulty accompanied the selection of the word to describe a receptacle or building containing live aquatic plants and animals, aquavivarium and other names having been used before aquarium was finally settled upon.

"The euphonious and unique name of 'Aquarial Garden' was bestowed upon an aquarium opened in Boston in 1860. Prof. E. S. Morse, President of the Boston Society of Natural History, thinks it may have been suggested by Agassizi, who was greatly interested in the institution. The *Leisure House* of 1864 states that Agassizi 'may frequently be seen walking towards the Boston Aquarial Gardens'. The histories and guidebooks of Boston covering that period tell very little about the opening of the Aquarial Gardens. It is interesting to learn from Prof. Morse that the exhibition consisted of individual aquariums around the hall, and in the center a high tank, in which seals, a shark and other animals were displayed. Afterwards a group of Africans, Zulus, Hottentots and other negroes danced and sang on the stage'.

"Such awkward words as aquavivarium and aquarium-keeper are not likely to become popular. A new book in our AQUARIUM library, published 60 years ago in London, is entitled *The Aquarian Naturalist*. This is typically English. From old American dictionaries we learn that aquarians were members of a heretical Christian sect that flourished about the middle of the eighteenth century and were so called because they used only water at the Lord's Supper. *Murray's English Dictionary*, at present the standard dictionary in England, gives this definition and also defines aquarian as 'One who keeps an aquarium'. It also states that the word has been used, though rarely, as an adjective, an article in the *Illustrated Observer* for 1865 being entitled 'Aquarian Principles'."

The word aquarist was adopted some years ago by the New York Aquarium. In perfectly correct form, probably, it should be aquariist; but the contraction is preferable. The publishers of the *Century Encyclo-*

paedia, conferring with the offices of THE AQUARIUM on the subject several years ago, stated that in view of our adoption of the word, its usage would be regarded as established, and they proposed inserting it in the next issue of their encyclopaedia. This has not yet been printed.

"Mr. W. A. Poyser, editor of *Aquatic Life*, revived the word aquarian in 1916, and has since used it in his magazine, though he also uses aquarist. Mr. Poyser advised the writer this summer that he had received intelligence of the formation of an astrological society in Boston for the purpose of studying mental, moral and physical effects of planets on human beings. As the world was passing through the portion of the universe determined by the sign Aquarius, the society was named *The Boston Aquarian Society*, its members being known as aquarians. Mr. Poyser's informant expressed a humorous fear lest a confusion of the titles aquarian and aquarist lead to the latter being accused of stargazing. But however that might be, aquarium lovers may take assurance from the moral in the old story about the little boy who, being a stargazer, finally fell into a pond while looking skyward—which only shows that he was obliged to direct his attention to aquatic life sooner or later.

"It is true that the word aquarian has proved versatile, having found a place successfully in the realms of religion, pisciculture and astrology; but aquarist, being capable of a single construction, seems to hold the advantage." Thus was this important word fixed once and for all, in the aquarium hobby.

When Ida M. Mellen wrote the above piece, she was Secretary of the New York Aquarium. Although she is not remembered much today, she was one of our great aquarists and as important as either Heede or Brind. Personally knowing such historical personalities in the hobby as William Damon's sister, who had the first freshwater aquarium in this country, Miss Mellen made her mark early with articles such as *The Fresh-Water Shrimp* which appeared in the N.Y. Zoological Society *Bulletin* in 1919, *Effects of Captivity on a Sex Character* which appeared in *Science* in 1922, and *Goldfish Mortality* which appeared in the *Pet Dealer* in 1928.

Ida Mellen wrote one of the fairly early books on fishkeeping in America, *Fishes in The Home*, published in 1927; in that same year she also wrote *Young Folks' Book of Fishes*. Her real masterpiece, however, was the monumental *1001 Questions Answered About Your Aquarium*, coauthored (she was the senior author) with Robert J. Lanier in 1935. In time, she rose to the position of Chief Aquarist of the New York Aquarium, but she always had her finger on the pulse of the hobby and could evaluate it with an objectivity not shared by any of the prominent aquarists of her time. A truly distinguished aquarist was Ida M. Mellen.

To be continued.

ANNOUNCEMENT

The Aquarium magazine has always, since its inception, taken pride in the fact that the bulk of the material contained in its pages has been written by hobbyists and stems directly from the grass roots of the aquarist's pursuit.

To implement this policy further, *The Aquarium* announces that twice a year it will publish an article selected from aquarium society bulletins which in the opinion of the editors is particularly outstanding for originality of presentation, a novel idea, or because it offers something revolutionary in the art and science of fishkeeping. Each selection will excel in one of these areas.

The author of such an article will receive payment for his or her material at the same rate as that received by writers whose material is accepted for publication by submitting it to *The Aquarium* on a free lance basis. The society bulletin from which such material is selected will receive credit as well as a citation in the form of an honorary plaque.

It is anticipated that this new policy will serve to encourage hobbyists to participate to a greater degree in the production of their society bulletins and that it will stimulate the exchange of ideas among hobbyists wherever *The Aquarium* magazine is read, nationally and internationally.

Selections will be made on the basis of the value of the material they contain to the hobby as a whole in any of its phases. Writers who have articles published in the past in *The Aquarium* magazine will not be excluded nor will the newcomer to the hobby who has had his first article published in his society's bulletin if his material is outstanding in any of the areas described above.

The editors of *The Aquarium* magazine reserve the right to make editorial changes in selected material but will not change the thought or ideas presented. Writers of selected material will be notified through the editors of their society bulletins.

SOCIETIES: continued from page 31

had by writing the society in care of the Exchange Editor, 6 Carl Road, Arlington, Massachusetts 02174.

Josephine White discusses *Emperor Tetras* in the September issue of the *Duluth Aquarist* (published by the Duluth Aquarium Society) and in a most thorough way describes her method and suggestions for breeding these lovely little fishes. They are easy to feed, she tells us, accepting frozen brine shrimp, white worms, mosquito larva, grated beef heart, and a good grade of dried food. A temperature in the 78-80°F range is good, and although not fussy about water, a partial change should be made periodically. Several specimens should be acquired and the author gives a detailed description of both males and females. Briefly, the adult female is not as brightly hued as the male, nor does she have as elongated caudal and tail fins. In preparing the spawning aquarium, the author makes sure that good light, preferably sunlight, shines through it. Filtered rain water is used and marbles or gravel cover the floor of the tank. One floating nylon mop and two weighted mops are arranged together in one section of the aquarium. An infusorian culture is started and a trio of two males and a female is selected. Of course, the female should be well rounded with eggs. The trio is placed in a small bowl containing water from their original aquarium. This bowl is allowed to float in the spawning aquarium for about 10 minutes and then the fish are netted out into the spawning tank so that little or no water from the bowl is allowed to mix with the spawning water. The fish are not fed and are kept in this tank for two days. They are then removed to their original tank. The eggs start hatching two days after the spawning takes place and it is now that the light shining through the tank will be helpful. Even in good light the tiny babies are difficult to see. Infusoria is now poured into the aquarium, one-half cup at a time, two feedings being offered the first day. Each day an additional feeding is added up to four and then they are reduced by one each day until a week has passed, when newly-hatched brine shrimp are offered along with microworms. The author removes the marbles at this time. A five or ten-gallon tank is used and is filled to about three-fourths of its capacity. In about three weeks the young begin to take on the appearance of emperor tetras and by six months they are beginning to mature. The tank must be kept clean. We are merely giving a resume of the author's directions here. Serious breeders of this species should read the original article as it is nicely detailed and is certainly reference material as Josephine White's articles are prone to be. Write to the Duluth Aquarium Society at 2600 Ormsby Road, Duluth, Minnesota 55810 for information regarding the society and its bulletin.

The Care and Breeding of Cichlasoma festivum by Bob Shauris in the October issue of *The Worcester Aquarist* (published by the Worcester Aquarium Club) points up a peaceful cichlid that has been somewhat neglected in recent years in aquarium literature which is rather surprising when one considers that cichlids as a whole have had their share of attention. The species offers much interest in that it does have a pleasing appearance and is relatively easy to keep happy sans temperament problems and gets along very well with the ever popular angelfish. Author Shauris likes its changing color characteristic and despite its shyness, points out that it will accept food from its owner's hand. It prefers a warm tank, we are told, which, we assume means in the high 70's. Good aeration and a well-planted aquarium are required and although most foods are accepted, earth worms, tubifex and white worms are relished. Several specimens should be kept together if breeding the species is contemplated, and pairing off will occur through natural selection. A spawning tank should be located where interruptions can be prevented, and a flat stone or wide-leafed plant provided. Although the eggs can be artificially incubated, the author describes a typically interesting family relationship common to most cichlids which will be missed, of course, if the eggs are removed from the parents. When the youngsters are free-swimming they may be fed newly-hatched brine shrimp. *The Worcester Aquarist* is published by the Worcester Aquarium Club and information regarding the association and its bulletin may be had by writing the club in care of Editor George A. Banks, 15 Davis Road, Auburn, Mass. 01501.

W. B. McSpadden, or "Mac", as he is affectionately known throughout the aquarium world, has a penchant for oddball fish as well as an observing eye. This is a most fortunate combination when it is possessed by a hobbyist who is willing to share his knowledge. Mac's concise and informative articles show up in a number of society bulletins and a file of his pieces would be a goldmine of reference material for a hobbyist with similar taste. The October issue of *The Hartford Bulletin* (published by The Exotic Fish Society of Hartford) carries Mac's commentary on aruanas and reading it we are again reminded of his talent for picking out idiosyncratic information peculiar to his subject. Noting that the young aruana he had purchased (it had just shed its egg sac) was not eating well in the 10-gallon tank where he had placed it in water carefully adjusted to that in which it had been kept by the dealer, Mac added a small African butterfly fish which doted on frozen brine shrimp. The young aruana caught the idea quickly and soon the two strange tankfellows were dining together on this nutritious fare. The African butterfly fish not only encouraged the young aruana to eat,

but prepared it to accept other fish as tankmates. Mac's aruana now lives in a 25-gallon tank (all 13 inches of him/her) and has developed the personality of a household pet. Although not too demanding as to water quality, Mac favors a pH of 7.0 and a temperature of 78°F. He warns that the fish is a jumper and its tank should be fully covered and secured. This issue also carries George Maier's *Aphyosemion nigerianum*. This species, according to the author, is a most successful aquarium subject in that the male is very colorful and attains a length of 3 inches. It will adjust to most water conditions provided the change is brought around gradually. Two methods of propagating *Aphyosemion nigerianum* are given. The first one entails the use of a small, well-planted aquarium into which a pair is introduced. Floating plants should be present. After 2 weeks have elapsed, the pair may be moved to another aquarium. Within a week, the author tells us, young fish will be seen in the spawning tank. The second method is more sophisticated but promises a larger yield of youngsters. Here a bare tank is used containing several nylon spawning mops. At three-day intervals, the mops should be removed, the water squeezed out; the eggs are found clinging to the fibers which are removed to a container of water treated with a fungus remedy. Eggs that show fungus should be removed immediately. The young, when first hatched, should be fed infusoria for 3 days and newly hatched brine shrimp and microworms after the third day. This species prefers water in the low 70's. The author of this piece, George Maier, is publicity chairman of the American Killifish Association, and at the end of his article he suggests by way of a membership application, that hobbyists interested in the American Killifish Association can receive information regarding it by writing R. F. Yacano, 2778 Oakland, Eden, New York 14057. *The Hartford Bulletin*, published by The Exotic Fish Society of Hartford, reflects an active, well-established club and those interested in membership or information regarding its official publication should write to Editor Elizabeth H. Muller, 34 Elmer Street, East Hartford, Connecticut 06108. [Ed. Note: George Maier's *Aphyosemion nigerianum* has appeared in several society bulletins by the courtesy of the American Killifish Association.] ●

ADVERSARIA: continued from page 28

Who would have suspected that *Clarias* could create so much havoc? But it has, and people are hearing about it! Whether or not piranha could survive in Florida water is not known, but if enough people THINK that it could, legislation might be pushed which would prohibit the importation of many tropicals to the aquarist.

It is painfully clear that the hobbyist who disposes of unwanted

and then go another 50 miles upriver in a motorboat.

"Along with two entirely new (to aquarists) *Corydoras* species, we caught two 10-inch loricariids (identification no longer remembered, if indeed it was ever known), each of which carried a cluster of about 100 large greenish eggs between the large lower lip and the chin. The eggs were removed from the fish (they remained in tight clusters) and placed in collecting cans. Within an hour the eggs of one cluster hatched into surprisingly large, very active tadpole-like critters. They lived in the can and were flown back to Georgetown a week later.

"It would be interesting to know if any readers of *THE AQUARIUM* have on observed loricariids carrying their eggs about on the lower lip". EDITOR'S NOTE: There have been a considerable number of aquarium references to the breeding of loricariids since the Friswold article cited by Mr. Fletcher. The bulk of these appeared in the now-defunct *AQUARIUM JOURNAL*, but back issues may be obtained by writing to the San Francisco Aquarium Society, California Academy of Natural Sciences, Golden Gate Park, San Francisco, California 91318. The issues of interest are: September 1959, pgs. 326-328 (spawning *Xenocara dolichoptera*); October 1959, pg. 375 (spawning *Xenocara dolichoptera*); February 1960, pg. 108 (spawning of *Loricaria*); April 1961, pgs. 190-193 (breeding and sexing *Loricaria*); July 1961, pgs. 330-332 (breeding *Xenocara multispinis*). ●

WHAT'S NEW: continued from page 23

vice the aquarist doesn't have to squeeze a bulb or invest in a more expensive electric motor driven device, on the other hand its action is much slower. ●

AUTHORS: continued from page 20

injections and we plan to publish these results when they are obtained.

Bob presently holds a Bachelor of Science degree in Mining Engineering and is currently finishing a Master of Science in Mineralogy (both from Ohio State University). He was a laboratory instructor in that University's Mineralogy Department for three years, and has worked for a mining machinery company for the past two years. Currently he is President of the Columbus Aquarium Society. ●

PROBLEMS: continued from page 16

it. Cutting off a part of a swordtail's tail for abusing a smaller, sick fish is as fruitless as spanking a guppy for eating one of its young would be. On the other hand, watching the performance and not doing anything about it is not governing the small world of which we have become the high official very fairly. At least, if we were in the position of the sick fish, we would feel that we were getting a pretty bad deal. No, I do not think the swordtail was at fault. I'd place the blame on the high official whose business it was to protect the small sick fish. ●

COX: continued from page 37

across there is less chance of scattering the patches of daphnia. Also, you can avoid gathering the large amounts of unwanted plant life and debris which make cleaning the daphnia a difficult task.

To reach areas away from shore, make a long-handled net. With heavy twine, secure the net handle to a long sturdy stick or bamboo pole. A bamboo pole that comes in three three-foot sections is ideal. It is lightweight and easy to carry.

If daphnia are not visible, make a sweep near the surface anyway, just to make sure. If not successful, try running the net through deeper water. Push the net away from you, bring it around in a half circle, then back again. Follow through with this motion making a figure eight pattern. This prevents the net from turning inside out and permitting any of the captured daphnia to escape.

As the daphnia are collected place them in a plastic bucket. When a satisfactory amount has been gathered, pour them into 1-gallon jars for transportation. Daphnia need plenty of oxygen so overcrowding should be avoided. On warm days a few ice cubes in each jar will slow down their metabolism, thus reducing their need for oxygen. When daphnia are abundant it is easy to overcrowd, but it's better to arrive home with a few live daphnia rather than a large number of dead ones.

To clean the daphnia, pour the contents of the collecting jars through

CREDITS

PHOTOS:
W. Tomey, P. 10-14; Gimmie Lu Cox, P. 34-37; A. Klee, P. 8, 45-48; A. Roth, P. 4-7, 33, 38-44, 73-78.

FISH:
LAKE CICHLIDS supplied by S. Liberman, Paterson, N. J. and Paramount Aquarium, Ardsley, N. Y.; PIRANHA supplied by Betta Tropicals, Bronx, N. Y.

a sieve or section of window screen. If the daphnia are small, they will pass through and the unwanted debris and potential fish enemies will remain behind. Some of the major enemies are the larval form of insects such as the water tiger (*Dytiscus*), dragon fly (*Odonata*) and damsel fly (*Ischnuga*), all of which can be dangerous additions to the aquarium. If the daphnia are too large to pass through a fine mesh screen, a larger mesh is of little help as the things you want to screen out merely pass through with the daphnia. This is where care during collecting saves time since, if you can't screen out the debris, duckweed and insect larva, they must be picked out by hand. After separating, pour the daphnia into the collecting net and transfer them to clean water. This water should be free of chlorine and similar in temperature and type to the water in which they were collected. Make a final inspection before transferring small portions of daphnia to the aquarium.

For many, the search for daphnia is exciting and rewarding. For others, such an excursion is impossible or improbable. Nevertheless, your fish need not be denied such a fine addition to their diet. The search for daphnia can always take you to your favorite tropical fish store. There you can purchase daphnia—frozen, dried, freeze-dried or incorporated with other ingredients in flake or meal form.

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FRYER: continued from page 44

for different habits demand either a minimum or a maximum size. Predators must achieve a certain minimum size before they can deal with their prey, yet such a size would prohibit another species from frequenting crevices among rocks. Not only do these lakes harbour the richest cichlid faunas but they can also claim the largest species, for the piscivorous *Boulengerochromis microlepis* of Lake Tanganyika is the world's largest cichlid and attains a length of 80 cm (31 inches) and a weight of more than 1·5 Kg (3·5 lbs.).

In color there is tremendous diversity. Most striking perhaps are some of the rock-frequenting species of Lake Nyasa which include fishes which are completely sky blue, have blue and black vertical bars, gold and black horizontal stripes, or other almost equally bright and attractive colors. As is the case in most cichlids these colors are usually, but not always, intensified, or developed only, during phases of reproduction.

Although the range in body form is perhaps not great, the same is most emphatically not true of the structure of the mouth and its dentition of which these fishes exhibit a fantastic diversity of types which are, of course, related to food collection. Food is a prime necessity of life and when we consider the ways in which it is obtained we are concerning ourself with one of the most important activities of an animal. What is more it seems that one of the keys to the remarkable success of the cich-

lids in African lakes, and one of the reasons why so many species have been able to evolve in a single lake, has been their ability to develop apparatus for the collection of a wide variety of foods. This is by no means the whole answer, however, and indeed when we begin to unravel some of the problems related to feeding habits we see that although we can answer some questions we raise others. But this is going too fast, and first it is necessary briefly to look at the range of feeding habits. Fish-eaters we have already mentioned. These are extremely numerous and exhibit the sort of mouth structure that one would expect—a wide gape so as to be able to engulf large lumps of food—more often than not other cichlids—and sharp backwardly-directed teeth. They also have in the throat an opposed set of tooth-covered pharyngeal bones, whose structure well repays examination in any cichlid fish, and which in this case are armed with sharp teeth which actively rasp the flesh of the prey as well as serving to force it backwards into the gullet.

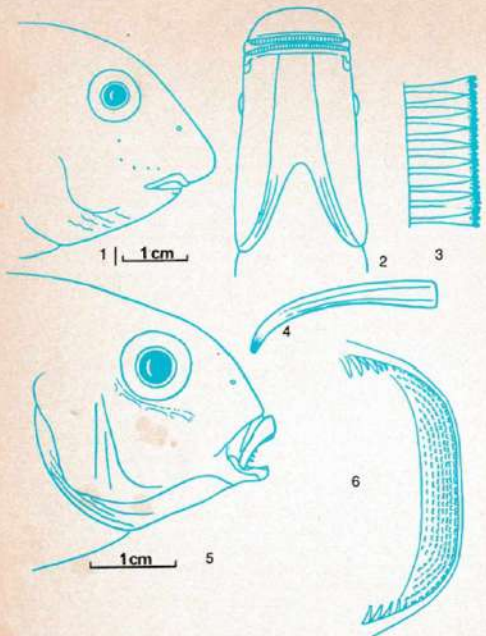
Species with very different feeding habits also use both the teeth on the jaws and those on their pharyngeal bones for dealing with their food. For example there are several mollusc-eating species of which most pick up snails or small mussels with their jaws and pass them back to the pharyngeal bones which here are massive, are armed with a few flat-crowned teeth, and serve like a pair of nutcrackers which smash the shell of the prey to expose its succulent contents. In Lake Victoria, however, there are snail-eaters which have solved the problem of dealing with their hard-shelled prey in another way and have acquired the ability to lever out the soft parts from the normally protective shell.

Other species feed on minute crustaceans drifting in open water. Such plankton feeders, of which a considerable number belonging to the genus *Haplochromis* exist in Lake Nyasa, have protrusible mouths which they shoot out to form a sucking tube up which individual food items, apparently detected by sight, are drawn into the mouth. From here they are prevented from escaping by a set of sieves, the so called gill-rakers. Others, such as certain species of *Lethrinops*, dig for insects and other small invertebrates on sandy shores and separate these from the sand in an ingenious way. The edible morsels are taken into the mouth along with a quantity of sand and separation of the two is necessary if too much sand is not to be swallowed. This is achieved by the use of gill-rakers akin to, but much more robust than those of the plankton feeders. The fish violently expels the water from its mouth between the gill-rakers, allowing the sand-grains to pass as a dense cloud at each side of the head and retaining the food items. If different species have sieves of a different mesh they can collect their food in the same place yet select different items, and this they do on sandy shores in Lake Nyasa.

Perhaps the most elegant devices for food collection, however, are seen in species which frequent rocky shores in Lakes Nyasa and Tanganyika. Here the fishes are confronted with an apparently inhospitable expanse of barren rocks among which no rooted plants grow. In a temperate lake one might expect to find but few fishes in such a situation, but in these tropical rift-valley lakes cichlids abound and in the main use as food either the algae which from a slimy mat on the rock surfaces or the small invertebrates which live among the algae. Of the latter *Labidochromis vellicans* (figs. 12–13) is an example. This little fish has long forceps-like teeth by means of which it can pick up even minute animals from the surface of rocks. Of the species which feed on the algae itself there is a great variety, and although they all use essentially the same source of food they collect it in different ways. This sharing is an unusual state of affairs in nature where the exploitation of a particular resource tends to be the prerogative of one and not a group of species—but this is a separate problem. Three examples of algal grazers are shown in figs. 1–9. Of these *Labeotropheus fuelleborni* (figs. 1–4) as it were chisels its food from the rocks, *Pseudotropheus tropheops* (figs. 5–6) files it off, and *Petrotilapia tridentiger* (figs. 7–9) combs if off with its fantastically long, spoon-tipped teeth.

From scraping algae to scraping the scales from other fishes is perhaps not a big step and it may be that one of the most curious of habits arose in this way, for *Genyochromis mento* (figs. 10–11) subsists largely on the scales which it rasps from the body of a sluggish bottom-living cyprinid of the genus *Labeo*. The postulated sequence, algal scraper to scale snatcher, may well be valid in this case, but this is not the only case of scale eating in the great lakes and indeed each of the three major lakes has at least one scale-eater—and in Nyasa there are several species! Not all these can plausibly be explained as descendants of rock frequenting algal browsers. Most remarkable of all these fishes are the two species of *Corematodus* of Lake Nyasa which not only eat scales but mimic the fishes whose scales they remove! *C. shiranus* serves as an example. This species lives among shoals of *Tilapia* and has the same coloration as its provider of food so that its presence can go undetected in a shoal. Its habit is well known to the indigenous fishermen who refer to it by a name which means the "boss" of the shoal.

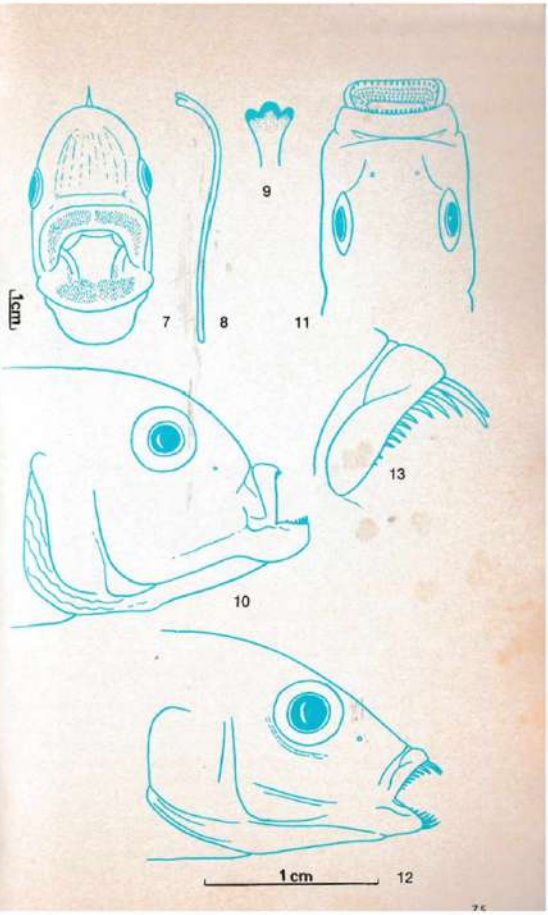
This is only one example of the great knowledge which the fishermen have of these fishes, and few aquarists, with the facilities which are at their disposal, can excel them as observers. A striking instance of this has just come to light. When the writer was working on Lake Nyasa he was told by the fishermen that *Haplochromis compressiceps*, a species which lurks in weed beds, bites out the eyes of other fishes. This I never witnessed, but very recently this species has been obtained and kept in aquaria in Germany and there it has vindicated the claims of the fishermen by indulging in the gory behavior which they claimed it to practice. Obviously *H. compressiceps* is not a desirable species for the

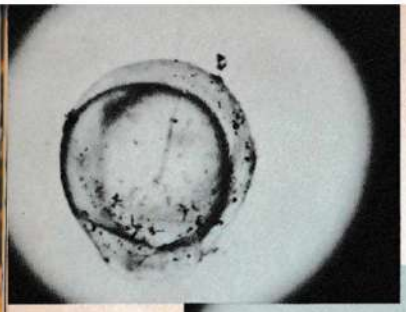


1. Head of *Labeotropheus fuelleborni* from the side. 2. The mouth from below. 3. Part of the row of teeth which lines each jaw. 4. A single tooth from the side. 5. Head of *Pseudotropheus tropheops* from the side. 6. The file-like teeth of the upper jaw. 7. Head of *Petrotilapia tridentiger* from the front. 8. Single tooth seen from the side. 9. The tip of a tooth. 10. Head of *Genyochromis mento* from the side. 11. From above. 12. Head of *Labidochromis vellicans* from the side. 13. Details of the teeth of the upper jaw.

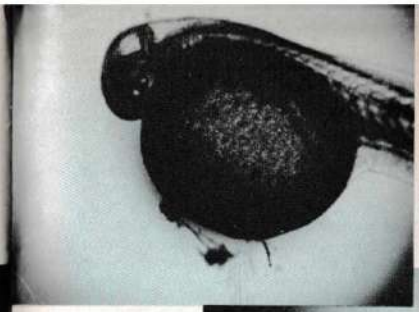
community tank.

It was the intention when this article was begun, to deal with other aspects of the behavior of these fishes some of which are at least as striking as these discussed here, but even these few remarks on feeding and related matters have used the available space. From this point alone they are outstanding and indeed demand a whole book to themselves. ●

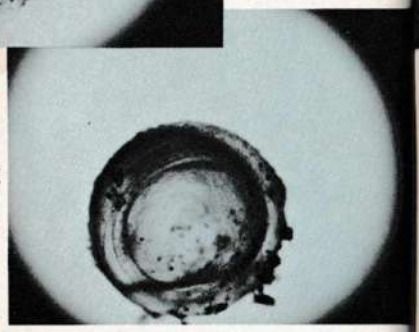




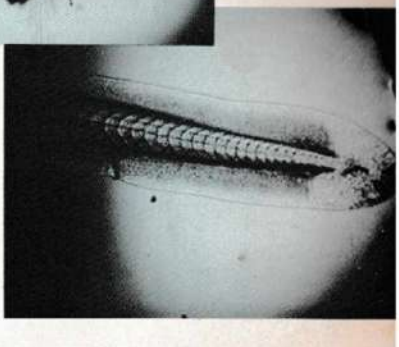
Egg of ***Spilopleura nattereri*** *one hour before hatching.*



Five hours after hatching, the yolk sac of ***Spilopleura nattereri*** *is abundantly obvious. Note that the fry do not look much different from those of other characins.*



Egg of ***Spilopleura*** *12 seconds before hatching.*



The tail-section of a 5-hour old fry, showing details of the vertebrae and fin attachment.

LEPPERT: ***continued from page 5***

On December 11th, the fish that appeared to be the male was swimming in circles, fanning with his pectoral fins in the very same place the pair had been observed the preceding day. The female, on the other hand, was busy keeping all other fish from the nesting place. This went on all day and about 2:00 o'clock in the afternoon, I siphoned some of the gravel from the nest, bringing up about 100 eggs in the process. These were immediately placed into three tanks as follows. The first tank was at 80°F, with gravel, but no airstone. The second was at 78°F, supplied with an airstone, with methylene blue added to the water. Lighting was normal for this second tank. The third tank was at 72°F, also with methylene blue and an airstone. This tank, however, was placed in a semi-dark location. All three tanks were provided with box filters. In addition to these egg distributions, one egg each was placed into nine 1-quart jars containing water from the breeding tank. These also were situated in a semi-dark location.

At about 3 PM that same afternoon, the male returned to the nesting site and resumed his fanning. It should be noted that the breeding tank was furnished with white gravel, driftwood, rocks, and rooted and floating plants. The water temperature at the time of spawning was 76°F.

On December 12th, at 7:30 AM, all three of the hatching tanks were examined. About two-thirds of the eggs had hatched, the remainder being fungused. The latter most likely was a result of the damage suffered when they were siphoned from the breeding tank. At 11:00 AM I siphoned about 5 gallons more water, some gravel with it, from the breeding tank. This contained from 300 to 400 eggs, many already hatched (actually fry then at this point), others just on the verge of hatching. These were put into a 20-gallon tank containing an airstone. Even after this, the parents continued to guard the nest.

December 13th and 14th were my off days at the Zoo and during this time, a staff member required a box filter. Unfortunately, he took

the one serving the first tank containing fry. When I arrived at work, I also found that, for some reason, the air had been turned off to the second and third fry tanks. There was no sign of either eggs or fry in the 20-gallon tank and closer inspection showed the presence of numerous microscopic organisms which had apparently eaten the fry. I went to the breeding tank and found that the parents were no longer guarding their nest. Using the siphon once again, I attempted to obtain more eggs but to no avail. All I found were more of the microscopic organisms.

My last hope now was the jars. I had originally placed a single egg in these jars as I hoped to raise perfect specimens for photographic purposes. From the time they are free-swimming, my experience has been that piranhas are fin-nippers. I was in luck! All nine fry were alive! By December 18th, their yoke sacs were almost gone, and by the 19th, they were free-swimming and taking live brine shrimp.

The red piranhas spawned again on December 28th and two days later, I removed the eggs by siphoning. These were placed in a bare tank with water from the breeding tank (at 75°F), located in semi-darkness. An airstone was also provided. By January 5th, there were about 500 healthy fry, all free-swimming and eating brine shrimp.

By January 16th, the first spawn (of December 10th) had started to take shape. Blunt heads could be seen on the fry, and a black spot at the bases of the tails. At this stage, they were about $\frac{3}{16}$-inch in length. Nine months later (September), they were 4 inches in total length (I managed to save six of the nine) and in perfect condition. The parent fish (which included an extra female) have been spawning every two to three weeks. Not all of the fry were saved, of course (due to limited space), but about every fourth spawn was kept. Some were actually used as fishfood for other fish; the remainder were sent to a local wholesaler in fishes.●

EDITOR'S NOTE: I have seen the parent fish in question and the spawning tank (as well as fry, eggs, etc.). It would appear that two factors are somewhat different here than would be expected in the average home aquarium, viz., circulating water, and an extremely large tank. These tanks were originally built to accommodate native fishes; thus the circulating feature. Of course, the fish are well-fed and cared for at the Zoo, and attain a respectable size, the parent piranhas included. We have records now of piranhas spawning in plants near the top of the aquarium (e.g., *Serralsalmus spilopleura*), and those spawning in the gravel (it is interesting to note that *Serralsalmus spilopleura* were spawned in the very same tank at the Cincinnati Zoo and, at the same time, as were the *nattereir* described in this article). Another significant fact is that high temperatures were not a requirement of spawning. I have found similar temperatures prevailing in the larger streams in the Amazon basin that contain piranhas. AJK