9 / 1965 • 50 CENTS

aquarium journal

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Volume XXXVI
Number 9
September 1965

aquarium journal

The Magazine Aquarists Believe In

Published by the
San Francisco Aquarium
Society, Inc.

ublished monthly by San Francisco quarium Society, Inc., Steinhart Aqua-um, Golden Gate Park, San Francisco 3, California. Telephone BAyview -0054. **Subscription rates:** $5.00 yearly U.S., Canada, and Latin America, sewhere $5.50.

ntered as second-class matter February 1, 1948, at the post office at San rancisco, California, under the Act of larch 3, 1879.

contents

cover photograph

The red-breasted Piranha, Serrasalmo natteri, *as photographed by aquarist-author-photographer Braz Walker, of Waco, Texas.*

Abundant future ahead for Journal —
to be edited by distinguished staff

Society Names Publisher

DR. HERBERT R. AXELROD and T.F.H. interests have been named publisher of the *Aquarium Journal*, effective with the January 1966 issue, according to Frank Tufo, President and Chairman of the Publications Committee of the San Francisco Aquarium Society, Inc., publishers of the magazine for the past 36 years. The decision was made by the S.F.A.S. Board of Directors at their September meeting, Mr. Tufo said.

The final three issues (October, November and December) in 1965 will remain essentially the same editorial format as the present *Journal*. However, these three issues will be printed for the Society by T.F.H. in New Jersey. Dr. Axelrod will act as Editor-in-Chief. Dr. Martin R. Brittan, Professor of biology at Sacramento State College, will be an Associate Editor. James W. Crawford will remain as Executive Editor through the December 1965 issue.

As of this issue, Dr. Stanley Weitzman, Associate Curator of Fishes United States National Museum, is retiring from the editorial staff of the *Journal*.

Beginning with the January 1966 issue, the magazine will acquire a new title and new appearance. The name will be enlarged to *Ichthyologica/Aquarium Journal*. It will be staffed by one of the most distinguished group of editors, writers and aquarists ever assembled on an aquarium publication, including Dr. Brittan as Editor, assisted by Co-Editors

James W. Crawford
Executive Editor

Dr. George Myers, former Managing Editor of the *Journal* from 1952 to 1954 and Professor of Biology and Curator of Zoological Collections, Stanford University; Dr. Jacques Gery, Director of Laboratoire Arago, University of Paris, and others of similar stature to be announced later.

Dr. Axelrod commented that T.F.H. "will continue to maintain the high quality of editorial standards" of the *Journal*. "We plan to publish the more sophisticated editorial material in the new format, using color photography both inside the magazine and on the cover," he said.

Exciting plans for *Ichthyologica/Aquarium Journal* will be published in the next three issues of the magazine. Beginning in January, 1966, editorial headquarters of *Ichthyologica/Aquarium Journal* will be situated at the office of the Editor, Dr. Martin Brittan, Sacramento State College, Sacramento, Calif. Circulation and advertising offices will be located at T.F.H. Publications, Inc., 245 Cornelison Ave., Jersey City, N. J.

Until January 1, 1966, editorial, circulation and advertising offices of the *Journal* will remain at the California Academy of Sciences, Golden Gate Park, San Francisco. ◄

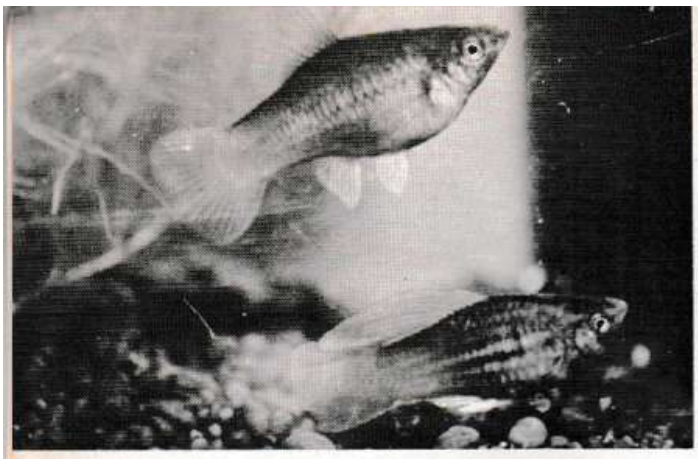


Photo: A pair of hi-fin moon fish as developed by the author. Photo by Glenn Takeshita.

Since 1960 the author has been trying to develop high fins on this species!

Hi-fin Moon Fish

Glenn Takeshita
Honolulu, Hawaii

SINCE 1960, when the Simpson high-fin swords first made their appearance in the tropical fish hobby, I, like many others, had the great desire to transmit this high-fin character to the numerous color varieties of the moon fish, *Xiphophorus maculatus*, by the process of hybridization. But it was only about twelve months ago with the introduction of the high-fin *X. variatus* into Hawaii, that I was able to do this successfully.

For almost two years, many attempts to transmit the high-fin character to the moon fish via the high-fin swordtail proved fruitless. At first, I was quite positive that it was the size of the high-fin male swordtails that was the barrier. But later I found out that this was not so because success was not achieved even after using very tiny high-fin sword males which were in every way compatible to

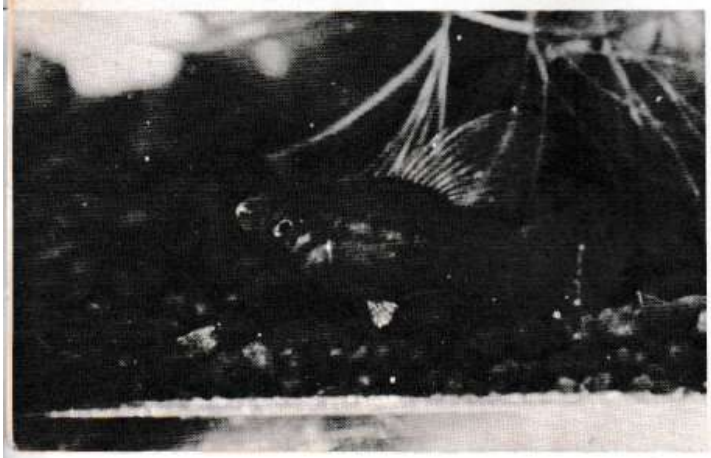


Photo: A male specimen of the hi-fin moon fish, as photographed by the author.

the female moon fishes. I also tried the alternate method of breeding the high-fin female swordtail with the common low top male moon fish, but this too did not prove fruitful.

For some unknown reason, it seems that the high-fin *variatus* are more capable of crossing with the moon fish than the high-fin swordtails. The high-fin moons that I have on hand now are still far from being an ideal "fixed" strain but some specimens look very promising. Some males and females of the first generation cross between the high-fin *variatus* and the moon fish still resemble the *variatus* parent more closely than the moon, but backcrossing to the moon parent should in time remedy this situation.

The present first generation stock are very poorly colored with only a few individuals showing an orange body color plus the very round disc-like body shape. But I feel that these high-fin moons will eventually have a great impact on the tropical fish hobby, because they possess great possibilities in respect to color variability coupled with the wonderful high-fin attribute.

Here in Hawaii, many different color varieties of the high-fin moon are now in the process of development. I know of at least three other people that have first generation hybrids with the high-fin character. We are all working independently; each of us striving to create something new, beautiful and unique to give to the tropical fish hobby. ◄

CLUB NEWS

T. I. F. A. S.

The International Federation of Aquarium Societies held their 10th Annual Convention at Cleveland, Ohio recently and William I. Lawrence was re-elected to a 2-year term as Chairman of the Membership Committee.

Photo: A female of the hi-fin moon fish, photographed by Glenn Takeshita.

Here is a freshwater rival to the discus as "king of the aquarium"!

Ocellated Featherback

Braz Walker
Waco, Texas

ALTHOUGH the discus is a sort of undisputed king of the aquarium, it is beginning to suffer a fate somewhat similar to its predecessor to the throne, the angelfish. Discus are uncommon enough and still command a high price and therefore retain their royal position, yet they have lost some of their magic and to many who would possess them they are more of a status symbol than a heart's desire. This is unfortunate for there are still few sights in the aquarium possessing the grace, beauty and majesty of a large pair of discus in full color.

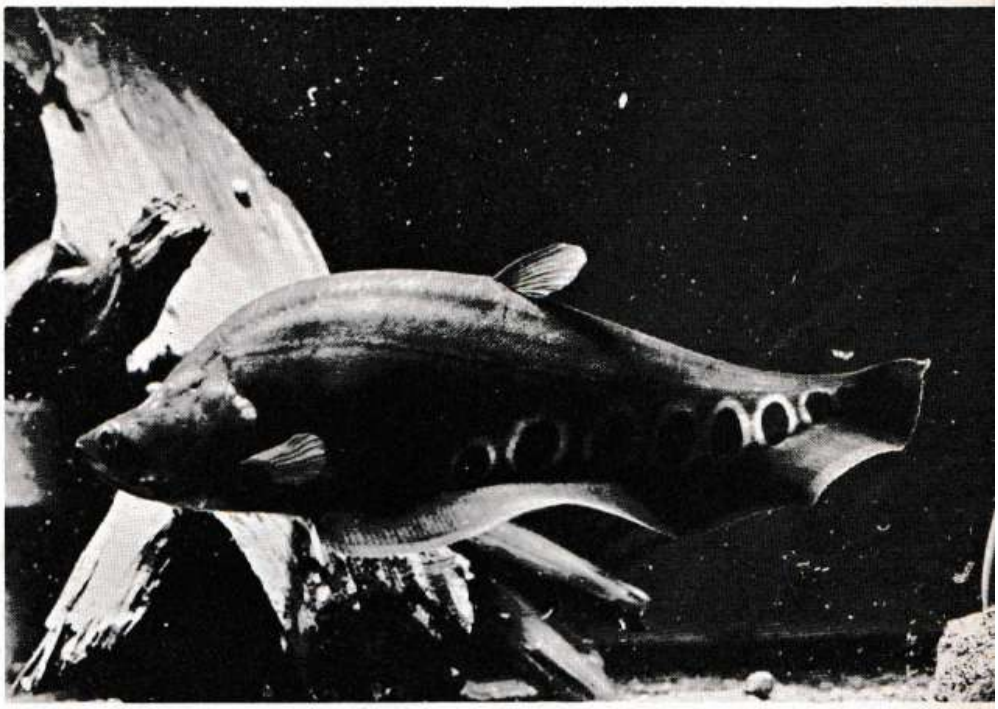
The ocellated featherback, *Notopterus chitala,* after it has attained its adult coloration is perhaps one of the most breathtaking of the fresh water fishes and as a show fish rivals the discus. The featherback too, has majesty in a retiring sort of way and has coloration and physical form entirely different but equally unusual and beautiful as that of the discus. The adult coloration (over four inches) consists of a body ranging in tone from brownish to golden copper and just above the anal fin is a row of ocelli which would make a peacock jealous. The long rippling anal fin is continuous with the caudal and is the propulsive system of the fish. Just as in the gymnotid eels, members of the family Notopteridae are capable of swimming almost equally well either backward or forward, but lacking the "radar" system of the gymnotids they seem to prefer moving in a forward direction.

This is an unusual fish in many respects, not the least of which is the difference in coloration between young and adults or even between adults depending upon the locale from which they were taken. Concerning those from Thailand, when the youngsters are about an inch long they develop a series of dark vertical bands and about the time their size has doubled, a dark spot appears at the base of each band and just above the anal fin. As the fish takes on size the spot grows darker and the bands grow lighter until they completely disappear, while around each spot develops a silver ring.

Another unusual characteristic of the adult featherback is the gibbous nape or characteristic hump which begins just back of the head of the fish. This sort of thing is also found in some species of South American characids *(Roeboides* and *Charax).* Young fish do not possess this characteristic but as the fish attains greater size and age the hump increases in prominence. This plus the presence of the dorsal fin are the major differences between the genus *Notopterus* and their near cousin *Xenomystus.*

His ability to utilize atmospheric air will allow the chitala to adjust his requirements to any aquarium of reasonable size, but if given plenty of room this is a large fish which in nature may reach a length of over three feet. In captivity this is unlikely unless you keep your fishes in a swimming pool.

Although their spawning is quite interesting, because of their size, hope of success in captivity is extremely limited. This is unfortunate since in nature the male fish protects the eggs with the same enthusiasm as a mother grizzly bear protects her cubs, even to the point of viciously attacking human intruders. Because of their importance as a food fish, the Siamese government has provided posts for them in areas where their



spawning is known to take place. These posts are used as spawning sites since they simulate the stumps upon which the fish ordinarily spawn. The eggs may reach 10,000 in number, however in the female only one ovary develops at a given time. She does not participate in the care of the eggs.

Although his natural food consists mostly of small fishes including the famous archer fish, *Toxotes jaculator*, plus insects and aquatic crustaceans, in the aquarium *Notopterus chitala* will accept a diet of beef heart or frozen brine shrimp. Unfortunately the latter will not only soon become too expensive in satisfying quantities but will also be too small in size. His eyesight is rather poor in the daytime but the featherback will quickly adjust his feeding schedule to yours and although you may be ignored at other times, at dinner time you will be greeted with a wagging tail which is good enough for most puppies. Small fishes are also appreciated but will usually disappear overnight since his eyesight will be better and his activity increased.

Aside from his beauty of form, color and movement, there is a dignity about

Photo: The ocellated featherback as photographed by Braz Walker.

this fish which is accented by his slow but always deliberate actions. Perhaps it is best expressed by his Siamese name *PLA KRAI* which means "fish which moves slowly but naturally." Frankly this is one of the few fishes in which a solitary individual or a pair can satisfactorily fill a 50-gallon aquarium permanently. ◄

An exhaustive study of Amazon waters where the expedition collected fishes

Water Analyses from the Peruvian Amazon

Part IX

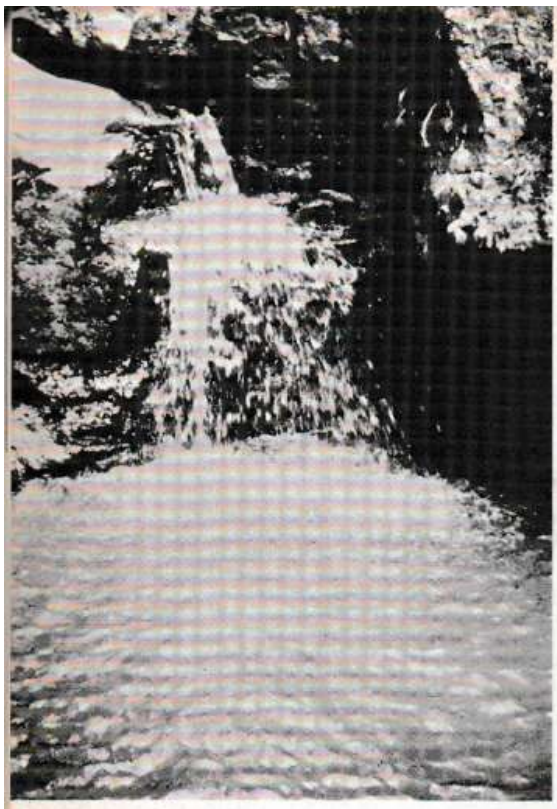
Albert J. Klee
West Chester, Ohio

Introduction

The effects of different substances upon fish life vary with species, size, age and physiological condition of the individuals. It has long been known by aquarists that water favorable for some species may not necessarily be adequate for others that have been adapted to somewhat different conditions. Further, the question of aquarium water quality is complicated by the fact that the effects of deleterious substances upon fish vary with the physical and chemical composition of the water. For example, in soft water the damaging effects of poisons are generally greater than in hard water. Decreased oxygen concentrations and increased temperatures tend to increase the susceptibility of fish to toxicants. Interrelationships between the dissolved constituents of water are also important. By synergistic action, the combined influence of several substances simultaneously may result in greater damage to fish life than the sum of the individual effects taken independently. On the other hand, certain combinations of salts act antagonistically to reduce the injurious effects of each. We need not, however, speak of water quality in such drastic terms as "toxicity" or "lethality." Our fish might be quite healthy in a given water, the problem being rather that of breeding. At times aquarists have overemphasized water quality in the aquarium and at other times, underemphasized it. There is insufficient space here to discuss these pros and cons, the author's objective being merely a report on the water conditions found during his recent expedition to central Peru. This represents data, from which the reader may draw his own conclusions.

Equipment

Through the courtesy of the LaMotte Chemical Products Company, I was provided with a special water test outfit that contained all of the required standards,



reagents, glassware and equipment for the following chemical determinations on natural waters:

pH value	*iron*
total hardness	*copper*
total alkalinity	*color*
chlorides	*turbidity*
dissolved oxygen	

The pH equipment was of the highest quality featuring an octet comparator and a bi-color reader. Briefly, an indicator solution was added to the water sample, the two then being mixed. The octet comparator is a plastic comparator that contains eight hermetically-sealed color standards mounted adjacent to the viewing windows. If the water sample is turbid or cloudy, it is necessary to compensate for the effect of this color or turbidity. This is done by means of a three test tube reading procedure using the bi-color reader. This exacting system permits readings to an accuracy of 0.1 of a pH unit.

Photo: A sample of some of the waters tested by the author. This was used primarily for swimming!

Total hardness was measured by an approximate titration procedure as was alkalinity and chloride. The iron test was colormetric in nature, with hermetically sealed comparator standards. The copper test used was qualitative only. Color was measured by means of an optical comparator, supplied with standards representing A.P.H.A. cobalt-platinum color values of 10 and 20. Turbidity was also by comparison. The dissolved oxygen was measured by a precise titrametric procedure, a modified version of the Winkler test. This involved solutions of manganese sulfate, alkaline potassium iodide, concentrated sulfuric acid, starch solution and sodium thiosulfate. All of this equipment was neatly protected by styrofoam and enclosed in a mahogany box.

With the exception of alkalinity, all of these tests are either already well known to aquarists or else self-explanatory. Alkalinity is not a specific polluting substance but rather represents a combined effect of several substances and conditions. It is a measure of the power of a solution to neutralize hydrogen ions and is caused by the presence of carbonates, bicarbonates, hydroxides, and to a lesser extent, by borates, silicates, phosphates and organic substances. The significance of alkalinity, as well as all of the other measurements previously mentioned, will be discussed after each water analysis. Finally, after my return, I measured the conductivity of various water samples using a Chrystalab Ionimeter.

Habitat Number One

This water sample was obtained on the outskirts of Tournavista, Peru, behind the Krause compound situated there.

Analysis

Date:	*August 20, 1964*
Time:	*8:52 a.m.*
Bottom:	*Mostly gravel, some mud*
Appearance:	*Clear to slightly*

	amber, under 10 A.P.H.A.
Water temperature:	*73°F*
pH:	*7.2*
Hardness:	*34 ppm*
Alkalinity:	*45 ppm*
Chloride:	*trace*
Iron:	*trace*
Copper:	*none*
Oxygen:	*7.1 ppm*
Conductivity:	*240 micromhos*

This stream, flowing moderately over a gravel bottom, contained *Rivulus peruanus, Astyanax bimaculatus, Hypostomus plecostomus* and an *Ancistrus* species. What may we conclude from this water analysis? The answer is simply that it really contains no surprises. This is clear, clean, cool, moving water containing little or no vegetation. It is very soft, well-oxygenated, and contains little in the way of dissolved materials. It is common in the hobby to recommend, generally speaking, that water favorable for a good mixed aquarium fish fauna (excluding common aquarium livebearers) falls within the following limits:

1. *Temperature 70-76°F*
2. *pH approximately 6.7 to 7.7*
3. *Hardness 25 to 125 ppm*
4. *Chloride less than 50 ppm*
5. *Dissolved oxygen not less than 5 ppm*
6. *Conductivity 150 to 500 micromhos*

This habitat, then, satisfies these guidelines. That the guidelines do not properly reflect the true state of nature, however, will be shown shortly.

Habitat Number Two

These water samples were obtained from a pool situated alongside of a logging road connecting the Pachitea river and Tournavista. The second analysis was taken five days later, after a short but heavy rain raised the level of the pool and flooded the road to a depth of ten inches.

	Analysis I	***Analysis II***
Date:	*August 20, 1964*	*August 25, 1964*
Time:	*9:00 a.m.*	*9:00 a.m.*
Bottom:	*Mud and plant*	*Mud and plant*

Photo: This is a typical habitat for **Rivulus peruanus** in the Amazon jungle. All photos by Mr. Klee.

	debris	*debris*
Appearance:	*Clear, slightly yellow*	*Clear but very dark brown (like tea)*
Temperature:	*76°F**	*77°F*
pH:	*6.8*	*6.5*
Hardness:	*51 ppm*	*51 ppm*
Alkalinity:	*90 ppm*	*50 ppm*
Chloride:	*trace*	*trace*
Iron:	*2.0 ppm*	*2.5 ppm*
Copper:	*none*	*none*
Oxygen:	*3.5 ppm*	*0.5 ppm*
Conductivity:		*525 micromhos*

*The sun had quickly warmed this relatively small pool (no larger than a bathtub) for forty-five minutes earlier this temperature was 75 degrees F.

The water in this pool flowed moderately fast but after the rain, its flow was swift indeed. Fishes caught here, both before and after the rain, included *Hoplosternum thoracatum, Erythrinus erythrinus, Hoplias malabaricus, Apistogramma borelli, Pyrrhulina melanostoma, Carnegiella strigata, Hyphessobrycon peruvianus* and *Pimelodella peruana.*

Prior to the rain, this habitat differed from Habitat No. 1 chiefly in its higher hardness, alkalinity and iron readings, and lower oxygen and pH readings. This is quite understandable since the high organic material content of this water would naturally decrease pH because of organic acids, increase hardness and iron because of the additional materials leached out of the soil (the soil in this area of Peru is reddish, containing much iron) and decrease dissolved oxygen because of the oxydizable organic material carried in the water. The alkalinity rose as a consequence of both increased bicarbonate and organic matter. We may characterize this habitat as one which is soft, acid, poorly oxygenated and with a significant iron content. The two most pertinent measurements are oxygen and iron. In North America, it has been reported that 3.5 ppm of oxygen will kill all kinds of fish although in winter, a few have been reported to tolerate 1.0 to 2.0 ppm for short periods. Also in North America, it has been found that 95% of waters supporting a good fish fauna have less than 0.7 ppm of iron.

Photos (opposite page) A typical river in South America, site of many of the water tests described. **(Right)** An Indian village at Tournavista —Photos by author.

Except for the hatchet fishes and tetras, which were found just at the surface of the water where oxygen was plentiful, the remainder of the fishes were in water generally considered unfit for fish with respect to dissolved oxygen. Granted, fishes such as *Hoplosternum*, *Hoplias*, *Erythrinus*, etc., are not great consumers of oxygen; nevertheless, we must review our ideas on oxygen requirements for fishes at least of these types. Contrary to what one might expect, the oxygen content *decreased* after the rain, decreasing in fact to an almost ridiculous level. I feared that my reagents had become contaminated but additional checks on Pachitea river water (which contains around 7 ppm oxygen) measured previously, showed this not to be the case. Furthermore, my oxygen analyses were reproducible to within 0.1 ppm (everything was run in duplicate except for this pool water which was run four times!). Although one might have expected the rain to oxygenate the water, the additional great quantities of oxydizable organic material (also indicated by the pH drop) absorbed almost all of the dissolved oxygen. Still, the fish survived, even at 0.5 ppm oxygen! Fewer surface characins were now caught but the bottom or middle strata fishes were still found, all in excellent condition. It was obvious that in addition to being low consumers of oxygen in the first place, these fishes were assisted in respiration by virtue of the swiftness of the current. There may not have been much oxygen in the water, but it was being replenished very fast. At the same time, waste products were being removed just as quickly. Some fish then, can successfully cope with low oxygen environments. This is probably why many fishes survive in overcrowded aquaria. Finally, one should remember that what holds for trout or bass need not necessarily hold for *Hoplosternum* or *Apistogramma*. The factor of acclimatization should also not be overlooked. It may be mentioned in passing that the rain caused dilution, decreasing the alkalinity due to decreased bicarbonate content of the water. The effect of the increase in organic material upon alkalinity is small in comparison to the bicarbonate effect. Thus, although opposing effects were present, the alkalinity decreased after the rain.

It is interesting to note that throughout tropical portions of Asia, Africa and South America, iron is often present in natural waters. This is a consequence of the easy leaching of the surrounding soil. Since many of our "problem fishes" come from such waters, this may have a bearing on the breeding of some fishes.

Habitat Number Three

This water sample was obtained from the Pachitea river in the vicinity of Tournavista.

Analysis

Date:	*August 1964*
Appearance:	*Slightly turbid, some silt present*
Temperature:	*79°F*
pH:	*7.7*
Hardness:	*102 ppm*
Alkalinity:	*95 ppm*
Chloride:	*45 ppm*
Iron:	*0.5 ppm*
Copper:	*none*
Oxygen:	*6.7 ppm*

Fishes caught or observed here included mostly very large specimens of *Chalcinus elongatus, Pimelodus pictus, Hemicetopsis candiru, Leporinus trifasciatus* and *Anostomus trimaculatus.* The water is more alkaline, harder and with more dissolved minerals than the smaller habitats already discussed. I could always identify river water from its chloride content alone. This river water was, as might be expected, well-oxygenated.

Habitat Number Four

This water sample was obtained from a swampy, muddy area alongside the road leading from Tournavista to Pucallpa, some 25 miles from the former.

Analysis

Date:	*August 1964*
Bottom:	*Mud*
Appearance:	*Very muddy*
Temperature:	*78°F*
pH:	*7.2*
Hardness:	*68 ppm*
Alkalinity:	*80 ppm*
Chloride:	*trace*
Iron:	*1.5 ppm*
Copper:	*none*
Oxygen:	*3.2 ppm*

Fishes found here included *Hoplias malabaricus, Prochilodus nigricans, Geophagus jurupari, Aequidens dorsigerus,* and *Hyphessobrycon peruvianus.* Vegetation consisted of flooded grasses. The flow was almost non-existent and there were a few water scorpions visible on the surface. A conductivity check showed the water sample to far exceed the range of my instrument (i.e., 600 micromhos). The muddiness (a good part organic in nature) of this water contributed to its high alkalinity and low oxygen content.

Habitat Number Five

This water sample was obtained from a tributary (of the Ucayali river) which forms over a third of the boundary of the town of Pucallpa.

Analysis

Date:	*August 1964*
Bottom:	*Mud*
Appearance:	*Muddy, greyish in color*
Temperature:	*86°F*
pH:	*6.8*
Hardness:	*51 ppm*
Alkalinity:	*65 ppm*
Chloride:	*trace*
Iron:	*4.0 ppm*
Copper:	*none*
Oxygen:	*4.2 ppm*
Conductivity:	*350 micromhos*

No vegetation was present. Fishes collected included *Brochis coeruleus, Hoplias malabaricus, Amblydoras hancocki, Gasteropelecus sternicla,Farlowella amazone, Loricaria ucavalensis, Apteronotus albifrons, Cichlasoma festivum, Geophagus jurupari, Otocinclus vestitus, Apistogrammoides pucallpaensis, Pseudostegophilus nemurus, Leporinus friderici, Trachycorystes coracoideus, Bunocephalus*

(Continued on Page 432)

FINNY FOLKS

By Diane Schofield

THERE IS more than one way to skin a pussy-cat . . . many clubs may have trouble with muttered minced oaths directed toward the judge when the smoke of battle drifts away from the scene of an aquarium show, but there is one club that doesn't need to worry about such carryings-on. The South Plains Aquarium Society of Lubbock, Texas, has this situation neatly in hand. For their judge at their Spring Show, they used a Border Patrolman from Sonora, Texas, Ray Shelton. What disgruntled entrant, pray tell, is going to have the temerity to tell a Border Patrolman to stick his head in a tank four times and pull it out only three?

This seems to be very smart figuring for such a young club. The South Plains Aquarium Society is only approximately two years old, although this is a date rather difficult to set exactly since originally (circa 1959) it was a free-flowing group who met at first in one member's home and then another. Now, however, with 20 families as members, they have switched over to a solid financial institution, the Security National Bank, for their meeting place. After all, one has to be near the money, now doesn't one? This is known as Smart Thinking.

While most clubs only have one show a year, needing the ensuing time to lick their wounds, staunch the flow of blood and apply a band-aid here and there, the South Plains group is back rarin' to go after only six months of recuperation. They hold their Spring Show in April and their Fall Show in October. This year it will be held at the Precinct No. 1 Club House at Slide Road and 50th Street, Lubbock, Texas from October 24 through October 26. At this show they hope to even up the 33 tanks that were entered in their Spring Show.

Recently I heard a good definition of a clique: "A clique is the group of people, who when asked to do something for their club, always say, 'Yes!'" It has always been thus . . . a war between those whose favorite word is "NO!" when asked to take on an office and the people on whom these negative souls bestow the label of "clique" because they are the only willing ones that care to bear the load of all. Bearing these salient facts of life firmly in mind, both Karen and Kenneth Wheeler must be the king and the queen of Cliquedom in the South Plain Aquarium Society because Kenneth is the president and Karen, the corresponding secretary. In addition, Karen is also the show secretary. These two Wheelers copped off not only the Best Cichlid and Best Betta trophies in their 1965 Spring Show, but the Sweepstakes as well. The rest of the members

of their Court of the Clique are Charles Tidwell, vice-president; Christine De Palma, secretary; and Dr. Bob Berry, parliamentarian.

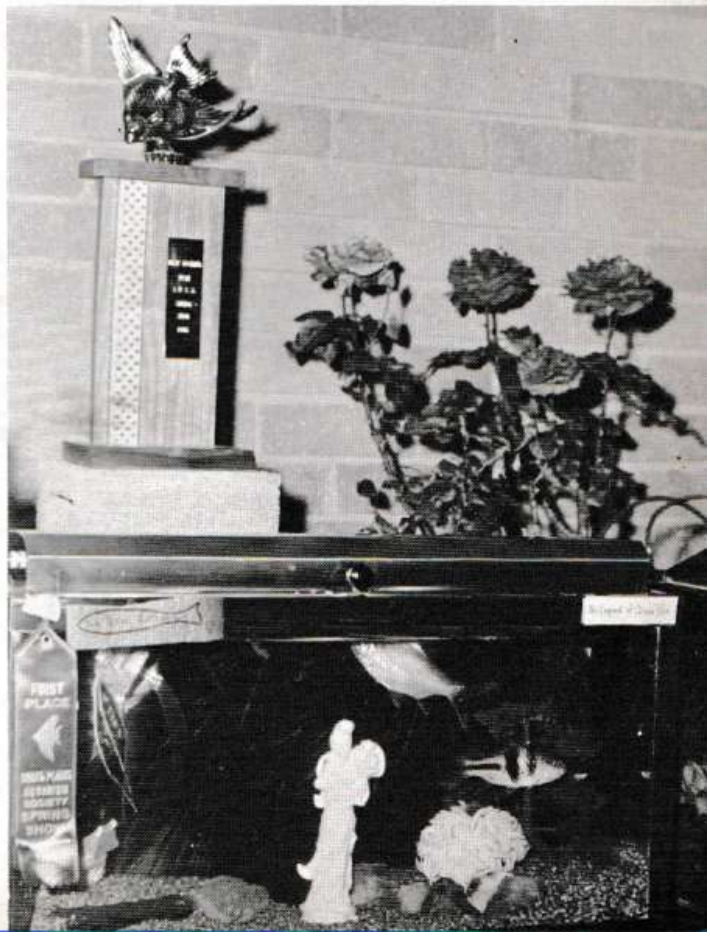
The Wheelers own almost enough tanks to hold their own show. Their 30 aquariums are composed of tanks from 5 to 30 gallons in size. And inside these little rectangular glass dwellings live "nearly all types of fish that we can get our hands on" according to Karen. They have spawned tiger barbs, pink Congo cichlids, black tetras, angels, some types of killies, bettas and they are currently having sport with the new hi-fin platy. All this is in addition to Kenneth's strain of multi-colored guppies.

And they are obviously only getting their second wind! Karen says, "We are always looking for anything new and different. We have just been trying to get rid of some of our other fish in order to get some rare bettas, but we have slowed down as we are planning to buy a new home. We plan to fix up the garage and have a special place so that the fish can have a room all to themselves this time and stop some of this 'fishing' in my kitchen."

Apparently a reporter from one of the local Lubbock papers had their number when he wrote, "The Wheelers all but *live* in an aquarium!"

° ° °

The Wheelers have a long wet road to swim before they cover as many years of "all but living in an aquarium" as another Texas citizen has. Mrs. Leona Bradley started back in 1931 with a pair of guppies that were brought from Ohio



Photos (opposite page) Karen and Kenneth Wheeler of the South Plains Aquarium Society shown holding the trophies they won in their spring show. **(Right)** The trophy winning best novelty tank, owned by the Anthonys. Photos by Christine DePalma.

under a woman's coat. These little amorous souls, doing what comes naturally, soon became 200 strong and in 1932, Mrs. Bradley had her first sale of fish. You see, for a number of years now, she has been operating Bradley's Aquarium out of her home.

This willing wet nurse of fish has a definite leaning toward the different as her words indicate, "My pleasure has been in new and unusual fish – something rare and different. At one time I had a ten-inch, red-breasted Piranha, 'Jimmy Boy,' a real pet. Recently there was an Arowana which grew from 5 to 25 inches in two years. He lived in a 35 inch tank but he could turn on a dime. I had to have two layers of oak boards on top to keep him inside." But it doesn't end with these stellar seldom-seen slitherers. Mrs. Bradley continues, "My tanks are also full of babies from livebearers and people often marvel because they can't do likewise. My theory is that generous feedings of dry foods, frozen shrimp and newly hatched shrimp, fed in that order, three times a day, plus *plenty* of live growing plants (not plastic) for refuge, will result in live babies that live and are not eaten." She works until 1 or 2 a.m. and sleeps until 9 a.m. As she says, "Working people have to retire early in order to start the day's work. But I'd never say 'quit.'"

These hours are not only spent in tending her fish-vending shop, but also frequently in getting out the bulletin of The Aquatic Researchers of San Antonio, "Aqua Focus." The exchange clubs will recognize this as being one of the most

Photos: (Left) Best exhibit tank, which also won a trophy for the Anthonys. **(Opposite page)** Thelma and Bob Anthony of South Plains Aquarium Society, holding their trophies won at the spring show. Photos by Christine DePalma.

prepossessing publications that go this route (Exchange address: 301 Blanco Rd., San Antonio 1, Texas). Mrs. Bradley is not a little responsible. To quote her directly, "I *get* the material, make proofs, cut stencils, mimeograph two hundred copies of twenty-one pages, assemble, address and mail over one hundred and fifty envelopes. The bulletin gets done whether I eat or sleep!" Care to take time out to shudder a little, other editors? You, who along with me, only do a *portion* of these chores for your club and still feel terribly put upon. What Mrs. Bradley is much too modest to state is from her own pocketbook comes a fair portion of the necessary money to put out "Aqua Focus."

Mrs. Bradley has worked her way through three aquarium societies starting with a record of being a charter member in the San Antonio Aquarium Society. Later on, together with a group of friends, she helped organize the Alamo Aquarium Society. This club started with 38 members and one of these was their president, editor and executive secretary of FOTAS (Federation of Texas Aquarium Societies), all of whose names happen to be Mrs. Leona V. Bradley. In 1955, when holding down all of these jobs she states, "We had one hundred registered for the convention with all eleven Texas societies represented — a record not equalled since." Some time later, yet another society was born — The Aquatic Researchers, which came to life with 35 charter members, and it is with this club that Mrs. Bradley is currently affiliated.

But then it is little trouble to do all of these things when you are young and were born in only 1890.

• • •

It is truly amazing what one often does up and beyond the call of duty for fish! And I am not making sport of a single person who does this because I take my place in the very front row ranks.

As any dedicated "fishophile" knows, whenever one is in a strange place, one is almost honor bound to seek out what kind of fish are kept there. And in an especially exotic spot, this need is almost overwhelming.

For the first time on a recent tour, I hit Manila. As soon as the door of my room of the Manila Hotel closed behind me, I was faced with a huge notice that proclaimed, "Don't forget to see the largest and best collection of aquariums in the Philippine Islands!" The spot in which these languished was apparently in the bar of a nearby hotel . . . a spot in which the Manila obviously owned an interest or else they would not be so wholeheartedly shooing their guests in that direction. ◄

Klee

(Continued from Page 426)

bicolor, and *Hoplosternum thoracatum.*

The quantity and diversity of the fishes were remarkable. This water was decidedly warm, low in oxygen, and relatively high in iron and other dissolved materials.

Habitat Number Six

This water sample was obtained from the Ucayali river, near the dock area of Pucallpa.

Analysis

Date:	*August 1964*
Bottom:	*Mud*
Appearance:	*Muddy*
Temperature:	*84°F*
pH:	*7.6*
Hardness:	*102 ppm*
Alkalinity:	*90 ppm*
Chloride:	*30 ppm*
Iron:	*1.5 ppm*
Copper:	*none*
Oxygen:	*6.3 ppm*

No vegetation was present and fishes captured included *Sorubim lima, Colomesus psittacus, Aphyocharax alburnus, Pimelodella peruana, Anodus latior, Hemicetopsis candiru, Pseudostegophilus nemurus, Vandellia plazai, Otocinclus macrospilus,* and *Hypostomus emarginatus.*

In short, this river differed from its tributary in that it contained (with the exception of iron) more dissolved materials, a greater oxygen concentration and was more alkaline.

Discussion

The rivers investigated generally differed from the surrounding ancillary waters in the following ways:

	Rivers	***Ancillary Waters***
pH	*higher*	*lower*
iron	*lower*	*higher*
hardness	*higher*	*lower*
alkalinity	*higher*	*lower*
chloride	*higher*	*lower*

oxygen	*higher*	*lower*

The "higher" figures for the rivers mostly reflect the increased amounts of dissolved materials carried in them. The higher oxygen content is due to the swiftness of the main river currents, which are powerful indeed! Iron, on the other hand, is lower for the rivers since there is less leaching likely to occur.

The most significant observations about all of the water analyses may be summarized briefly as follows:

1. *No real extremes of pH were encountered.*
2. *A wide range of temperatures (73 to 86° F!) was observed.*
3. *Iron content was significant, especially in the smaller bodies of water.*
4. *In general, in comparison with North American waters, all waters were soft and low in dissolved minerals.*
5. *In a number of habitats, the dissolved oxygen content was extremely low.*
6. *The most productive fish waters were extremely muddy.*
7. *Very little aquatic vegetation was found.*

The implications of these findings are fairly obvious. For one thing, it may be that the ability of a fish to adapt to aquarium conditions merely reflects the wide range in water quality of its natural habitat. Our fishes then, survive in spite of us! If one were to ask me how to duplicate the natural habitat of a fish, I would be severely tempted to answer, "Take a 10-gallon aquarium, fill it two-thirds with water, add a bucket of mud, stir, and then introduce your fish." It may not win any aquarium beautiful contests, but it is "natural" and typical! As for the lack of aquatic vegetation, the explanation is simple. Either the water was too muddy, or too shaded by terrestrial jungle plants to admit light needed for plant growth. The real locations for aquatic plants are in the swamps and marshes, not in rivers, pools or streams.

One must be careful, of course, not to take this one report as representing every-

thing there is to the water conditions of South America. There are places in which fish live on that continent, with waters of pH ranging down to 5.0! River waters are not always muddy. Some are clear, others are blackish.

For my own part, I will remember better perhaps some of the smaller, more poignant things about these waters such as my friend Dick Stone baiting a hook with *Rivulus peruanus* to catch pimelodids in the Pachitea, or the time the Rio Pachitea literally *boiled* with fish seeking to escape some unseen (to us) enemy, or the way the size of the parasitic catfishes matched the size of the fishes with whom they were caught (big pygidiids were caught with the big *Doras* species, little pygidiids were caught with the much smaller *Brochis*). It is best summed up by the following (Alexander Pope's "Essay on Man"):

"All nature is but art, unknown to thee;
All chance, direction, which thou canst not see . . ."

ACKNOWLEDGMENTS

The author would like to thank the La-Motte Chemical Products Company and Mr. William Kenny of their staff, for supplying the very accurate and sturdy equipment used during my expedition, and for their invaluable assistance on matters involving water analyses in general. ◄

Comparative tests run on hatchability of San Francisco vs. Utah brine shrimp eggs

Utah Brine Shrimp

Jerry Currier, and Marty Smith

San Francisco, California

AS MOST OF US know by now, San Francisco brine shrimp eggs are not always available in abundant supply. For this reason most hobbyists who have been dependent on the San Francisco product are occasionally faced with the problem of changing to eggs from another source. All of us involved with tropical fishes realize that serious problems can arise when departing a tested and proven routine. It can be a hair raising comedy at best and an expensive mistake at worst. This is true whether we keep a few fish for enjoyment or raise and sell thousands of fish for a profit. The Brine Shrimp Sales Company is going to fill the gap left by the occasional absence of San Francisco brine shrimp eggs with eggs from Great Salt Lake in Utah. When our dealer (Flora Scott of B & H tropicals, San Francisco) told us of the impending shortage of San Francisco shrimp eggs we asked her to get a quantity of Utah eggs so we could run comparative tests. Here are the results of our tests and we think they tell the entire story. In outward appearances, Utah eggs are very similar to those from San Francisco. The most outstanding difference seems to be the fact that San Francisco eggs float while Utah eggs sink. The nauplii (baby shrimp) from both San Francisco and Utah eggs are definitely phototropic (that is, attracted to light).

Here is a bit of background on our test procedure. We wanted to be sure that water conditions and temperature would not vary and invalidate the test results. We decided to use two of the

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Photos (Left) One of the expeditionary force of two aquarist collectors taking a much needed swig of water from the canteen. Photos by the author.

Seining for a particular species in South African pools can be trying!

Collecting Trip Notes

Rolf A. C. Jensen
Johannesburg, South Africa

From the dense reeds of the nearby swamp came the mellow bubbling call of a coucal bird. I set up in my sleeping bag and shook my companion awake; a clear, hot winter's day was dawning and we had plenty of work ahead of us.

Martin Drake and I had been skin-diving on the coral reef at Zavora, about two hundred miles north of Lourenco Marques in Portuguese East Africa. Now the time had come to head back home to Johannesburg in the adjacent Republic of South Africa, and we planned to collect freshwater fishes along the way.

Half an hour and a quick breakfast later, our temperamental old Chevrolet reluctantly groaned to life, and we were off. I was particularly anxious to find *Nothobranchius rachovii*, which had been mentioned as living cosiderably to the north. However, I had a hunch that some intensive searching might yield results, and although it happened to be the middle of the dry winter season, no pessimism clouded our thoughts as we scanned every piece of water within sight of the road.

Finally some likely-looking pools appeared, situated a hundred yards or so from a river, and connected to it by some swampy reed beds. We marched in with our seine net, firmly pushing thoughts of leeches and, worse yet, the deadly bilharzia parasite, out of our minds. A local native watched us curiously for some time. Deciding apparently that "if you can't figure 'em, join 'em," he waded out and enthusiastically gave us a hand. No killiefishes came to light, but two silvery characins

of the species *Alestes imberi* and the cichlids *Tilapia sparrmani* were found. Nearby pools yielded the same species plus a two-inch barb, *Barbus toppini*, and a drab-colored three-inch goby *Glossogobius giuris*. The latter fish, I later found out, inhabits both fresh and sea water.

I asked our helper about a bright red-and-blue little fish, one and a half inches long *(Nothobranchius)*. It immediately became clear that he was a Shangaan (a tribe of that area) and that his English was as excellent as my Shangaan or Portuguese; which is to say that, further conversation being impossible, I abandoned my quest for information and reverted to sign language whenever communication became essential.

On all the many subsequent stops only various species of the cichlid genus *Tilapia* and the same barb were caught. At about two o'clock we turned off the main coast highway (actually an atrocious one-lane "strip-road" at this point) to a little beach resort by the name of St. Martino. Situated about thirty miles from Lourenco Marques, St. Martino boasts a lagoon and an hotel — and very little else. Less than a hundred yards from the north-western shore of the salty lagoon, and separated from it

Photo: Displaying the seining net by one of the collecting team. Photo by Rolf A. C. Jensen.

by a line of sand dunes, was a swamp with pools of clear brownish water free of vegetation in a few places. Scarcely had we settled down here to eat a belated lunch than Martin spotted movement in the water of the pool nearest us. A hasty inspection revealed hundreds of killiefish swimming at the surface. Lunch went by the board as we began seining feverishly, and within a short while we had caught as much as we could take home alive (all our previous specimens had been "pickled" in formalin). We placed about seventy fish in each of two one-gallon bottles and a further fifty in a smaller container. Although we had no oxygen available, a dose of sodium amytal was added in the hope that this would slow down the metabolism of the fishes sufficiently to enable them to withstand the crowding. Naturally, with plastic bags, oxygen and some of the newer tranquilizers, a far higher degree of crowding would have been possible. However, in spite of extremely hot weather and plenty of car trouble on the twenty-four hour trip home not a single fish died.

It was obvious from the start that we had obtained two different species of killie at St. Martino. They were unknown to me, but were soon identified by Mr. R. A. Jubb of the Albany Museum in Grahamstown, South Africa, as *Aplocheilichthys katangae* and *A. johnstonii* (now placed in the genus *Micropanchax.*) *Microphanchax johnstonii* is rather a plain fish, while the Katanga killie, as we soon dubbed the other species, shows a diffuse black patch on the side on a green iridescent background. Fins are yellowish, and the typical iridescent "lamp-eye" makes both species quite attractive. The Katanga killie is sometimes available in the United States.

Thus our disappointment at not finding *Nothobranchius* was somewhat compensated. In fact, as most collectors will readily admit, one often does not find what one is seeking. I am still convinced that *N. rachovii* exists south of Beira, and *N. orthonotus* certainly does. Perhaps some day they will be collected near Lourenco Marques, possibly by someone looking for something else. After all, if the expected were always collected, what fun would there be in it? ◄

CLUB NEWS

Greater Atlanta Aquarium Society

Meets on the first Thursday of each month at 8:00 p.m. at the Architects and Engineers Building, 230 Spring St., on the second floor, Atlanta, Georgia. The size of the society has doubled since it was formed earlier this year, according to Ed Symmes, Secretary.

★ IDEAS ★
BY HOBBYISTS

The Journal will pay $5.00 for original ideas published. Keep less than 200 words. Send your idea today!

Save the Females

To prevent female bettas from being harassed and even killed by male bettas, I find it best to use many airstones colored the same as the female. Put them on fine dark sand. After spawning when the male begins attacking his mate, she scoots off into the camouflage (colored airstones) and disappears. When the male eventually finds her again she scoots off into the camouflage. The male returns to his bubble nest after he loses her very many times.—*Terrence Hoover, San Francisco, California*

B & H Tropicals News

At press time the editors received the happy news that Mrs. Flora Scott has taken over B & H Tropicals at 3277 Mission St., San Francisco. Congratulations, Mrs. Scott!

Aquarium Stock Company is almost synonymous with tropical fish hobby

End of an Era

Gene Wolfsheimer, F.A.I.
Sherman Oaks, California

FOR FAR longer than I can remember, the names "Berkitz" and "Aquarium Stock Company" have been synonymous with the best in the aquarium hobby. It all started back in 1910 when Bernhard Berkitz supplied leeches and drug sundries to physicians from an upstairs loft on Greenwich Street, New York. He called his business the Aquarium Stock Company. The word "Aquarium" in the name of his company caused considerable public misunderstanding. People kept coming in for fish and supplies. Finally, getting tired of turning down customers, Bernhard started stocking a few goldfish, bowls and a bit of fish food. In a few years, this business of convenience had far outstripped his other products.

Bernhard's son, Leonard, as a youth, went to Germany to study the handling and breeding of tropical fishes under the experts in Hamburg and Bremen. After his return Leonard and Bernhard Berkitz built Aquarium Stock Company at their New York store into the world's largest retail tropical fish and aquarium supply business.

The elderly Bernhard Berkitz retired in 1940 and with the full charge of organization resting on his shou lders, Leonard soon looked toward the west coast. In 1946, Aquarium Stock Company in Los Angeles was opened. My own pursuits in the hobby began in 1945 here in Los Angeles and I was in a position to see the effects of the Los Angeles opening on our local business. The advance to this new western front was met with hostility and suspicion by other dealers. Their big city-big business techniques caused a revamping in local operational policies that are still in effect today.

The first opening of Aquarium Stock Company in Los Angeles took place in a

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Photo: Betty Berkitz of the Aquarium Stock Company as photographed by Gene Wolfsheimer, F.A.I.

THE AQUATARIUM is one of the newest and most grandiose attractions of the Florida west coast. Located on St. Petersburg Beach, it houses the largest circular tank of its kind in the world. The main tank is 100 feet in diameter and 22 feet deep. It contains 1,247,000 gallons of filtered sea water. Other facilities include a smaller (200,000 gal.) performance tank, three outdoor pools, and 34 wall aquariums.

The general design was first conceived by the L. G. Ball family, who hoped to bring a new influx of tourists to the area, and to promote the economic growth of the St. Pete Beach area. Having already built and launched the Miami Seaquarium, they set about to build an even greater attraction.

The gigantic task of stocking one of the world's largest oceanariums remained once construction had ceased. A fourteen foot Pacific pilot whale was "flown in" from California. Thousands of reef fishes were purchased and collected by the author and Mr. Robert P. L. Straughan.

Worth a trip to St. Petersburg — it has the world's largest circular fish tank!

Florida's Aquatarium

R. A. Martin
Curator of Fishes
Aquatarium

Porpoises were caught and purchased. And thousands of fishes were caught locally by our collection crew headed by Mr. Grady Marlowe.

According to the latest census, we now have one Pacific Pilot Whale, nine Bottle-Nose dolphins, two spotted dolphins, eight California Sea Lions, two Harbor Seals, and a solitary, but happy Hum-

Photo: Aerial view of the Aquatarium complex of buildings and parking lot.

boldt Penguin named "Rumplestiltskin." Larger fishes include nurse sharks, cownose rays, three species of sting rays, jewfish, red groupers, black groupers, scamps, and rock basses. Schools of spadefishes, pinfish, and grunts hover over the rock formations in the main tank.

Fishes from various parts of the world are exhibited in the corridor tanks comprising "Neptune's Gardens." Native corals and shells accompany fishes in scenes from the underwater world. Some tanks were so realistic that their inhabitants were induced to spawn. Both *Dascullus trimaculatus* and *Dascyllus aruanus* bred among the corals in a Pacific reef tank.

Even though the original goal set for the Aquatarium was to have the "world's greatest marine show," interest is now being kindled for some serious scientific research program on water chemistry, and the physiology of marine organisms. We hope that the Aquatarium will some day be a center for marine research. ◄

Wolfsheimer

(Contiued from Page 440)

small unpretentious store on busy Beverly Boulevard, just a few short blocks from their present address. Soon after the quiet opening, I visited the shop and was pleasantly surprised to find the elderly Mr. and Mrs. Bernhard Berkitz sitting on little camp stools in front of the shop. It was the middle of our winter but the sun shone down, warm and friendly. They sat there soaking it in but bundled up to their chins. They had just arrived from wintry New York.

We started chatting and I came to learn more and more of the family and the tremendous growth of the business that he had started. Inside the store, Lenny Berkitz and his wife, Betty, were already highly enthusiastic over the prospects of this new business venture. With Betty had come her parents and her sister, Ann Goldberg. In the years that followed, having moved into their newly-

built permanent location, it was a familiar sight to see Lenny constantly on the run around the store. He seldom walked slowly. Betty was part of the sales force and Ann managed the office which was an open room adjoining the store at the far end opposite the main door.

Hobbyists from other parts of the country as well as foreign visitors all asked the same thing upon arrival in Los Angeles. "Can we see Aquarium Stock Company?" Also, the Los Angeles store became a mecca for the Hollywood trade. Besides supplying aquarium set-ups for movie sets their customers included such notables as Helen Morgan, Gloria Swanson, Shirley Temple, Greer Garson, Gracie Allen, Loretta Young, Henry Fonda, Natalie Wood, James Mason, Mrs. Gary Cooper and Errol Flynn, just to name a few. Visiting recently to take a picture of Betty Berkitz I passed the pianist, Liberace, on his way out, having just made some purchases for his fish collection.

In 1957 Leonard Berkitz and his wife, Betty, separated. Lenny went to live in Tahiti, where he still resides. He comes back to the United States about twice a year to oversee personal business and maintain his citizenship. The New York store had been sold to Mr. Louis A. Dalwin, who had long been its manager. Betty continued to maintain the Los Angeles store. Ann Goldberg, Betty's sister, stayed on in the office for a while but soon left after breaking in a new office manager, a girl named Bert Zellner, who also came from New York. Bert married in 1958 and is no longer a part of the store*

By January 1st of this year, Betty Berkitz, the last Berkitz in the firm of Aquarium Stock Company, sold the Los Angeles store to Alfred Mazer and ended an era in the hobby. The "Berkitz Dynasty" quite probably created as much interest and advancement in the hobby as

*You guessed it—she married the author!

any other enterprise since the start of fishkeeping. Probably a great deal more.

I have known Al Mazer for a very long time and he has been a well-known importer and wholesaler of fishes, supplying the local area. Upon questioning Al, I found an amazing coincidence. Al, who is from New York, used to sell Bernhard Berkitz tropical fishes in the years 1931-1933. He knew Leonard Berkitz as a boy.

Both Louis Dalwin of the New York store and Alfred Mazer of the Los Angeles Aquarium Stock Company will continue to operate as in the past, maintaining the usual policies of offering the finest in fishes and merchandise to the hobby. ◄

* * *

Harbor Aquarium Society

The 12th Annual Tropical Fish Show of the H. A. S. will be held October 8-10, 1965, at the Cabrillo Beach Marine Museum, 3720 Stephen White Drive, San Pedro, California, according to Bertha L. Hutchison, Secretary. ◄

Brine Shrimp

(Continued from Page 435)

gallon jug brine shrimp hatchers we described in the April 1965 issue of the *Aquarium Journal*. These were set side by side and room temperature was maintained at a constant 80° F. throughout all of the tests. The hatchers are designed to operate with three quarts of solution. The specific gravity of the solutions was maintained at 1.025 (13%) for all tests. Aeration was medium, that is, enough to keep the eggs in constant motion. (Light aeration is sufficient for San Francisco eggs but more air was needed in these tests because of the tendency of Utah eggs to sink.) Each test was run twice in an attempt to rule out the possibility of "freak" results. We ran a series of three tests, varying the chemical composition of the hatching solutions.

In our normal operation, using San Francisco eggs, we use a solution composed of:

3 quarts dechlorinated tap water
1/3 cup (heaping) aquarium rock salt
1½ teaspoon epsom salt
½ teaspoon sodium bicarbonate (baking soda)

Our first test was using this formula to which one-half teaspoon of eggs was added.

The results indicated that after 24 hours of operation, the hatch from both the Utah and San Francisco eggs was equal. The hatchers were operated for another 24 hours and at the end of a 48 hour (total) period the hatch from the San Francisco eggs exceeded the hatch from the Utah eggs by approximately one-third. We did note that the Utah shrimp seemed to be more prone to mechanical (i.e. handling) injuries and oxygen deficiencies.

We examined comparative samples of Utah and San Francisco shrimp under a 75x microscope, at this time, and noted that the Utah shrimp were slightly larger and darker in color than San Francisco shrimp. To the naked eye Utah shrimp appear to be more orange in color whereas San Francisco shrimp tend toward the yellow.

The second test was run using salt (sodium chloride) only and adding slightly more, to maintain the 1.025 specific gravity. In 24 hours the hatch from Utah eggs was definitely greater than that from San Francisco eggs. However, at the end of a 48 hour test period the hatch was greater for San Francisco eggs. This test also showed that the TOTAL hatch from both types of eggs was considerably less than with the salt, soda, and epsom solution.

The third test was run using salt and epsom salts with no soda. Again after a 24 hour test period Utah eggs had a much greater hatch than the San Francisco. At the end of 48 hours the San Francisco hatch was again greater. We

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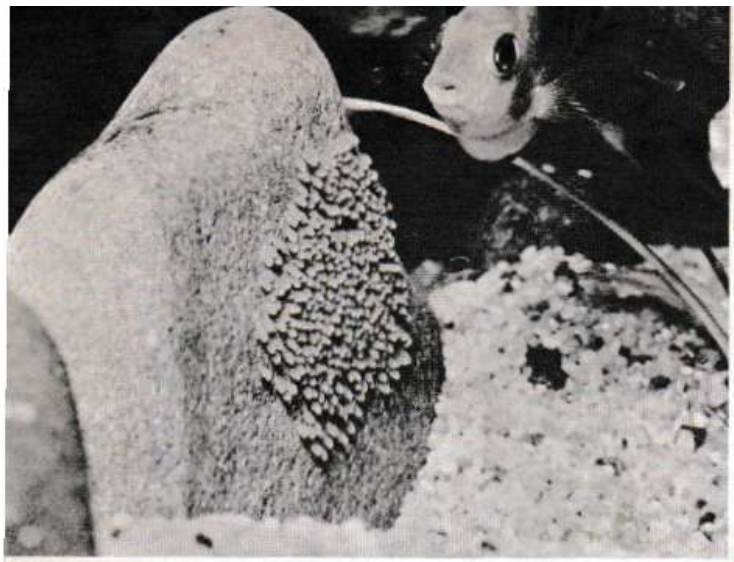


Photo: — One of the parents dutifully watches over the newly-laid eggs on the side of a rock. All photos by Eric Friese.

The author discovered a school of orange chromides in a local shop!

Orange Chromide

Eric Friese
Seattle, Washington

DESPITE its steadily growing population the Pacific Northwest has been unable to attract or produce a correspondingly increasing number of aquarists. Consequently the supply and demand in the tropical fish business is considerably smaller than in New York, Chicago or Los Angeles. Thus I was extremely surprised and pleased to find a school of young, medium sized orange chromides, *Etroplus maculatus*, in one of the local pet shops here in Seattle in the early Fall of 1963. Without hesitation I purchased half a dozen of these fishes, in hopes of eventually getting a mated pair.

Etroplus maculatus is one of the few cichlids native to Southern Asia, with its main distribution throughout India and Ceylon. Ichthyological literature indicates about 80 mm (about 2½ inches) for the male and about 50 mm (about 2 inches) for the female. Unlike *Etroplus suratensis*, which predominantly lives in a marine environment, and only returns to the brackish water of the estuaries for spawning, *Etroplus maculatus* frequents both fresh and brackish water. In captivity *E. maculatus* definitely seems to do better when a small amount of table salt is added to the water. Several authors have mentioned that this fish should have as much as 1 tablespoon of salt per every 2½ gallons of water, while I have found that my orange chromides did quite well on 1 tablespoon of salt per 10 gallons. Regardless of the quantity added a certain amount of salt appears to be necessary for the well being of *E. maculatus*. When I first obtained my specimens I avoided the use

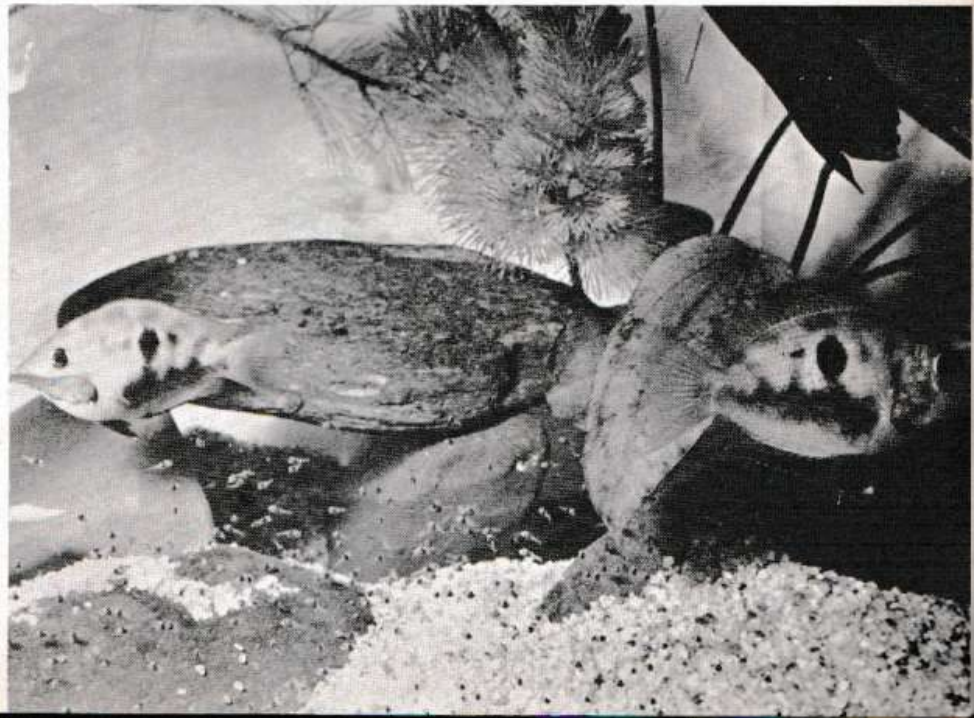
of salt in order to prevent damage to the plants in my tank; however, the fish became extremely susceptible to various parasitic infections. Applications of different drugs proved to be either completely ineffective or they produced only partial results. However, an addition of a concentrated tablesalt solution always helped bring about a complete cure.

Etroplus maculatus is one of the more attractive cichlids available these days. The body of the mature fish is strongly compressed, relatively deep, and almost disc-shaped. The eyes are dark, almost velvet black, as are the pelvic fins and the lower half of the anal fin. The lower portion of the body from the pelvic fins to the base of the caudal fin is also dark, often solid black in an excited male. The flanks are marked with three large blackish dots, the center one being very distinct, about 8 mm (about 5/32 inch) in diameter, and always visibly present, while the other two dots are somewhat less pronounced, and often completely faded. The back is grey to light brown and turns to a golden yellow-brown along the sides. The throat has a warm golden color. Beneath the eyes there is a band of shining blue-green dots, while the gill covers have two or three horizontal golden bands. The entire body is covered with rows of tiny red spots which darken towards the dorsal portion of the flanks, but are still visible in the dorsal fin. [*Editor's note: I have had males that were bright sulfur yellow while in breeding condition.*]

Sexing *Etroplus maculatus* is often quite difficult. The coloration of the females is normally less intense and pronounced compared to the bright colors of the males. Females also stay slightly smaller than males. The best assurance for a productive pair is to obtain a number of young ones, and then wait for a mated pair. A pair of *Etroplus maculatus* that has spawned once is normally mated for life.

When I first purchased my young *E. maculatus* they ranged in size from 40 to 45 mm (about 1½ - 1¾ inches). After about two months with alternate feedings of tubifex worms, frozen brine

Photo: The parents swimming among their fry in the author's tank. Photo by Mr. Friese.



shrimp and drosophila I had an obvious pair. The male was about 60 mm (almost 2¾ inches) by that time, and the female 50 mm (about 2 inches). These two fish started to dominate the entire tank. Contrary to reports in the available literature my mated pair started to dig holes, even up-rooting an occasional plant here and there. Finally, both fish concentrated their efforts on one hole, right in front of a large, smooth surfaced rock. After two days of intensive digging there was a hole 45 mm (1¾ inches) deep, with a diameter of about 100 mm (about 4 inches). On 13 November, the third day after the beginning of the "construction work" on the large hole, I noticed the female swimming around with a spawning tube extended about 1 mm. After some preliminary passes over the smooth surfaced rock, the female started laying the eggs, three to five at one time, and the male would alternately fertilize the eggs and chase away any intruding inhabitant of the tank. The whole spawning act took place in the typical cichlid fashion. Late that afternoon the spawning was completed, with about 200 to 300 eggs at-

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Brine Shrimp

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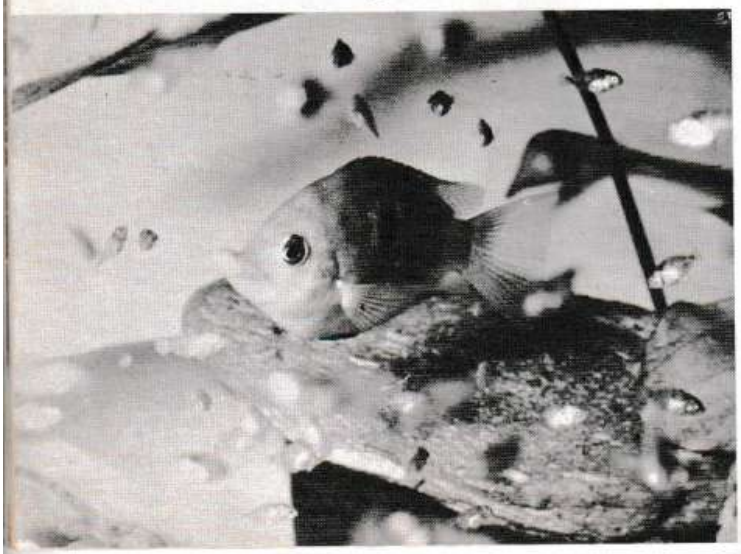
could see that the Utah shrimp were more active than with previous formulas.

It is interesting to note at this point, that although the Utah hatch seems to exceed that from the San Francisco eggs in 24 hours, the TOTAL hatch in 48 hours always favors San Francisco eggs. We also ran tests using trays with no air. The San Francisco hatch always exceeded that from Utah eggs. We would highly recommend the use of strong aeration when using the tray method. Here again the addition of epsom salts and soda will increase the hatch.

In view of these tests we would say that Utah eggs will give a smaller hatch than is usual for the same quantity of San Francisco eggs, and it seems reasonably safe to draw the conclusion, that while both types of eggs will hatch in a solution made with salt only, the salt, soda and epsom solution will increase the hatch. Aside from this, the results from Utah eggs are entirely satisfactory and should fill the gap left by the lack of San Francisco eggs.

We would like to have run tests using borax as recommended by M. A. Reuting in the May 1965 issue of *Aquarium Journal* but our test sample of Utah eggs was exhausted. We can, however, agree that borax would probably be as effective as soda and epsom salts for increasing the hatch. The principle is the same i.e., to soften the egg cases and buffer the pH of the solution. ◄



Photos: (Left) Female orange chromide making herself at home among her large family. **(Opposite page)** Proud parents watching over their fry. Photos by Eric Friese.

Plenty of good practical advice on how to achieve a really outstanding tank

Exceptional Aquarium

Thomas G. Basler
New York, N. Y.

Most of us recall our first venture into the pet shop. Some of us as novice aquarists were naive enough to think only in terms of the fish we intended to purchase. But, we soon realized that for even a minor set up we needed an aquarium accompanied by light, plants, gravel, rocks, food, heater, cover, thermometer and soon a siphon, filter, aerator, pH tablets, anti-algae tablets, special lights, a net and a mineral block.

We returned home with all the proper components to set up an attractive aquarium to equal if not surpass the qualities of our neighbor's. But it didn't happen. Why? He has the same kinds of fish, in fact from the same dealer. He has the same equipment, no more. We duplicated the soft cabomba, the strange banana plant and the expensive sword plant that were in his tank. The same rock and gravel was available to both. Yet, when all was ready and the neighbor saw the tank – he knew – and worse yet—we knew—his aquarium was beautiful – ours was just ordinary.

The difference of course is in the arrangement of the tank; the proper com-

bination of fishes (in temperament, size and color), of plants (in size, shape, color and softness), of rocks, and finally of gravel. For those who do not believe arrangement is important, try imagining the American flag with checks in lieu of stripes, mountains with streams running straight down the sides, not flowing with the terrain, or that man from Mars with all three eyes on the right side of his head.

Almost any good book on tropical fish suggests plant and even rock arrangement as well as tried and true fish combinations which are usually obvious even to the beginner. Yet, few of these books or even journals with their "beginners corners" give extensive advice on color, size and placement of gravel.

Again, the novice after trying hours of careful choosing of fish, plants and even rock will end the purchase and also the bid for a stunning aquarium by adding ". . . and give me twenty pounds or so of gravel."

Most of us by this time have seen the novelty aquaria and their gravel – these may be nice in their polychromatic ways, but here we will deal only with the natural look rather than the "pastel pink paradise" of black slate on white sand effects.

Fortunately we have an extensive assortment of gravel to choose from – nearly all will lie quietly and not jump out of the tank nor float to the top. They don't bite, nor do they necessarily bring forth their own odor. This narrows our problems down to just four – choosing color, size and texture, and lastly but most important – placement.

Fine gravels, sands or even muds are found on the floor of natural streams, lakes and oceans, the natural habitats of our tropical beauties. Attractively decorated aquaria can be created from all sizes, from the microscopic oozes to the larger chunks and bits of rocks three-eighths of an inch in length or more.

The settling of wastes must be taken into consideration in some cases, root structure of the plants in others, and with some rough and sharp crushed rock – the noses of our noble but too oft' forgotten garbage man – the catfish, must also be considered.

Mixture of fine and coarse gravel have easily changed a "set in its way" – staid aquarium to a lively and interesting sight with each nook and cranny a world all its own.

Color of course must be compatible with the fish and rocks and, if several colors are to be used – with each other. Some successful aquascapers have mixed the gravel before introducing it into the water, thus resulting in a third single gravel, still looking natural and possibly creating a more pleasant and natural effect. Some colors for base gravel even add to the reflective powers of the overhead light, others preventing the same. Some authorities claim that the color of the gravel in the aquarium actually effects the colors assumed by the many fish swimming above.

The favorite in my largest tank at the moment is a light gray rock from Oregon, which immerses as light green and deepens in color with age to I know not what verdancies. But most of us need not import rocks from afar, just stop gazing at our fish long enough to look under our own noses – or rather feet. The local rock pit or building under construction may yield untold – and yet seen wonders. I can still picture a visitor to a Miami wholesale-retail aquarium picking out nearly fifty pounds of rock and gravel to transport back to Cincinnati, while her husband looked suspiciously at the "unusual" and "gorgeous" rock. Painful memories slowly dawning on him were confirmed by the dealer, who stated that the cost was high due to the expense of shipping the rock all the way from southern Ohio. ◄

Friese

(Continued from Page 448)

tached in a neat, orderly manner to the rock. The eggs were of a peculiar grey color, slightly oval shaped, and they were attached to the rock by tiny, very short threads. The parents jointly or alternately guarded and fanned the eggs. To prevent any aggravation of the parent fish I removed all other occupants of this tank.

On 17 November, 4 days after the spawning, the young ones hatched and dropped down to the previously prepared hole. Two days later the parents transported their brood to another hole, and from then on alternated daily between these two holes. On the seventh day after the hatching the yolk sac of the young appeared to be almost absorbed, and some of them started to swim around inside the hole. The following day all of them were swimming in a swarm outside their hole, closely guarded by the parents. Newly hatched brine shrimp were immediately taken. At night the parents would haul their young back into one of the holes by picking them up in their mouths, two or three babies at a time, and spitting them into the sand pit. Also if one of the young got too adventurous and started to leave the swarm, one of the parents would go immediately after it, and transport it back to the crowd. In case of any imminent danger both parents would give warning signals by rapid backward jerking movements with their pelvic fins, and all the young ones would immediately let themselves sink to the bottom and remain motionless until the danger was over.

Now after 4 weeks with regular feedings of brine shrimp (fresh and frozen) and chopped tubifex, the young have grown to about 10 mm (a little less than ⅜ inch), and the school is gradually disintegrating. ◄

Braz Walker
Waco, Texas

A tropical that carries an efficient radar system in its 12-inch frame!

Black Ghost Fish

IN RECENT years advances in technology concerning data processing and electronics have been astonishing but almost as impressive as the accomplishments are the bulk and complexity of the machines themselves. It's a little unnerving to realize that for possibly several million years one of God's other creatures has been carrying around within his twelve-inch frame not only an efficient radar system with which to navigate dark and muddy waters at night but also a transmitting and receiving station for electrical communication and the necessary data processing equipment to accomplish all of this using a single sonic frequency of approximately one thousand cycles per second (about two octaves above middle C on the piano).

The fishes of the family Gymnotidae have long been kept by aquarists because of their odd appearance and their equally unusual methods of locomotion. They are found only in South and Central America and are very closely related to the characins. Most are long and eel-like and swim using a rippling motion of the anal fin. Many have no caudal (tail) fin and the posterior portion of the body is instead tapered to a fine point. The blade-like anal and the pointed tail have resulted in most of the members of the family being called "knife fishes." If a knife fish finds himself in an embarrassing position he simply reverses the rippling motion of the anal fin and takes off in the opposite direction.

To a collector of the unusual, none is so appealing as the ghost fish or black ghost *Apteronotus albifrons* (incorrectly *Sternarchus albifrons*) which is not only the most handsome of the family but possesses a "personality" seldom found in aquarium fishes. Stimulating the same nerve that makes piranha fanciers enthusiastic about their "blood thirsty" little pets is the fact that many of the South American Indians are deathly afraid of this particular species and believe it to be the reincarnation of their dead ancestors.

The "black ghost" inhabits small creeks throughout the Amazon Region, the Orinoco, The Guianas, Rio Paraguay, Rio Parana, and the Ucayale and is one of the few members of the family to possess a caudal fin. The jet black coloration of this fish is interrupted only by two creamy white bands just in front of the caudal fin and a creamy white band which extends from the tip of the snout over the top of the head and approximately one-third the length of the fish's body before it disappears. From this comes the second part of the scientific name *albifrons* which means "white front." Even the large pectoral fins are a "soft" black in color. They are used for steering and braking and their paddling action also supplements the propulsion of the anal fin at times, either backward or forward. Although there is no actual dorsal fin most authorities attribute to this fish the possession of a dorsal thong or filament. The specimens which I have kept and observed have not possessed such an appendage. Dr. Earl S.

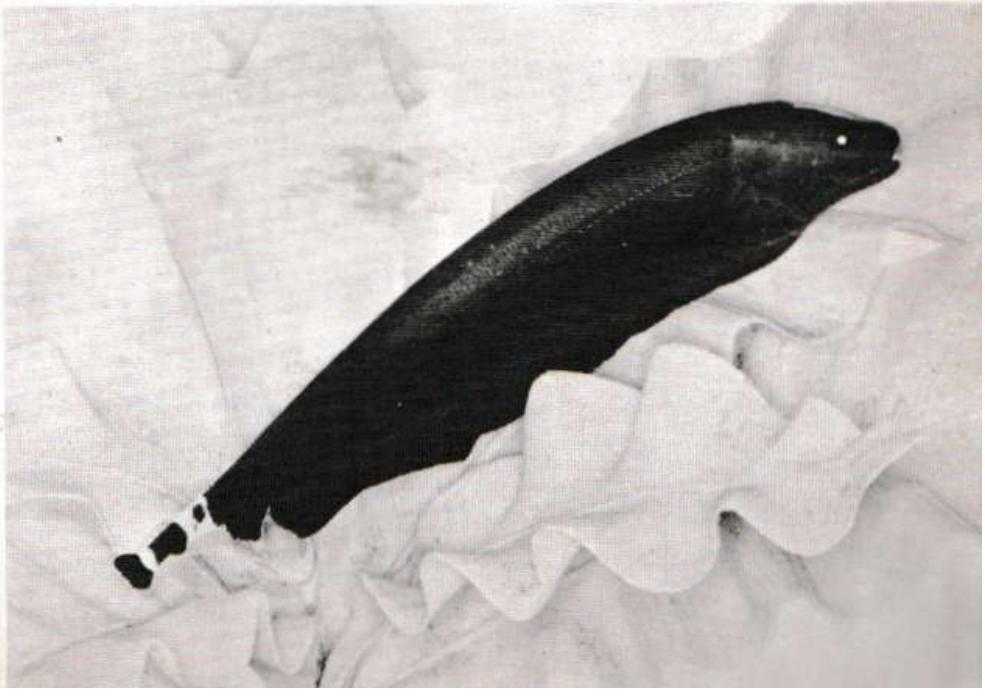
Herald informs me that although the single specimen now on display at the Steinhart Aquarium also lacks such a filament, these are probably lost through some sort of physical accident. The almost unbelievable ability of members of this family of fishes to regenerate tissue which has been destroyed makes it seem probable that over a long period of time this would be at least partially restored if this were the case.

Although there could be little doubt of the electronic ability of a fish like the electric eel, most other members of the family were long thought to be incapable of electrical activity although they did possess electrical tissue. This is the case of *Apteronotus albifrons* and although authorities such as Ellis recognize the presence of this particular type of tissue, it is merely mentioned as "pseudo-electric organs." Comparing the two millivolts (thousandths of a volt) of the black ghost to the five hundred or six hundred volt charge of *Electrophorus electricus* is a little like comparing a citizen's hand walkie-talkie to a television station and it is easy to see how the signal was so long overlooked. Like the walkie-talkie, however, it serves its purpose and allows the fish to navigate flawlessly although his eyesight is poor.

Experiments have also been performed proving communication exists. The signal of the black ghost was recorded at different times during a state of inactivity, at feeding time and while being frightened or disturbed. When these signals were played back the reaction of the fish was always exactly as it was at the time of the recording. Perhaps the most interesting was the mad search for the head of the chow line when the feeding signal was played although no food had been introduced into the aquarium. (This should not be attempted without proper knowledge and equipment.)

The relative inactivity of the ghost fish during the daytime is more than compensated for by his ceaseless exploration of every crack and corner of the aquarium when the lights go out. There *is* a ghostly quality about this creature and you will find yourself sitting fascinated in a shadowy room with eyes glued to his aquar-

Photo: The black ghost fish resting in leaves of an aquarium plant. Photographed by Braz Walker.



ium as he darts about or hovers with beating pectoral fins which give the same sensation as a hovering bat whose silent wings seem as if they should make some noise. Although in nature his food consists of small fishes, shrimps and insect larvae, this species will thrive on a diet of beef heart or frozen brine shrimp. A well-filtered seven gallon aquarium will easily accommodate an average size specimen and the space could hardly be better utilized. ◄

In past years experiments "proved" that catfish cannot stand salt!

Corydoras Myth

Albert J. Klee, and Clarence Knepper
Cincinnati, Ohio

ADMITTEDLY, some myths die hard . . . and so it goes with a number of aquarium myths. The longer they go unchallenged, the more they take on the stance of aquarium "laws" to be copied dutifully from one author to the next, perhaps with embellishments along the way. The "*Corydoras* Myth" is a case in point. A number of years ago, so many that the authors frankly were still in their swaddling clothes, some purported "experiments" were made to determine how much salt treatment different species could stand, and it was observed that the *Corydoras* died first. We place "experiment" in quotations simply because the authors feel rather strongly that, with few exceptions, the word has been prostituted again and again in the hobby. Be that as it may, the myth has been carried down to the present.

In an excellent article in the Australian aquarium magazine, *Fin Chat* ("Catfish can't stand salt?"), Fred Parkes, its erudite editor remarks: "It is surprising how many statements we read and assume are correct. This is partly due to not having the time nor resources to check them all, and to a feeling that if you can't believe the experts who *can* you believe? The fact is that in such an unscientific subject as tropical fish-keeping where proper scientific experimentation and controls are practically impossible, even the experts have much to learn, and the field is so vast that we read statements from one expert and assume that, because he is a recognized authority, he must be right. In this manner erroneous theories are accelerated with every new book that is written." We heartily agree with Mr. Parkes.

Some of his observations are quite pertinent here. At one time he noticed that a tank of pearl gouramies had, as he put it, "developed mysterious shimmies." He then dosed them with salt to a fairly dangerous strength but the fish began to die, one by one. Puzzled, he brought this to the attention of his assistant (Mr. Parkes owns an aquarium shop in Australia). It turned out that the assistant had also dosed the tank with salt. To quote Fred again, "With that I tasted the water and it tasted strongly saline; in fact I have never tasted such salty water containing freshwater fish." The point is, however, that 8 half-grown *Corydoras aeneus* in the tank were still swimming around, active and healthy! Afterwards, he kept every

species of *Corydoras* he could lay his hands on in tanks with brackish water fishes with salt added to the extent of one ounce of salt per gallon. After months, everything was well. In fact, *Corydoras arcuatus* lived wonderfully in his tank of scats!

Now it is not claimed that salt will not kill fish. There is practicually nothing that we can add to tank water that will not kill fish at some critical concentration. Ellis, in his "Water Quality Criteria" (SWPCB Publication No. 3, pgs. 209-210, State of California), supplies the information that among U.S. waters supporting a good fish fauna, ordinarily the concentration of chlorides is below 3 ppm in 5%, below 9 ppm in 50%; and below 170 ppm in 95% of such waters. He reports that the following concentrations of chloride have been found to be harmful to fish:

Concentration, ppm	Type of fish	Reference
400	"trout"	Adams, 1940
2000	"some fish"	Brenecke, 1945
4000	"bass, pike, perch"	Adams, 1940

Marine water typically contains 30,000 ppm chloride, brackish water 2800 ppm and tap water 50 ppm. Roughly speaking, each level teaspoon of salt per gallon increases the chloride content of an aquarium by 1000 ppm. Emmons ("Measuring and Adjusting the Quality of Aquarium Water," *Aqualife*, pg. 3, June 1956) has stated: "Aquarium water often builds up a salt content of 500 ppm or more, particularly when salt is purposely added. Beyond 1000 ppm plants are likely to suffer . . . some do not like more than 300 or 400 ppm."

By way of our own contribution, the authors conducted the following designed experiments. Three, 3-gallon aquariums, each containing 10 *Corydoras aeneus* were set up. The thirty catfish involved were 2 months old, all from the same brood. The tanks were bare-bottomed, equipped only with inside filters. Feeding consisted of dry shrimp pellets, brine shrimp and shred-

ded beef heart. Care was taken to insure that no food was uneaten and that each tank received the same amount of food daily. Tank No. 1 was the control tank . . . it received no salt other than the amount originally present in the water, and that added through feeding. Chloride, hardness and pH measurements were made using LaMotte Chemical Company equipment (the first two tests were via titration, the last-named via color comparison). Tank No. 2 was brought up to a chloride concentration of 2400 ppm over a 4-day period (using regular, non-iodized salt); Tank No. 3 was brought up to a chloride concentration of 3600 ppm over a 14-day period. One month after initial salt addition, all thirty fish were in excellent condition. All were eating well and the size distribution of these young catfish appeared random, with no correlation with the amount of salt present in the tank. The water analyses after 30 days produced the following data:

	Chloride, ppm	Hardness, ppm	pH
Tank No. I (control)	330	140	6.4
Tank No. II	2400	155	7.2
Tank No. III	3600	160	7.6

The increase in hardness and pH of salt tanks II and III over the control tank is attributed to the small amounts of hard, alkaline salts present in ordinary table salt to prevent "bridging" in damp weather. The relatively high chloride concentration is attributed to the feeding of brine shrimp pellets and brine shrimp. The tanks used were small, and the natural increase of chloride content observed due to feeding probably cannot be taken as typical for the ordinary aquarium.

Finally, desiring to observe what happens when the chloride addition is sudden, a strong salt solution was dumped into the control tank, to bring it up to a concentration of chloride of 3600 ppm, i.e., that of Tank No. III. No extraordinary immediate response was noted and after two weeks, the catfish were active and in excellent health! All experiments were terminated when it became clear that salt or no salt, our 30 experimental animals appeared capable of living out their ordinary life spans.

Undoubtedly, it is possible to kill *Corydoras* with salt. But then it is even possible to kill scats. What we have demonstrated is that the danger to *Corydoras* from the use of salt in reasonable and normal disease-treatment amounts, is virtually non-existent in waters of normal aquarium quality. The effect of chloride on fish is osmotic in nature for there is no convincing evidence that chloride ions have any specific toxicity ("Aquatic Life Water Quality Criteria," Second Progress Report, *Sewage and Industrial Wastes*, Vol. 28, No. 5, pp. 684-685, May 1956). It is clear that the osmotic resistance of *Corydoras* is far greater than formerly believed. This discussion should properly lay to rest one of our oldest aquarium myths. Certainly appropos is a quotation from Robert Herrick's "Seek and Find":

"Attempt the end, and never stand to doubt;
Nothing's so hard but search will find it out." ◄

★ IDEAS ★
BY HOBBYISTS

The Journal will pay $5.00 for original ideas published. Keep less than 200 words. Send your idea today!

Vegetable Grater

A very quick and easy way to shred raw meat for your fish is with an inexpensive vegetable grater. First, freeze the meat solid. Then simply rub it across the grater as you would a vegetable. These graters can be purchased in any grocery store, and each has several size openings, so choose the right size for your fish. A lot of meat can be shredded at a time and then frozen in single feeding portions. — *Mark Scott, Mountain View, California*

From: E. W. Cooper
Philadelphia, Pennsylvania

I am extremely interested in acquiring information about the identification of dwarf cichlids. The material I have available [several popular pamphlets and a book] covers only a few of the more popular dwarf cichlids. Can you give me the names of other publications and where I can acquire them which give a complete or up to date information on the dwarf cichlids?

REPLY: Very little in addition to what you have mentioned is available currently. Some recent descriptions, etc. have been published in the German publication "DATZ" and Mr. Albert Klee has published an article on these fishes (page 388 of the July 1964 issue of the Aquarium Journal). Also see November and December of 1963 and March and April of 1965 for further articles on dwarf cichlids by Paul Loiselle and Richard Stratton.

° ° °

From: Edmund Cooper
Van Nuys, California

I am looking for some information about obtaining microworms, white worms and fruit flies for food. Could you direct me to a supplier?

REPLY: The worms may be obtained by checking our advertisers. For example by the want ads, live cultures have been offered there for the last several months. For fruit flies, try any of the various biological supply houses in the United States, for example Ward's of California, P.O. Box 1749, Monterey, California.

° ° °

From: C. B. Hunter
San Jose, California

When we purchase fish from a tropical fish shop and the clerk proceeds to inflate by mouth the plastic bag with air (we use air loosely) we shudder with fear. On occasions the fish have had some strange and sad experiences by the time we arrived home. Could it be they have a nicotine kick, are intoxicated, car sick or just gassed? The 64 dollar question, do we have reasons to fear this method of supplying air to fish?

REPLY: I doubt that this practice is causing your fish any great discomfort. However, I find it as revolting as you for reasons of sanitation. Who wants to handle a bag someone has breathed into? It seems very inconsiderate to us.

Letters to the Journal

° ° °

From: Arthur Gentile
Bayonne, New Jersey

In the June 1965 issue of your magazine you answered a letter from a V. Bichinella who inquired about her inability to grow plants with an undergravel filter. In your answer you expressed a desire to hear from anyone who has had success with "underground" filters and plants. I have. In several tanks around my home I use undergravel filters of plastic plate type with slots for the water to enter. The tanks range in size from ten to 35 gallons; they are profusely planted and I make no bother to select the species of plants that go into the different tanks, whatever is available goes in. Actually my plants reproduce so rapidly that I take much more out than put in. Several of my less fortunate friends envision my home as "the valley of the jolly green fish tank." I attribute my "luck" to two things. 1. Undergravel filters. 2. Gro-Lux lighting. My water is soft because it comes out of the tap that way. It is acid because the undergravel filters make it acid, my

pH is usually about 6. I don't measure my plants growing, who cares what it is? My lights (Gro-Lux) are left on only about 4 hours each night, that eliminates the algae problem. The filters are operating about 12 to 16 hours each day. They are shut off at night because the pumps keep the household awake. Vallisneria grows profusely in my tanks, reproducing mostly by runners but occasionally they send up blooms. These are sheltered under the shading leaves of my broadleaf Amazons. The Amazons reproduce by floating runners, i.e. the runners they intended to crawl along the bottom but can find no place among the tangled network of vallisneria and pigmy chain swordplant, so they rise toward the top and an indirect angle sprouting baby plants with dangling pale green roots along the way. Floating above this metropolis of chlorophyl is an impenetrable mass of vine like floating plants (Cabomba, Elodea, Hornwort, etc.) which receives innumerable eggs and acts as midwife to thousands of juvenile fish. In my tanks containing live bearers this mass of floating vines is replaced by bushy rooted water ferns. I have found that the plants I have described as "floaters" will not flower unless they are rooted. I will now make a hypothetical statement by which I hope to explain my success with plants, I do not ask you to accept it as the truth, because I do not know if it is true or not: In nature, water seeps through the bed of soft bottomed streams bringing with it the same nutrients as an underground filter does in an aquarium. In rock bottomed streams with a thin gravel covering there is very little rooted vegetation because water cannot seep through. An aquarium with a slate bottom and plain gravel is almost the same way, except for the fact that since the water is largely stationary the sediment will seep into the gravel on a small scale and become devoured by poisonous anaerobic bacteria. With an undergravel filter the natural seepage action is performed on a scale large enough to support plant life. The continual movement of the water through the gravel brings oxygen to our clean little friends, the aerobic bacteria. I strongly feel that there are aquatic nitrogen fixing bacteria that correspond to terrestrial type found in our soil which change nitrogen into nitrites and nitrates which are useful plants for protein synthesis. The Gro-Lux lights are useful because they very closely resemble natural sunlight in their function. Only high protein foods should be fed because they can be broken down by the fish into elements suitable for the healthy support of plant life. Dry foods may be your problem, too many carbohydrates will rock the delicate balance of chemicals needed for luxurious plant growth off balance. Tubifex worms have established themselves in all my undergravel filtered tanks which is a desirable development, because they devour any unwanted bacteria and carbohydrates. The fear of

them dying and polluting the tank is nil because of the well oxygenated gravel. Of course my fish enjoy an occasional worm now and then, some of the more "finicky" fish spit them out because they dislike the taste of unwashed worms. I hope what little I have told you sheds a little light on the subject. I strongly believe that this may play a part in achieving all the right factors necessary for success.

REPLY: We don't agree fully with Mr. Gentile's "theories," however, we print this letter complete. It is often true, but not always, that water seeps through the soil and gravel in lakes and streams. The water may go either way (in or out) depending upon stream flow, springs, water table level and other factors. Plants in the wild often grow in some areas and not in others. Some seem to prefer fast moving water, some slow, some still water. Movement of water through the substrate may be important too. Its absence or presence may be important depending upon the kind of plant.

* * *

From: Mrs. Leon Thomas
Tacoma, Washington

Mr. Olafson, the owner of the pet shop in this city, has been most interested in helping me relative to two Chinemys-Reevesi turtles which I have. He brought to my attention your article and excellent pictures of turtles in the April issue of *Aquarium Journal*. I have asked the publishers to forward this letter to you in hopes that you might have some knowledge of this species of turtle. To date I have found little, if any, information on this turtle. My care, etc. has been by trial and error which apparently has been quite satisfactory for Mr. Olafson has never seen a turtle of this species grow to the size of my largest one.

I purchased my first turtle on June 16, 1964 at which time it measured in length approximately 1 inch. Today it measures 4½ inches. My second turtle was added on October 21, 1964 measuring 1½ inches. Today it measures 2½ inches. I will insert here that I previously had another of these turtles but with the small amount of knowledge I had at that time, it expired. I have received all the information Encyclopedia Britannica could find, have consulted both research departments of our library and Seattle's library, purchased at least five books on tortoises, terrapins, and turtles, and asked questions at several pet shops.

It is my understanding that this turtle is an Oriental underwater turtle—probaby from Southern Japan. I have found that they like American cheese which apparently supplies the needed calcium, for their shells are very firm. In addition to cheese, they are fed hamburger and brine shrimp. Of most interest recently to my husband and I was that we thought the largest turtle was a male. An organ which resembles the penis in the human male was noted on occasions by us since the first of this year. I considered myself fortunate, as a novice, to be able to get some excellent pictures of this demonstration with our own 8 mm movie camera. Some of the actions of this turtle toward the smaller one has caused us to wonder if it (the smaller one) might be a female. None of my books show any pictures relative to the mating habits of turtles and the description leaves much to be desired. My turtles incidentally are in a 10-gallon aquarium with some tropical fish.

These turtles are very interesting to watch and play with. They yawn when tired, scratch their noses and are very alert. It is quite heartbreaking however not to know if you are doing all you can to care for them and not knowing the answers to questions such as:

How large will they eventually grow?
Is the larger one a male?

Since they are both growing larger, should they be transferred to a tank of their own?

If they should be transferred to another tank, does it need a filter?

Does this species of turtle need more water in which to swim rather than 1-2 inches, i.e. as long as it has a place to climb out of the water if desired?

I have made a raft of my own from chicken wire since the largest turtle's weight broke the turtle raft I purchased from the pet store. They enjoy climbing on it to get under the neon light, so I would definitely continue to have a raft and light over a separate aquarium if they should be moved to one.

Taking another look at your article and your classification of turtles, I thought I might describe my turtles in case I was misinformed as to their name. The carapace is very dark brown with 13 marked areas bordered by many small areas. The plastron is similar color with 12 marked areas. They have very sharp and long nails – 5 on each foreleg and 4 on each hind leg. Their eyes are yellow and black with a slanted Oriental look. Along both sides of the neck are many yellowish-green stripes – these become more predominant as they get bigger and older.

Any information or suggestions you could send would be greatly appreciated by my husband, the turtles and me. Would you please send any correspondence to our home address which is: Dr. and Mrs. Leon B. Thomas, 509 North Yakima, Apt. #406, Tacoma, Washington 98403.

REPLY:

Aquarium Journal *has forwarded your letter to me for reply.*

I am sorry that I cannot increase your knowledge of the Reeves turtle. It was new to me at the time I was gathering material for my article. I found it in a Philadelphia pet shop when I was visiting the shops to see just how many species are available commercially. As you have discovered, there is little about the Reeves turtle in American hobby literature.

However, I can suggest two contacts, both of which should give you some helpful information. Write to the Curator, Division of Reptiles, United States National Museum, Washington, D.C. Also write to the Embassy of Japan in Washington, asking them for the name and address of an institution in Japan that can supply you with information about the reptiles of Japan.

Your large turtle may or may not be a male. The copulatory organ of turtles is found inside the cloaca. Normally it is not visible. During times of sexual excitement, when the organ is enlarged, it may be visible through the entrance of the cloaca.

I believe you can rest assured that your Reeves turtles are being adequately cared for. You state that yours have firm shells and are growing. These are the two most important indicators of good health.

It would be good to start thinking about 15- or 20-gallon Aquarium for your turtles. They will appreciate the increased space.

— Alan Mark Fletcher

CLUB NEWS

San Francisco Aquarium Society, Inc.

The October meeting of the S.F.A.S. will be held on Thursday, October 7, 1965, at Steinhart Aquarium, California Academy of Sciences, at 8:00 p.m., according to Frank Tufo, President. Program for the evening will be a special showing of a full-length film in color, "The Silent World," featuring the famed Jacques Cousteau with his underwater cameras. An Academy Award Winner. Also a "Mr. Magoo" cartoon entitled "Captains Outrageous," according to Jim Crawford, Program Chairman.