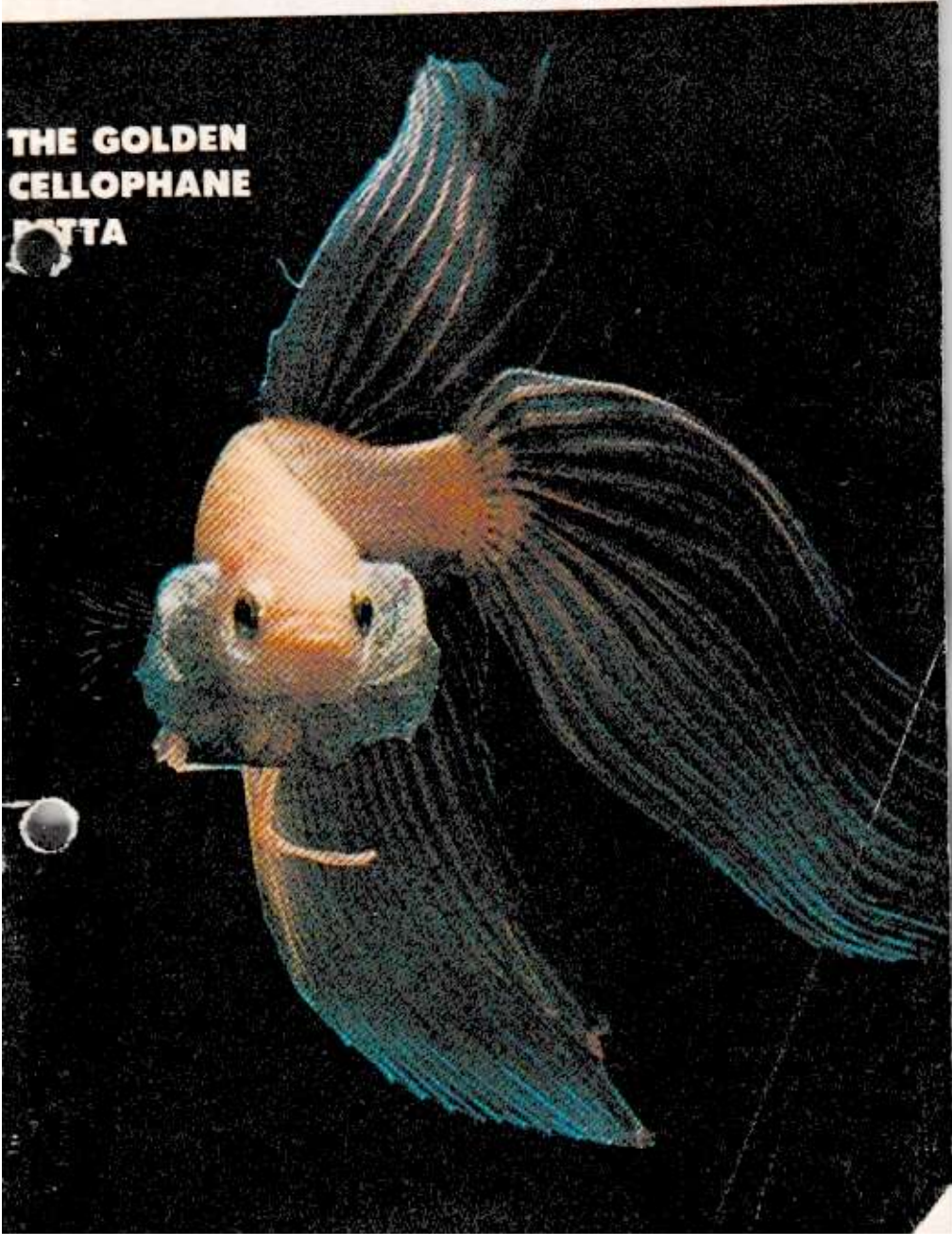


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On The Cover

Fantastic is the word for this photograph of a beautiful Golden Cellophane Betta. Andrey Roth used a modified Nikonmat with a Micro lens on high speed Ektachrome film with electronic flash lighting.

(Additional credits appear on page 67.)

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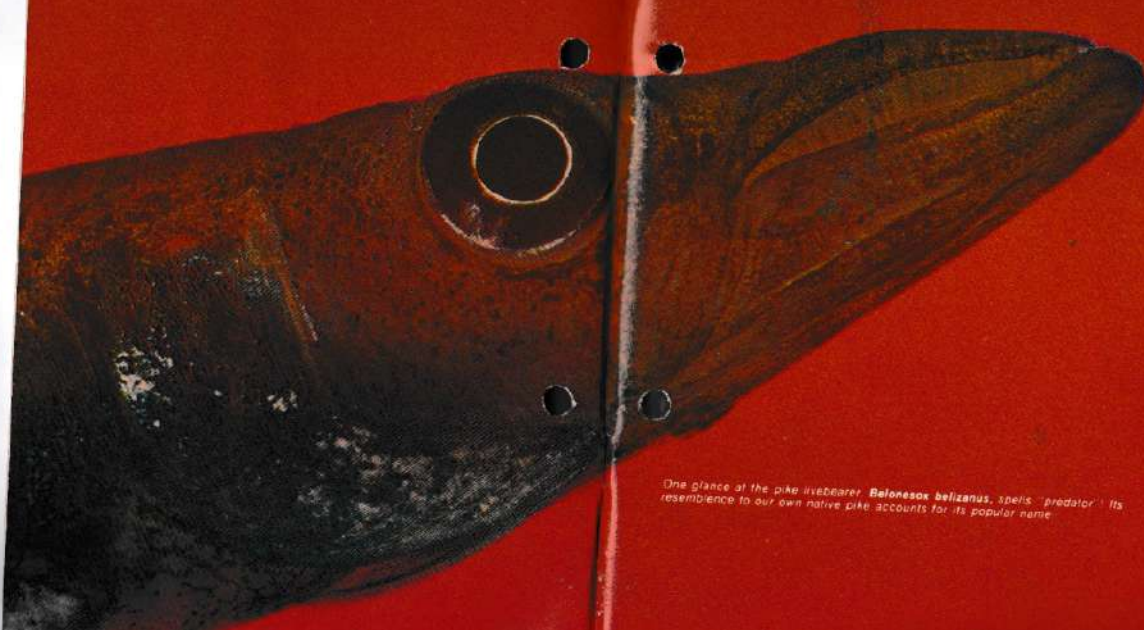
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The Pike Livebearer

by HARRIET CONNELLY

IN THE AQUARIST'S CATALOG OF livebearing fishes, we find a varied collection — the peaceful as well as the predator, the tiny with the large. Among the fresh and brackish waters of the Atlantic coast of Southern Mexico, British Honduras, Honduras and Nicaragua lurks one of the aquarist's most unusual livebearing fishes, *Belonesox belizanus*, the aquatic giant of the livebearers. Its large size, bizarre appearance and ominous reputation always draws a large crowd of hobbyists when on public display. continued on page 46



One glance at the pike livebearer, *Belonesox belizanus*, spells "predator"! Its resemblance to our own native pike accounts for its popular name.

The golden cellophane betta, developed by George Torres of the Bronx, New York. The fish was developed over a period of five years, during which many selective breedings were made.

The Golden Cellophane Betta

by GEORGE TORRES

SPORTS OR MUTANTS ARE WORDS THAT are quite often used very freely by fish hobbyists, yet very few are privileged to be the recipients of such in their tanks. In my case, the accidental discovery of the unusual bettas to be described was the by-product of five years of selective breeding in an attempt to obtain a perfect red-finned Cambodia betta, years in which the clearest-bodied red-finned male was continually being crossed to the clearest-bodied red-finned female.

continued on page 43



CRABS AND THEIR RELATIVES IN THE HOME AQUARIUM

by B. F. CHHAPGAR

SEVERAL KINDS OF CRUSTACEANS, at least the more highly evolved, are suitable for keeping in a home marine aquarium. Thus, there are the crabs, hermit crabs, shrimp, lobsters, and related forms. Let us start with the crabs.

There are many varieties of these, but the most popular ones are the swimming crabs because of their bright colors, handy size, and easy availability. They can be distinguished by the last pair of legs which are flattened so as to help in swimming. There are several colorful varieties that can be collected at the seashore in rock pools.

The desirable size is three inches wide, but beware of their claws! Even at this size they can give the careless aquarist a painful nip. The safest way to handle a specimen is to pin it down against the bottom of the aquarium with the thumb. Then, holding it down with both thumbs, the claws are forced against the body with the forefingers. In this position, the crab can be easily lifted out. Rough handling in a net should be avoided as the crab is prone to hold on tightly to the net frame, and pulling it free might result in its shedding its claw, or claws. Legs are also readily shed, but this propensity of the crab to voluntarily break off its limbs does not harm it permanently. This is nature's provision for escape from enemies and eventually a new limb grows where the old one broke off.

Feeding crabs is no problem. Raw shrimp, mussel, or even a lean meat is readily accepted. Shredding the food is not necessary as the crab has powerful masticating jaws for this chore. The claws are not used for this purpose; they only serve to hold the piece of food. The food is cut up so finely between the jaws that one can see a stream of particles emanating from the mouth. As this tends to pollute the water of the aquarium, it is advisable to use a power filter.

A handicap in keeping crabs or, for that matter, all crustacea, is their periodic molting. When the crab casts off its old shell, its body is soft and it is helpless to ward off attack by other inmates of the aquarium. It should, therefore, be removed to a separate aquarium and kept isolated until its new shell forms and hardens. It now will be larger for it is in this manner that crustacea grow. Readiness to molt can be detected when the crab refuses food and by whitish edges appearing on the edges of the segments of the last pair of legs.

Swimming crabs are powerful enough to shift sizable rockwork which they readjust to their liking. Rockwork should, of course, be provided to give them hiding places and thereby a sense of security. Unfortunately, the swimming crabs (*Portunidae*) insist on aerated water and will die if not allowed to come above the surface in an aquarium not provided with aeration. Provision should be made, therefore, for them to leave the water; this can be done by having some of the rockwork

continued on page 40

A FOREGROUND PLANT FOR THE AQUASCAPE

by G. W. E. BRUNNER

"NOT VERY PROMISING FOR THE home aquarium", I thought when I saw this plant for the very first time. It was a small shoot which resembled moneywort (*Lysimachia nummularia*) or water hyssop (*Bacopa*), but the variability and adaptability of aquatic plants is often very surprising. Setting the plant into the gravel of a tank, it soon developed delicate shoots with small elliptical, bright-green but somewhat reddish (at the tips) leaves. It seemed to be quite a different plant than the emersed form with its roundish leaves! Even now I was a bit skeptical, for often I have observed that such submerged forms survive but briefly in the average heated aquarium. But in this regard, the new plant was an agreeable "disappointment". I have had it for many years now in my tanks, and it is always in good condition, i.e. an ideal aquarium plant.

Where does the plant come from, what is its scientific name, and how does it grow in its natural environment? Unfortunately, I have never seen it flower so I cannot vouch for the scientific name, *Rotala rotundifolia*, but most certainly it is a member of the genus *Rotala* which belongs to the Loosestrife Family (Lythraceae). It is found in Southeast Asia as a creeping plant in wet areas. Some *Rotala* species have adapted to alterations in water level and have become weeds, so to speak, in rice paddies. In this manner, they have spread to many other portions of the world in which the climate is warm.

What are the requirements of *Rotala* in the aquarium? First of all, there should be sufficient light. I have *Rotala* in a tank illuminated only by two fluorescent lamps of the warm-white variety. The distance between the gravel and the lamps is nearly 15 inches. Many failures with this plant (and others) can be attributed to poor lighting. A fact that should be borne in mind is that, the higher the sides of the aquarium (and therefore the water level), the more light is needed for illumination! Furthermore, if we desire a beautiful grouping of *Rotala*, there should be no shadows cast upon it by floating plants. In short, keep the lighting to the plant uninterrupted by others.

Propagation is really no problem as stem-cuttings will develop roots within a short while. To obtain strong plants, it is preferable to mix the



Rotala is suited to tanks of almost any size, especially the small aquarium. It should not be planted as solitary specimens, but in groups.



An emersed shoot of *Rotala*. The above-water form in no way resembles the delicate form of the submerged plant.

gravel with a small amount of potting soil (this is best done by growing the plants in pots buried in the gravel). *Rotala* grows well both in soft and moderately hard water. Temperatures should be within the 68 to 86°F range, with the optimum temperature being about 75°F. As it is a small, delicate plant, it is used to best advantage as a foreground plant, set closely together in clumps of 10 to 20 shoots. From time to time, the stems should be shortened and the plants reset, to keep them as bushy as possible. Cultivated in this manner, *Rotala* is one of the most highly recommended of the new aquarium plants on the market, and a very decorative addition to the aquarium at that. ●

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A NEW CLASSIFICATION OF FISHES, PART II

by ALBERT J. KLEE

OUT OF THE APPROXIMATELY SEVENTY-FIVE FAMILIES of fishes from which our aquarium specimens are obtained, about 95% are to be found in Division III. Most of these are found in three of the five Superorders of the Division, viz. Ostariophysa (carps, characins and catfishes), Acanthopterygii (cichlids and bubble-nesters), and Atherinomorpha (killies and livebearers). A survey made by the author to determine the percentage of the total number of species of aquarium fishes in these three Superorders resulted in the figures 47%, 28% and 16% respectively, leaving 9% of the total number of species scattered about the other Superorders of Divisions II and III.

The one Superorder in Division III that contains no aquarium Families is the Paracanthopterygii, a collection of mostly marine fishes, particularly deep-sea forms, but which also includes our native blind cave fishes of the Family Amblyopsidae. Another Superorder that can be treated briefly is the Protacanthopterygii, an assemblage of more or less slender, predatory fishes such as the salmon and the pike. Included within, however, are two Families of passing aquarium interest: Umbridae (UM-BREH-DEE) and Phractolaemidae (FRAK-TOE-LEE'-MEH-DEE). The former contains the mud minnows (*Umbra*), and the latter contains the rather peculiar, archaic-looking African fish, *Phractolaemus ansorgii*. Since mud minnows are kept only by the most avid of native fish fanciers, and because *Phractolaemus* is both rare and expensive, the Superorder is of little significance to the aquarium hobby.

The Superorder Atherinomorpha, shown in Table I together with pronunciations of the Family names, is of considerable importance, however, as it contains both the killifishes and the livebearers. The Suborder Exocoetoidei is of limited interest but does possess the Family containing the halfbeaks, Exocoetidae (which replaces Hemiramphidae), and the Family containing certain very rare aquarium garfishes such as *Potamorhynchus* and *Xenotodon*, i.e., Belonidae.

Of great interest is the Suborder Cyprinodontoides, containing six aquarium Families (all aquarium Families in Table I are asterisked). Going down the list we find the medakas (Oryziatidae), the killies (Cyprinodontidae, a family which includes the previously-separated

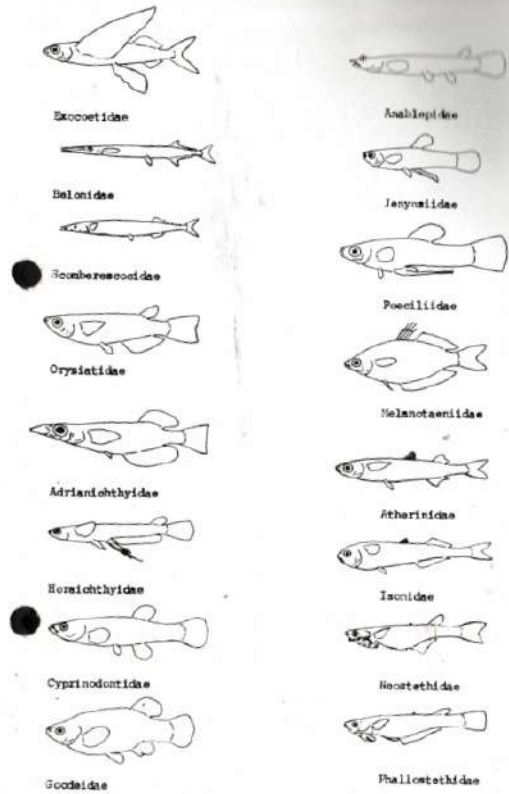


Figure 1: Families of Atherinomorpha

Fundulidae, Orestiidae and Empetrichthyidae), some peculiar Mexican livebearers occasionally seen in aquaria (Goodeidae), the four-eyed fishes (Anablepidae), the peculiar and rarely seen *Jenynsia* (Jenynsiidae, which includes the previously-separated Fitzingeriidae), and the livebearers (Poeciliidae, which includes the previously-separated Torneuridae). The important Families, however, are Cyprinodontidae and Poeciliidae—the killies and the livebearers.

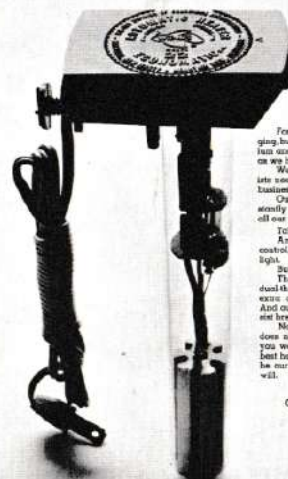
The Suborder Atherinoidei contains two Families of much more limited interest. The Family Melanotaeniidae contains the familiar Australian rainbow fishes (*Melanotaenia*), and the Family Atherinidae (including the previously-separated Pseudomugilidae) which houses certain Australian and Celebes fishes such as *Telmatherina* and *Pseudomugil*. Sketches of all of the Families in Atherinomorpha are shown in Figure 1.

To be continued.

TABLE I
SUBORDERS AND FAMILIES OF ATHERINOMORPHA

Suborder Exocoetoidei	
*Exocoetidae (EX-OH-SEE'-TEH-DEE)	
*Belonidae (BEL-LONE'-EH-DEE)	
Scomberesocidae (SCOM-BER-ER-SOWS'-EH-DEE)	
Suborder Cyprinodontoides	
*Oryziatidae (OH-RYE-ZEE-AT'-TEH-DEE)	
Adrianchthyidae (A-DREE-IN-ICK-THY'-EH-DEE)	
Horaichthyidae (HOR-AH-ICK-THY'-EH-DEE)	
*Cyprinodontidae (SY-PRIN-OH-DON'-TEH-DEE)	
*Goodeidae (GOOD'-EH-DEE)	
*Anablepidae (AN-AH-BLEP'-EH-DEE)	
*Jenynsiidae (JEN-IN-SY'-EH-DEE)	
*Poeciliidae (PEE-SILL-EYE'-EH-DEE)	
Suborder Atherinoidei	
*Melanotaeniidae (MEH-LAN-OH-TEH-NYE'-EH-DEE)	
*Atherinidae (AH-THER-RIN'-EH-DEE)	
Isonidae (EYE-SON'-EH-DEE)	
Neostethidae (NAY-OH-STETH'-EH-DEE)	
Phallostethidae (FAL-LOW-STETH'-EH-DEE)	

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A Short Discussion On Chemistry

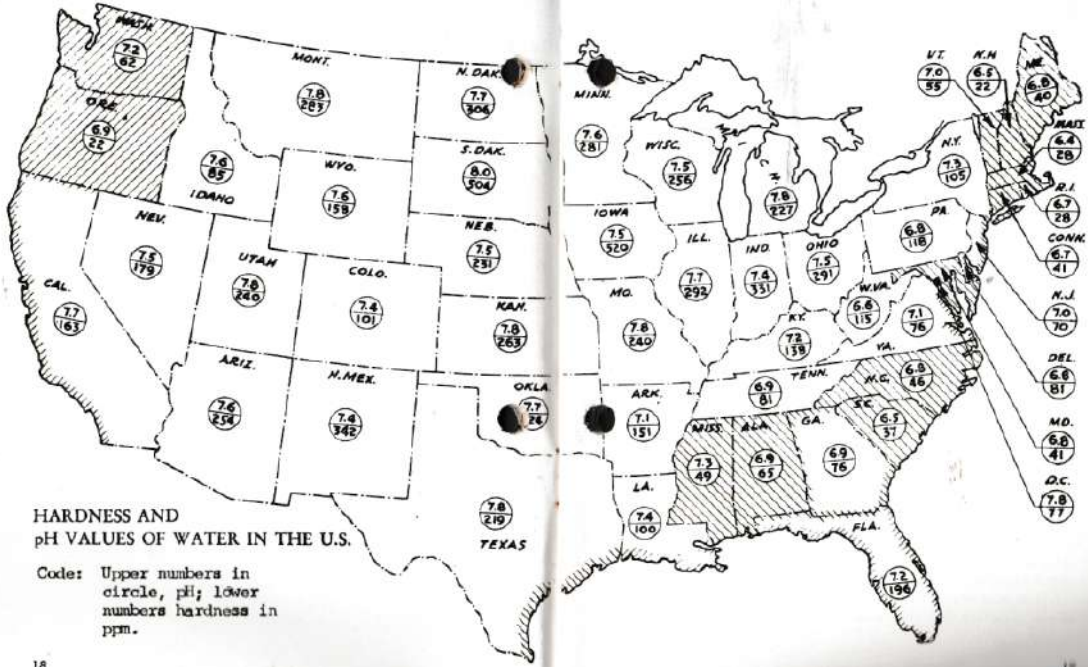
by JERRY CURRIER & MARTY SMITH

NO, THIS IS NOT GOING TO BE AN intellectual problem in big words to explain a small topic. We promise! But we have noticed that many people allow themselves to become overly concerned with two items of water chemistry, viz., pH and hardness.

pH can be described with a lot of fancy terminology but to the home aquarist it boils down to, "Is my water too acid, too alkaline or just

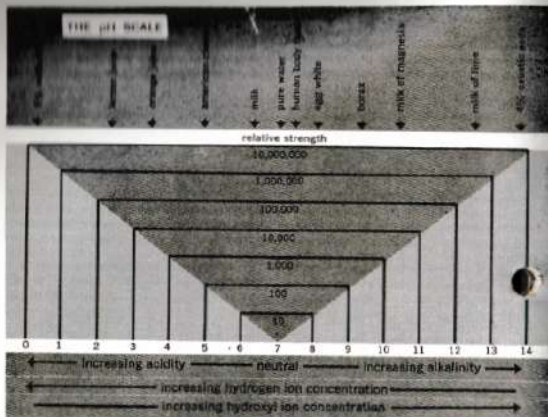
right?" First off, let's get a lot of people up in arms and state that we firmly believe that the acidity or the alkalinity of aquarium water for the most commonly kept fishes is not really important. For instance we have a number of spawning pairs of angelfish (*Pterophyllum scalare*). The water in which they are kept ranges from a pH of 7.5 to 6.6 or so. These fish spawn with great regularity and seem to have no preference as to water condition.

We have spawned and raised the black neon in water with a pH of 7.5 and a hardness of more than 120 ppm. The same holds true for many



HARDNESS AND pH VALUES OF WATER IN THE U.S.

Code: Upper numbers in circle, pH; lower numbers hardness in ppm.



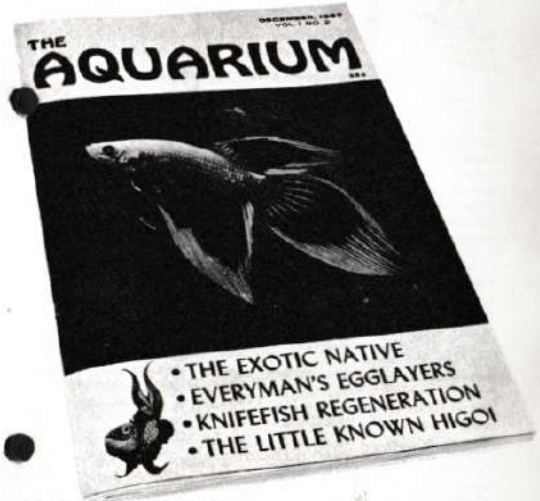
of the egglayers. Everything from zebra danios (*Brachydanio rerio*) to the black phantom tetra (*Megalomphodus megalopterus*) have been successfully spawned and raised in a wide range of water conditions.

Although we will admit that excessive exposure to extremes in water conditions may bring on disease or debilitation to certain fishes, we also feel that too many people turn their aquariums into chemical torture chambers for the fishes. The individual we are referring to worries constantly about pH and/or hardness. He is continually dumping some sort of chemical into his aquarium(s) to "bring the water to the 'right' condition". Soon his fishes are listless or dying, his plants are turning brown and wilting, and he blames the fish dealer, the fluorine in the city water supply, the weather, or any other handy scapegoat for his own mismanagement.

We propose that water should not be adjusted to the fish but conversely, that the fish should be adjusted to the water. This simply means that your fish can probably be acclimated to your water if you do it slowly. "How do you do that" you might ask. By simply adding small amounts of your water to the container in which your fish were placed when you purchased them. This should be done over a period of half an hour or so. (Because of the limited oxygen in this small volume of water you may wish to aerate the water in the container by means of

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Societies at Work

By
HELEN SIMKATIS

THE TRUE MIRACLES ARE EVERYDAY happenings we take for granted. We could prove our point by numerous examples, but we really don't have to because Don Hohenstein has done it for us in his *Now You Take The Egg . . .* appearing in the June issue of *Aqua-Focus*, published by the Aquatic Researchers of San Antonio. In an era when packaging has become a symbol of our sophisticated technology, we are reminded that nature faced the problem of packaging eons ago in the early stages of evolution and squared it away by phasing the egg into the scheme of things. The author shows us this remarkable little package through his eyes and we will never take it for granted again when we consider his inventory of what it contains. The list reads something like this: x number of inherited characteristics of a given individual of a given species; x number of abilities and limitations; x number of physical and mental tendencies of all the preceding generations of both parents of the individual; all of where the line of the individual has been, and all of where it is going; plus a survival kit of food and means for both respiration and waste disposal during the incubation period. The miracle we take for granted becomes even more miraculous when we realize that every giant tree as well as each blade of grass we see began life in a tiny package we call a seed. The author goes on to describe a number of kinds of eggs, their complexities, and the many ways they are brought through the incubation period and we are left to our own devices to contemplate the built-in knowledge that directs each creature to tend its eggs in a particular way. This is a piece that stimulates awareness and alerts us to the wonders of life in which

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we are participants. Best of all, we are promised there is more to come in the next issue of *Aqua-Focus*. In this same issue, Braz Walker reflects on *Jellyfish: Old and New*. Tracing it back to the Cambrian Period, some six hundred million years ago, he tells us that it has changed little and this is because its design was a most successful one. He pinpoints this creature as being the first to have a true mouth and stomach. Its stinging tentacles enable it to reach for fish and other living animals and paralyze them before stuffing them into an eager mouth. The maneuverability of a jellyfish is further evidence of its functional design and as fragile as it seems, its body can adjust to any pressure imposed upon it. These faculties add up to biological success and although it lacks a nervous system, the creature remains extant long after the mighty dinosaurs have disappeared from the earth. All of this allows you to cast quizzical eyes on the next one who tells you not to be a jellyfish. We might add, however, that it really depends on how much you want to survive. In another excellent piece in this issue, Dr. Harry O. Specht covers the *Golden Convict Cichlid* very nicely. He pins it down as being a color variant of *Cichlasoma nigrofasciatum* and gives the background and history of this mutant. He singles it out as being a most desirable cichlid and lists its merits. Among these is the one characteristic many hobbyists look for in a cichlid; it is a good community tank fish, but, of course, should be kept with fish of comparable size. It gets along with gouramis and swordtails but can hold its own with Jack Dempseys and *Cichlasoma severum*. His specimens are kept in a large aquarium (180-gallon capacity) and do not exceed 4 inches in length. It is a hardy fish, not fussy about hardness of water, and not difficult to feed. The fish is a willing spawner and will raise a family in a 10-gallon tank although a somewhat larger tank may be used. Dr. Specht furnishes the spawning tank with several flat rocks and a flower pot turned on its side. Beef heart and live food are used as conditioners. This is reference material as well as good reading and those who are interested in working with cichlids for the first time should consider this attractive, amiable species. Along with these three outstanding articles, this issue is filled with sparkling material gleaned from international as well as domestic sources. Write to Editor Leona V. Bradley, *Aqua-Focus*, 301 Blanco Road, San Antonio, Texas 78212 for information regarding the bulletin and the publishing society.

Jean Lucas weighs the pros and cons of the thinking man's fish in her *Confessions of a Confirmed Cichlid Nut*, appearing in the June issue of *The Wet Pet Gazette* (published by the Norwalk Aquarium Society). As best she can, she peels off her prejudice by frankly discussing the disadvantages of cichlids as aquarium fish. Aggressiveness,

continued on page 70

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ABOUT OUR AUTHORS



GEORGE TORRES

George Torres is one of our really hard-core hobbyists, and one of the best known aquarists in the tri-state area of New York, New Jersey and Connecticut. Although he has gained widespread recognition primarily for his strains of bettas, winning many dozens of trophies and developing the special strains he calls "Bronx Bettas", George originally started out with guppies. After a few years, however, the space problem literally forced him to give them up.

Recently, George was elected to his third term as President of the Bronx Aquarium Society and, in addition, was elected Vice-President of the International Beta Congress. He has written many articles for society bulletins throughout the country, some very controversial (they are still talking about one he wrote concerning albino bettas!). He is in great demand both as a speaker and as a judge. A man of considerable talent, George went to the famous Cooper Union Engineering School in New York City where he majored in Electrical Engineering.

His service career included a stint with the US Navy, and we certainly won't forget to mention his lovely wife Alice and his daughter Susan!



B. F. CHHAPGAR

B. F. Chhappgar (the second "h" is no mistake!) was Curator of India's largest and best public aquarium — the Taraporevala Aquarium at Bombay — between 1959 and 1965, whence comes his considerable expertise with fishes. At present, he is Assistant Director of Fisheries (Medium Trawlers) in the State Government at Bombay. As Director Chhappgar remarks: "This might seem to conflict with my earlier post in that, whereas my skill as Curator lay in killing as few fishes as possible, now I gain more credit the more I catch and kill!"

Mr. Chhappgar tries hard to get away from fishes in his spare time (too much of a good thing . . .) and escapes by taking to rock climbing and mountaineering. After all, rocks are the antithesis of water! But then

continued on page 67

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THIS IS MY PROBLEM

by HELEN SIMKATIS

From: Paul Wake, Riverside, California.

I have several questions that I would like to ask you.

Question: How many fish can safely be kept in a 10-gallon tank with an underground filter and airstone?

Answer: Although the rule a gallon of water to an inch of fish was developed long ago as a rough guide, it is still a good one. The reasons behind it then were based on sufficient oxygen content of the water and control of the build-up of carbon dioxide and waste materials. Since then new ideas on the subject have been developed. The water in the aquarium is the extent to which each fish you have in your aquarium will ever know. It represents not only where the fish will live, but it also represents the greatest distance it will travel. It is its indoors and outdoors. Fishes not only require sufficient oxygen and clean water in which to live, but they need exercise (swimming room) and freedom of movement (uncrowded conditions) if they are to grow and remain healthy.

Question: I have two aquariums, one ten and one five-gallon tank. When light shines through them, the white wall behind the ten-gallon tank is yellow white behind the five-gallon

tank it is white. Would you know what causes this?

Answer: The 10-gallon tank apparently isn't allowing as much light to pass through the water as the five-gallon tank which indicates that either the water isn't as clear as the water in the five-gallon tank, or that there is a film of algae growth on the front or back glass, or both.

Question: Can both a female and male betta be kept in the community tank without their fighting?

Answer: This really depends upon the individual specimens. We have known of a male and female betta living peacefully in a community tank, but on the other hand we have known of females that had to be removed because of aggressive males.

Question: What is the smallest tank angelfish can be bred in successfully?

Answer: As far as recommendations go, a 10-gallon tank can be used for breeding angles but a 15 or 20-gallon tank would be better.

Question: Recently I bought some *Vallneria* at a local pet shop. When I planted it in my 10-gallon tank, a few inches of the leaves were partially covering the surface of the water. I cut the leaves a few inches below the water with a pair of scissors. Soon after, the val began to die. What was my mistake and how can I

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WETBACKS FROM SINGAPORE

by DIANE SCHOFIELD

WITH RARE A VISA TO THEIR NAMES, there are many new "citizens" entering this country every day without a "by-your-leave" to our quota system. These are "wetbacks" but not quite the kind of sombreroed individuals that one pictures doing the breast stroke across the Rio Grande. These particular individuals are truly "wet" backs because they are fish which come in regularly from various points of the Orient, mostly Hong Kong and Singapore, to ultimately grace our home aquaria.

It is most interesting to see how the fish are kept in the shops in what might be termed the "Mother Lode" of tropical fish sources. During the course of one afternoon, I gleaned some unusual nuggets of information while standing in the steamy humidity of a Singapore fish shop, conversing with its owner. This oriental gentleman, who apparently had been in the fish business for quite some time, said that he always used a flashlight to determine the first signs of ich. He gives his fish the once-over-lightly early in the morning before it is completely light. The ich "blossoms" are prone to shine and stand out sharply under such illumination, becoming much more apparent to the naked eye than when viewed under more normal artificial illumination.

This same Chinese chap also passed on the information that he uses dried banana leaves to prevent fungus. He dries these leaves for one week, and then puts them into his tanks—a 7' to 8" piece of leaf to one 15 gallon tank is the dosage recommended. There is apparently something about these leaves, a chemical contained therein perhaps, that prevents fungus. One must stop at this point and say that naturally, there is no need for artificial heat in Singapore. What one really needs is artificial cooling, if anything. Nevertheless, ich and fungus are always spectres with which to be concerned no matter on which side of the globe one resides.

But, perish forbid, the fish in his shop do develop fungus. They get a very radical treatment indeed. He removes the fish from the tank and holding it carefully in a wet net, burns the tail (or the otherwise afflicted

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One of the tropical fish stores along Queen Elizabeth Walk.

part) with fire to destroy the offending organism. Apparently, this seems to destroy the fungus, which is really a parasitic plant, and doesn't harm the fish itself.

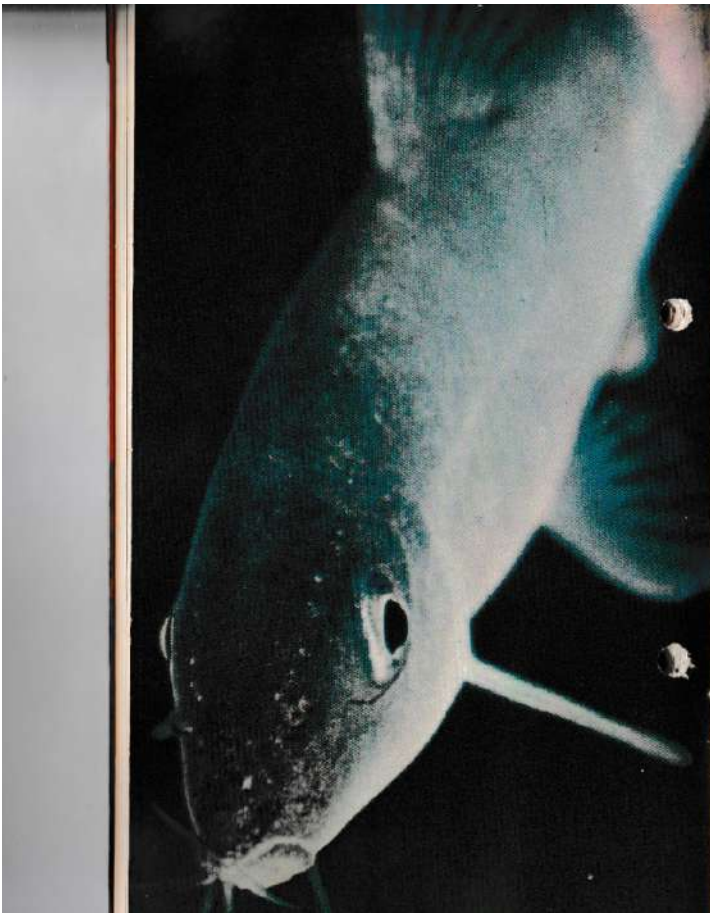
Tubifex is in plentiful supply in Singapore, being ridiculously cheap for a large portion. It is, moreover, never kept in running water as here, but instead is kept on a cold tile floor (or as cold a tile floor as it is possible to have in Singapore). This floor is at the back of the shop and since it is damp, the worms spread out on it and seem unusually healthy for such a hot climate. Occasionally, somebody rakes them up and rearranges the mass so that the worms underneath do not suffocate.

Another deviation from conventional fish-keeping is that this same Oriental gentleman seems to feel that colored lights are more beneficial to fish than those of more normal hue. He has done much experimentation along these lines and as a result, when one passes his shop, the tanks therein resemble an assortment of huge illuminated multi-colored blocks, as each one has a differently colored bulb lighting the paths of the fish as they swim around their dry banana leaves.

The majority of the fish in Singapore shops are tiger barbs and glass cats from Johore, which is just across the causeway from the relatively small island of Singapore. Most people do not realize that Singapore is only 27 miles by 14 miles in size; yet, such common inhabitants of our

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A Spawning Attempt At Blue Botia

by ABBEY DAVIDSON

LDACHES OF THE GENUS *BOTIA* are not generally popular in this country because breeding of the fish has been far from successful. The result is that *Botia* are expensive. Recently, however, a spawning has been reported in Europe. A spawning attempt was made here in Texas which appears to clarify sexing of *Botia modesta*, the "blue" *Botia*.

A specimen, which was developing a pronounced bulge forward of the anal fin, was isolated for several months. The most likely causes of the bulge were considered. Overfeeding was eliminated by taping Saran Wrap around the top of the tank while the fish was not fed for a week. The bulge was unchanged, so it was either a growth or an indication of a mature female. The fish was compared with two other blue *Botia* which had been imported with it. Compared to the other fish, the swollen specimen had (1) a different curvature above the head and forward of the dorsal; (2) a lower ratio of minimum depth of caudal peduncle to fish length and (3) a higher dorsal ray count.

The evidence indicated that a spawning attempt was in order. Arrangements were made with Dora's Tropical Fish in San Antonio for assistance. A tank of 30½ x 13 x 16½ inches was located in a quiet corner. The longer sides of the tank were arranged along north-south lines. Seven inches (in depth) of water of pH 7.2 and 100 ppm calcium carbonate hardness were added. Several plastic flowers and a bottom filter were used with no gravel. The water had safely contained fish for several weeks. Rapid aeration was employed to help reduce settling. Jumping was anticipated, so ceiling tile wrapped with aluminum foil was used as a cover. Lighting was from two 25 watt incandescent lamps located respectively about eight feet and fourteen feet from, and slightly above, the tank. Some diffused fluorescent light from a nearby tank was present, as was diffused daylight from a nearby window. No reflectors were used and the tank had a flat-blue background.

The swollen specimen and a ceramic catamaran boat were placed in the spawning tank with the water at 77° F at the bottom. A few hours

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CHHAPAGAR: continued from page 9



The blue crab (*Portunus pelagicus*) can be sexed easily. The male is deep blue and much larger than the yellowish female.



Charybdis craciata is venerated by local Christians because of the design resembling the back of a cross with an angel on each side.

projecting above the water level. In an emergency, if the aerator pump fails, these crabs can be kept in water just a half-inch deep so that part of their body is exposed to air.

Walking crabs are harder than the swimming crabs in that they can live in un-aerated water but they are wont to climb out of their aquarium and go exploring. The aquarium should be tightly covered to prevent their escaping. Grapsid crabs, which are found on rocky shores, should be especially avoided as they are extremely agile runners, having spiny legs by which they can easily climb out of a tank. Sluggish walking crabs, however, like the pitted brick crab (*Atergatis intergerimus*) or the box crab (*Calappa lophos*) are easy to keep, as they are not so adventurous as to climb out. The latter, as well as the yellow swimming crab (*Matuta hmaris*), having all legs flattened as an adaptation for swimming, often bury themselves completely in the gravel, leaving only their eyes peeping

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The throatspotted crab (*Portunus sanguinolentus*) and the pitted brick crab (*Atergatis intergerimus*) make good pets.

out.

A group of crabs which do not require any artificial feeding are the fiddler (*Uca*) and porcelain (*Leucosia*, *Philyra*, etc.) crabs. They pick up sand grains and lick them clean of the fine film of diatoms and bacteria that grow on the sandgrains. Unfortunately they are all of a small size with the burrowing habit and are easy prey for larger crabs or fishes. The spider crabs are so named because of their long spindly legs. Many carry a "garden" of seaweeds and sponges on their backs.

Related to the true crabs (or *Brachyura*) are the *Anomura*. These occur in several shapes, some having a long lobster-like tail while others bear a superficial resemblance to crabs. The latter, however, can be distinguished by examining the abdomen. In true crabs the flap, or abdomen, is tightly tucked under the body. Moreover, the last joint of the flap is simple and triangular. In the crab-like *Anomura*, on the other hand, the flap, though tucked under the body, is loose and is readily unfolded behind the body. Its last joint has two plates (uropods) on each side of it. The claws are usually flat and not as strong as those of crabs. These creatures are quite common and can be found by overturning stones between the tide marks. They cling tightly to rocks and they are even more prone than crabs to shed their legs and claws. They should, therefore, be picked up carefully.

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The box crab (*Calappa lo-phos*) can hold its broad claws in front of its body for protection.



Maluta lunaris is a graceful swimmer, having all its legs flattened to form paddles.



Petrolisthes boscii (the red one) is more closely related to the hermit crabs, but the porcelain crab (*Leucosia neocaledonica*) is a true crab.

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The sea scorpion (*Thalassina anomala*), unlike its terrestrial brothers, makes a harmless pet.



Pagurus punctulatus is a true hermit crab.



The green crayfish (*Panulirus versicolor*) is even more pretty when young.

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The hermit crabs have only the front part of their bodies encased in hard armour. The abdomen is soft and fleshy. To protect this soft delicacy, the hermit crab tucks it into a sea snail shell. It normally tries to occupy an empty shell, but if it cannot find one, it will kill the snail, eat it, and occupy the shell. It might also fight with another hermit crab, forcing it to vacate its "house" and then requisition it. The shell seems to play an important psychological role for the hermit crab, as an animal without a shell seems to wander about frantically in search of one. It's not that it is ashamed of its nudity, but it does not feel secure until its exposed belly is protected. Naturally, as it molts and grows it requires a larger shell, and this should be provided if one wants to keep hermit crabs in the home aquarium. It is interesting to see how a hermit crab, on coming across an empty shell, investigates it by rolling it over and viewing it from all angles. Ultimately, when it is satisfied, it quickly comes out of its old shell and pops its abdomen into the new one.

Shrimps also make good occupants of a marine aquarium, but lobsters are too aggressive. Crayfishes, however, are all right. Remember, however, that they grow to over a foot long, when their feelers (antennae) may be double this length. At this size they would be rather a tight fit in most aquariums. Even though the crayfish lacks claws, it should not be handled carelessly. Never hold one with fingers encircling around the front part of its body, as the animal can flap its abdomen vigorously under, stabbing the hand with the strong spines on the sides of the joints of its abdomen. The spiny feelers can also inflict injury.

The pistol shrimp, as its name implies is capable of making a loud sound by clicking the fingers of its larger claw. Beware of keeping one—they have been known to crack the glass of their aquarium by the resonance resulting from the sound—a feat one would not imagine to be possible by a puny two-inch shrimp.

Crabs, hermit crabs, shrimps, and lobsters can all be kept in a community aquarium provided all the occupants are continually and adequately fed. Large fishes may otherwise nip at their legs. On the other hand, though fishes are too agile in the daytime to fall prey to any of these creatures, at night they may be stalked and caught. Crabs and hermit crabs are also likely to steal food from sea anemones. Remember, also that they are bullies with their weaker brethren, so if feeding is scanty or at prolonged intervals, they may provide you with a practical demonstration of "survival of the fittest." Otherwise, they are not very demanding.

As all crabs are cannibals, there should not be a great difference in the size of inhabitants of the same aquarium. Abundant feeding to offset the cannibalistic tendency, availability of clean aerated seawater, shelter in the form of rockwork, and watchfulness to remove any crabs about to molt, will result in a troublefree aquarium. ●

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TORRES: continued from page 7

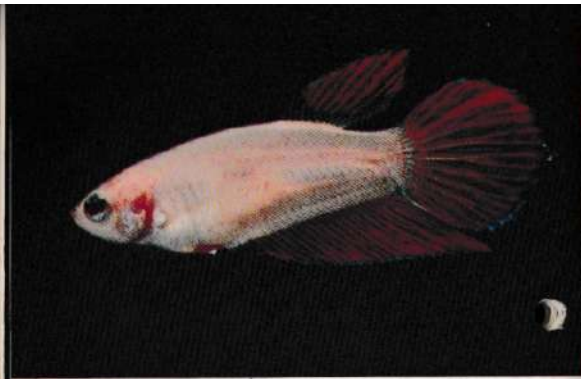


This adult golden cellophane female was severely damaged by the male, but the closeup photograph clearly shows the golden coloration characteristic of this new strain.

One day last summer, when routinely checking a tank that contained a small spawn of six-week-old Cambodia fry, I noticed that there were six fry that were not showing any red color in their fins, although this in itself was not particularly unusual. They immediately were separated, placed in a 5-gallon tank and pampered for the next month or so. As they grew, it was noticed that their fins were starting to take on a very pale golden hue. Particularly interesting was the fact that the bodies of both the two males and the four females involved were assuming a degree of translucence such that the spinal column of these fish were discernible. The males were placed in jars, the females remaining together in the 5-gallon tank.

By the time they were four months old, it was noticed in the males that what was originally thought to be a complete golden color in the fins was, in fact, only an illusion that was created by the fins folded and at rest. When both males were exposed to the view of other males,

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An example of the red-finned progeny (at four months of age) that were produced in the final course of developing the golden cellophane bettas. These fish were not, of course used in breedings that followed.

Along with the red-finned cambodias, about 25% golden cellophanes were produced (such as this one at four months of age) in this final stage in the breeding series. These fish were then bred, brother-to-sister, to produce a 100% true-breeding strain.



A very young (10 weeks) cellophane betta. At this age they are very transparent.

causing their fins to spread and erect in their customary fighting pose, it was noted that the fin rays of all the fish were of a golden color and that the membrane between the rays was transparent to the extent that one could see right through them. The color of the bodies of the males was now becoming a darker gold.

The females were examined and although their fin coloration was exactly that of the males, their body coloration had maintained their startling golden clarity. More surprising, however, was the fact that all of the inner organs of the females were visible to the naked eye (the transparency of the body was not unlike that of the glass catfish, *Kryptopterus bicirrhus*). The swim bladder, ovaries, part of the circulatory system, vertebral column, and even some eggs were visible. Having bred bettas for many years and having seen literally thousands, both males and females, I must admit that I had never seen anything quite like these six young sports. They were immediately christened with the exotic-sounding name, "golden cellophane betta".

In the months that followed, brothers and sisters were conditioned properly and have since been bred. The progeny of the F-1 cross produced a spawn of about 75% red-finned Cambodias and 25% golden cellophanes. The red-finned male Cambodias are of the normal type (blood-red fins, pink-colored body) but the females, in addition to having blood-red fins, also have the same body characteristics as their golden cellophane mothers. Subsequent brother-sister crosses have produced 100% golden cellophane progeny. As to what this does to Mendelian theory, I won't even guess! ●



The "business end" of the pike livebearer. The curve of its upper jaw enhances its "mean" appearance. Once a fish is caught in this needle-work of teeth, it is held fast.

CONNELLY: continued from page 5

In most cases, the wicked-looking jaws are the first part to attract attention. In many ways, the fish resembles our common pike, hence the popular name. The substantial curve to both the upper and lower jaws does not permit *Belonesox* to close them. As a result, row after row of fine teeth are easily visible, enhancing its appearance as a "mean" fish. The overall coloration is olive-green, flecked with regular rows of small black spots. In reflected light the sides show an iridescent green, and the large black area at the base of the tail is complemented by a big eye. The dorsal fin is set far back on the fish, but otherwise the fins are not outstanding. The anal fin of the male serves, as in all livebearers, as a gonopodium but in *Belonesox* it is rather large and well-defined.

In their natural habitat, *Belonesox* are found in neither fast nor stagnant waters, but rather along the banks of slowly moving streams, mangrove and reedy swamps, and inlets to salty bays. In the aquarium, an addition of salt is sometimes helpful to prevent fungusing of bruises, but I do not find it necessary with my fish. They seem to prefer dirty to clean waters, and well-planted to open ones. *Belonesox* have even been found in areas completely covered with algae, and in cattle watering holes! In these ubiquitous surroundings, *Belonesox* are discovered near the water surface preying on small characin-like fishes.

An interesting account of the collection of *Belonesox* in the wild



Because the pike livebearer is so striking in many ways, aquarists often overlook the fact that it is a livebearer, one of the hobby's largest in fact. As with all livebearers, the anal fin of the male is modified to form a gonopodium, used during the mating process.

was given several years ago by James D. Thiele of Miami, Florida. Writing in *Aqua-Focus*, the publication of the Aquatic Researchers of San Antonio fish club, Mr. Thiele described the experience as follows: "On March 17, 1955, a four-man fish collecting expedition for the Navy and the University of Miami left that city by plane for Havana, Cuba, enroute to Merida, the capital city of Yucatan, Mexico. The object was to collect living specimens of *Belonesox helizanus*. The fish were to be used in a research program conducted at the Department of Microbiology, University of Miami, under contract to the Office of Naval Research.

"Arriving in Merida, Yucatan at about 6 p.m. on March 17, 1955, we wasted no time in making preparations for collecting *Belonesox*. At 6 a.m. on March 18th, the four-man team started for Progreso, Yucatan, by automobile loaded with all our equipment. Our destination was a series of small rivers just outside the city limits of Progreso—information supplied to us by Dr. Luis Rivas of Miami University. Upon arrival, we observed the area and discovered a few specimens of *Belonesox*. With a large dipnet, we quickly captured a nice pair which were placed in an aquarium so that our guides could be sure of what we wanted.

"They assured us they were familiar with *Belonesox* and told of a large freshwater spring (Cenote) where they were extremely large and plentiful. Our present location was almost pure salt water, so it was



In overall appearance, the pike livebearer resembles a sort of rocket. The many rows of very fine black spots on the sides of the fish enhances its appearance.

decided to try out the Cenote. After a lengthy trip upstream and then overland, we arrived at the site. Careful observation and search of the area turned up *Mollenisia velifera*, *Astyanax mexicanus*, *Cichlasoma meeki*, *C. octofasciatum*, *Gambusia* and *Cyprinodon*. But no *Belonesox*! We then started downstream. In a very narrow stream about two miles long we ran into many *Belonesox* but the heavy jungle growth made it very difficult to catch them. After about four hours, we managed to capture some fifty specimens. It was nearly 4 p.m. so we decided to return to the car and back to Merida.

"In the hotel, we set up plastic bags in boxes and made up an emergency aeration system connected to an oxygen tank. We decided to use this oxygen system only if an emergency arose and, if possible, to save it for the return trip back to Miami. The next day, March 19th, 1955, we collected about twenty-five more specimens of *Belonesox* and about twenty more *Mollenisia velifera*. We got in some more photography and returned to Hotel Merida about 3 p.m.

"For the rest of the afternoon, we just turned tourist and visited the interesting places in Yucatan. At 9 o'clock we came back to the hotel and were greatly alarmed. A foul odor hung about the room and almost all the fish were gasping for air. This was an emergency, so we turned on the oxygen. Within an hour, all the fish save for four *Mollenisia velifera*

were in perfect condition, and so the oxygen was turned off. The next day, we packed the fish in plastic bags, filling the air space with oxygen and placing them in boxes for the return trip to Miami. On our trip back to the University, our prize *Belonesox* female gave birth to 116 young as we changed planes at Havana, Cuba. Upon arrival at Miami, we had lost only one large male and one of the new-born fry. We considered our trip very successful. Today, these *Belonesox belizanus* are playing a very important part in the research project at the University of Miami."

Perhaps the earliest of the American aquarium reports about the maintenance and reproduction of *Belonesox* was that published in the April 1930 issue of *Aquatic Life*. The article, entitled "Notes On *Belonesox belizanus*", was written by that fishfarm pioneer, William E. Schaumburg of Crescent Fish Farm in New Orleans, and is reproduced here in part: "At the time these fish were received they were about 2½ inches long, and careful examination convinced us that four of them were females. In this section of the country, every pool and body of water abounds in *Gambusia affinis*, so our food problem was an easy one. By December, they had grown to a big size, the males attaining a length of 4½ inches while the females had reached a total length of 5 inches. We also noted that the females were gravid, so they were placed in separate tanks and fed plentifully.

"On January 12, 1930, one of them gave birth to 22 young. The female was placed back with the males two days after she had delivered her young, and on February 28th, one month and ten days after her first young were born, she gave birth to 44 young. Another female gave birth to 20 young, and the third had 18 on her first delivery. The last two have not had their second litters yet, but will in a week or ten days.

"The birth of the young was quite interesting. They were born at intervals of from 10 to 15 minutes, the first one head-first and the second one tail-first, and so on until the whole litter was delivered. This is nature's way of packing the young—whose forepart of the body is larger than the hind part—comfortably in the body of the female. We sacrificed one of the young immediately after birth in order to obtain accurate data on measurements, and found it to be ¼ths of an inch long.

"Contrary to expectations, we found the female was not disposed to eat the young; in fact, we noticed that she stopped eating two days before delivery of the young. The youngsters took large daphnia and mosquito larvae the day after birth. The growth of the youngsters is undoubtedly fast. The young born on January 18th are at this writing (March 4th) two inches long. Because of the odd weather which caused a shortage of extra small *Gambusia*, they were fed on alternate days. We are going to try a later litter, when young *Gambusia* are plentiful, with a daily ration of them and see what growth is made. I predict a triple growth in 90 days.

"The fish are an interesting livebearer and will make a valuable

addition to any collection, but they cannot be kept with any small fish."

My own specimens range in size from 4 to 6 inches for the females to 3 to 4 inches for the males (the largest size reported for this species is 8 inches and 5 inches for females and males respectively). At first they were kept in a 29-gallon aquarium, but needing the space I transferred them to a 10-gallon tank. During an effort to feed them earthworms, whiteworms, dry and frozen foods, the *Belonesox* took no nourishment for almost two weeks. At no time did they molest each other despite the disparity in sizes. Finally, it was considered advisable to resume their normal fare of adult guppies. Fortunately, my work in linebreeding various strains of guppies provided me with enough culls to feed the *Belonesox*.

The temperature of the aquarium that houses my *Belonesox* fluctuates between 75 and 90°F, with no evidence of discomfort to the fish. Two of the females presented me with batches of young, enabling me to study them under aquarium conditions. The first batch was not long in being devoured by the parents, contrary to Mr. Schaumburg's experiences, but the second was saved by the concealment afforded by a handful of anacharis thrown in for just that purpose. Each batch numbered about forty, ½ inch baby *Belonesox*. Resembling little sticks, their sides were marked with a black stripe. The dorsal and anal fins were orange-tinted, and although they lacked the huge jaws of the parents, they did have an enormous eye.

The feeding problem was easy in this case, for the young ate frozen brine shrimp and frozen daphnia from the start. German aquarists, who have known this fish since 1909, have stated that the young are compatible, but my observations indicate otherwise. I paused from a photographing session in time to see a week-old *Belonesox* grab a companion by the middle of the body. After struggling for over 20 seconds, the victim managed to free itself, minus quite a few scales.

As an experiment, I placed a young guppy two-thirds the size of the baby *Belonesox* in their tank. Within a minute, a baby *Belonesox* grabbed it about the middle, tossed it and had it swallowed. Over the succeeding weeks, however, I was able to train the *Belonesox* to eat grated, frozen beef heart. This was a great relief as I was fast running out of guppies!

Belonesox belizanus is a fascinating fish, definitely one of those "different" livebearers. As much as I do not like to inject a sour note here, it should be mentioned that the species is one of those on the restricted list in the State of Texas, and aquarists wishing to keep *Belonesox* there must obtain a permit for them and presumably for each one of the young that may come along in time. To further compound this nonsense, the State also requires notification in writing should the aquarist decide to get rid of his *Belonesox*. What fools some mortals be!

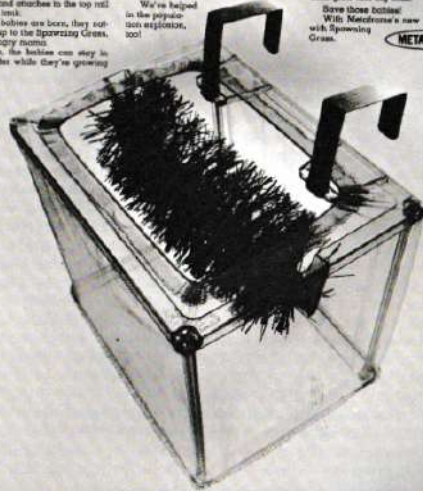
This is our new Net Breeder. It's the only one made with Spawning Grass. Now, she can have her babies and not eat 'em!

The newest aquarium hobbyists are excited from other babies a system to solve over the fears of their wonder, and attaches to the top rail inside of my tank. When the babies are born, they naturally swim up to the Spawning Grass, with their hungry mouths. After birth, the babies can stay in the Net Breeder while they're growing

up, fully protected and enjoying the same fresh oxygen of the community tank. We've helped in the population explosion, too!

This is the first aquarium breeding device that let's you see all the little ones grow into big ones. Solve those ickies! With Metacrome's new Net Breeder with Spawning Grass.

METACROME



KLEE: continued from page 33



One of the earliest aquarium cartoons printed in this country (1916). Viewing the humans in the tank for \$2.00 apiece, the youngster fish is saying, "Pop, buy me one?", the father fish — "No, they're too much balder", and the mother — "And they're too expensive!"

75 young and half-grown. I paid him \$2.50 for a half-grown pair which were transported to my home in a tin can. Having no way to heat them at the time, I placed them over an electric light globe for the night, forgot to cover them, and found them both on the floor in the morning, dried beyond repair.

"If my recollection serves me, there were also in this establishment, a few pairs of paradise and about 6 or 8 *Gambusia holbrooki*. This little fellow was really quite good looking, a livebearer, but seldom seen any more. The female resembles very closely a guppy. The male, about the same size as a guppy male, was made up of a series of black and white blotches, not unlike a poor grade black *Molliesia*. The eyes were a milky white and he was not an unattractive chap. Now and then in a litter, a much darker male would develop and usually brought good prices.

"At the time of which I speak, it was impossible to get Mr. Richards to relinquish any of his breeders at any price, but babies, a couple weeks old, sold for \$1.50 a pair. A small cabinet, probably of ten cubic feet contents, comprised the entire tropical fish department, and the foregoing fishes, both tropical and semi-tropical, comprised all the stock, so that one must use his imagination to figure out how any one could really get very far under these conditions unless he obtained pretty good prices for his products.

"The aquarium situation was really a little amusing. Being a mechanic myself and not able to afford a \$50.00 or \$75.00 aquarium, I felt that I could build it quite reasonable. I did so, but went aground in the fog when Mr. Richards refused to sell me any aquarium cement for the purpose of setting the glass. No amount of coercion could tempt him and I was informed that aquarium cement was a deep secret and his own particular formula. I am frank to confess that no one in San Francisco had ever heard of aquarium cement when I tried to buy some



A wrought-iron rack, built to hold three aquaria, circa 1915.



A standard metal frame aquarium (painted frame) of 1915.

elsewhere and I was forced, on my own initiative, to compile my own secret formula which, at first blush, materialized into an awful fizzle.

"While my tank frame was gradually rusting, I was in the throes of a new inspiration, namely mixing various dry ingredients and combining them into a perfected aquarium cement. I even had visions of making a fortune out of it if I did solve the problem. The house was littered with small pieces of broken glass, stuck together with various formulas, labeled, numbered and tagged. We finally completed the aquarium (much to the chagrin of our fellow tenants) on the drainboard of an apartment house sink. We had no other place in which to work.

"A few plants were obtained at fabulous cost and we were well on our way toward the realization of a wonderful dream, which, before many moons, took on all the aspects of a brainstorm.

"A new aquarist appeared on the horizon, and I discovered him quite by accident one day on Sutter Street at the corner of Buchanan. He had some beautiful medakas on display in a few bowls in the window. These were surrounded with various Japanese groceries and other paraphernalia. No other equipment was offered for sale except a few large goldfish which were in the back, along with two or three tubs of newly arrived medakas. This enterprising "Isaac Walton" was none other than an old friend, Mr. T. Murata, who was dying to get out of the grocery business and into the fish business.

"Suiting the action to the word, Mr. Murata did go into the fish business and on no very small scale. At the time this step was taken by him, there was no one in the West who had either the inspiration or the imagination to branch out in a big way along these lines. A new



The Long Island Bird Store
131 FLATBUSH AVE. Brooklyn

A view of the Long Island Bird Store, the oldest fish store in America.

aquatic importing organization was born in San Francisco when he opened his present establishment at 1919 Bush Street and known since as the Nippon Goldfish Company (*Editor's Note:* And still in business at the same location to this day!).

"Mr. Murata and his organization have done a great deal to advance the possibilities of aquaria in the home and they also have had a hand in the distribution of probably more goldfish than any one else on the Pacific Coast to date. It was he who originally brought to this country, some of our very finest fancy goldfish so highly valued throughout the Eastern States and which usually sold for considerable sums. Though San Francisco is apparently the gateway to the Orient where some of this stock originated, it has never, in the true sense of the word, developed the craving for the ultra in goldfish. It does seem funny that this should be so. Nevertheless, it has always contended itself with a mediocre assortment in its outdoor pools and gardens. Yet, some of the finest goldfish which have ever been brought into the United States have passed through the channels of the Nippon Goldfish Company, and found happy landings at the hands of many buyers in the Eastern portion of the United States. This organization became one of the interesting highlights in San Francisco because it was, at the time, an unique business venture, and from the start it has thrived and more than fulfilled the wants of both local fanciers and others scattered throughout the country."

We shall return to Mr. Locke's reminiscences at a later time. The "Mr. Richards" mentioned was W. J. Richards, the Vice-President of the first aquarium society in San Francisco, and we have already remarked (Chapter XI in this series) on the Nippon Goldfish Company.



A cover of the Brooklyn Aquarium Society BULLETIN after resumption of publication following the demise of the old AQUARIUM magazine.

However, two other dealers are worthy of mention also. The first is the Long Island Bird Store, in Brooklyn, which is still in business today. The firm was started in 1878 and, at that time, was primarily a seed, feed and farm supply store. But from the start, the Long Island Bird Store sold mixed-breed dogs. It is not known in what year the firm started to sell fish but it advertised in *THE AQUARIUM* magazine in 1912. This certainly antedates the entry of the Nippon Goldfish Company, and most likely even the Aurbardale Goldfish Co. of Chicago, thus making it the oldest currently operating fish store in this country.

It is also important to mention that from 1915 to 1920, a New York pet dealer, Richard Donker, was engaged in supplying marine fishes and water to salt water hobbyists. Donker shipped fishes and water



This sketch of a banded surftfish appeared in the BULLETIN. It indicated the parts of the fish which, in turn, were described scientifically.

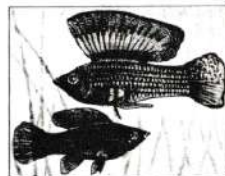
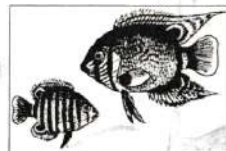
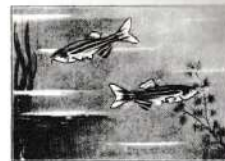
inland as well, and he and for a short time his successor, Arthur Catchpole, were the only dealers in the country in salt water fishes. Donker was in love with the wonderland of the sea and particularly in love with the grace and beauty of the coelenterates. As Ida Mellen once wrote: "He would sigh with delight for an hour at a time while watching a white anemone slowly wave its drooping tentacles like a weeping willow swaying gently in the breeze". It might be mentioned, in passing, that his wife, Ruth Donker, appeared in the New York City newspapers in 1911 when she performed a successful tracheotomy on a goldfish, the first so recorded.

In August 1915, the Brooklyn Aquarium Society resumed publication of its BULLETIN, an activity that was to continue until August 1919. At the time, Dr. Frederick Schneider was President of the organization. Its Corresponding Secretary, E. J. Wilcox, was named Editor of the magazine. At first, the resumed publication (a monthly) was quite modest, some 4 pages, and sold for 5¢ a copy or 50¢ for a year's subscription. In time, however, it expanded to 28 pages. It was a far better magazine than AQUARIUM NEWS AND NOTES, published by the Aquarium Society of Philadelphia, as it catered primarily to the tropical fish hobbyist rather than to the goldfish fancier, and boasted an able array of writers and aquarists such as Christian Heede, August Obermueller, Walter L. Brind and John Treadwell Nichols.

The pages of the BULLETIN, of course, provide numerous entries of historical interest, including the following short article which was the first ever published in the American aquarium periodical literature about *Betta splendens*. At that time (1916), the fish was known as "Betta Rubra".

"BETTA RUBRA"

"There is a very beautiful and attractive variety of aquarium fish



Several of the illustrations of fishes that appeared in the BULLETIN from 1915 to 1919. Upper left: *Tetradodon cutcutia*; upper right: *Brachydanio retio*; lower left — *Cichlasoma severum*; lower right — *Mollisilia volitans*.

called Betta Rubra which comes from distant Siam. They are also of the labyrinth family and as such are very pugnacious, the males fighting not only with other males of their own species, but sometimes with the females as well.

"The female Rubra is a rather light brown, with dark brown markings which come and go according to her moods. She also shows red and blue coloration, though these are not as prominent as in the males.

"When quiet and in repose the male fish somewhat resembles the female, but he is easily excited and irritated, and at such times shows really remarkable coloring. The body becomes a dark reddish brown, the fins and tail rays a vivid electric blue, while the lower portion of the back and upper portion of the ventral fins are brilliant red.

"The natives of Siam greatly enjoy the breeding of these fish and

frequently hold contests, much the same as cock-fighting, betting heavily on the results. The termination of such fights always comes with the death of one of the combatants, and sometimes both.

"At the breeding season the pairs are usually placed in an aquarium, the water in which has been withdrawn until it is shallow — not exceeding five inches, and the tank then placed in a secluded spot. The male will build a nest of air bubbles which float upon the surface of the water. For this purpose the mouth of the male is slightly stronger than that of the female and thicker. The eggs are carefully placed in the nest and allowed to hatch, and like the paradise fish, the female must then be removed. As soon as the young fish arrive the nest is destroyed and the male cares for the fry until they learn to swim freely and eat well.

"These fighting fish thrive best in a temperature ranging from 72 to 80° F".

The BULLETIN of the Brooklyn Aquarium Society, as we said, published its last issue in August 1919. During its lifetime it was a publication of remarkable quality, as was the organization which sponsored it. It did not, however, leave the hobby devoid of a magazine, for some years prior to this date, September 1915 precisely, an aquarium magazine appeared on the scene that was to influence the hobby significantly for some 35 years. This publication was AQUATIC LIFE.

To be continued.

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CURRIER & SMITH: continued from page 20

an air stone.)

We presently maintain a 33-gallon community tank, stocked mostly with small characins such as neons (*Hyphessobrycon innest*), cardinal, emperor tetras (*Nematobrycon palmeri*) and others. This aquarium's water has a highly improbable chemical make up. The pH is roughly 6-6 while the hardness is greater than 120 ppm!

Just how this unusual situation exists is not clear, but the fish do extremely well, old age being the prime cause of death, the plants, including aponogetons, water sprite (*Ceratopteris thalictroides*), water wisteria (*Synneia tetraflora*), and *Hygrophila polysperma* do extremely well. (So, might we add, do green and hair algae!)

The fish are continually removed from this tank for breeding purposes and spawned in water with a pH of 7-5 and a hardness of 17 ppm to 120 ppm! If care is used to prevent "shock" from rapid water changes, no harm befalls the fish and they spawn readily (or at least as readily as any of their species do). In this light, we wonder if generations of aquarists haven't spent too much energy worrying about water conditions and too little time just enjoying their fishes? ●

EDITOR'S NOTE: As usual, the ADVERSARIA column is open to readers who may take issue with, or agree with, the thesis of Messrs. Currier and Smith.

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PROBLEMS: continued from page 30

stop this from happening again?
Answer: Cutting the leaves probably did help to kill the plants; it would have done no harm to allow the leaves to partially cover the surface of the water. *Vallisneria* likes good daylight or about 14 hours a day of artificial light. The plants should be planted so that the sand does not come up over the crown of the plant (where the base of the plant meets the roots).

Question: I recently purchased an aquatic plant which the store owner called "baby tears." It came in a bunch and each individual plant has a long stem with leaves in a somewhat clover shape. Can you give me some information on this plant?

Answer: The scientific name of "baby tears" is *Helxine solieroi*. It is a moss-like plant and not a true aquatic. Florists often use it in brassy snifter arrangements or other kinds of terraria. In its natural state it grows on damp rocks. It is found in Sardinia and Corsica. It found its way into the hobby because when it is submerged in an aquarium, its small, light green leaves are most attractive. It receives little or no mention in books on aquatic plants which suggests that it may not prosper for a long time planted in an aquarium.

From: Jeffrey Friedman, Brooklyn, New York.

I have a pair of fairly young kissing gouramis in a community tank (10-gallon). I am not sure of their sex. Recently one is constantly annoying the other, forcing it to hide behind the rocks and plants. They are no more than 3 inches long. In the same tank I have 2 blue three-spot gouramis, each about 3 inches long. One was purchased about 3 days before the other and they are fighting, too. Does this usually happen?

Answer: Kissing gouramis are notorious for the behavior you have described. These fish ordinarily grow

considerably larger than 3 inches long and a 10-gallon community tank is really too small for them. At any rate, you should take out the aggressive fish and either give it away or sell it. You will not be able to spawn this species in a 10-gallon community tank and there will never be any peace in the tank until the aggressive fish is removed. The three-spot gouramis are also aggressive fish as you have discovered. I would advise you to either sell or give away one of these specimens, too. There are many peaceful fish that do well in a community tank, but you have chosen 2 species that do not fall into this category. If you are especially interested in gouramis, you might try *Cotisa lala* (dwarf gourami) or *Trichogaster leeri* (pearl gourami). Both of these species are peaceful and attractive.

From: J. M. Cain, Calgary, Alberta, Canada.

I am interested in attempting to spawn the bumblebee goby (*Brachygnathus sushozona*). In scanning the available literature, I have come across vague mentionings of spawning but no specifics. Could you supply me with such information? Also, is this fish strictly fresh-water or does it inhabit estuaries and river mouths?

Answer: This is a delightful fish and fully worthy of a 10-gallon tank for several specimens. It comes from Sumatra, Borneo, and Java where it is found in rivers and estuaries. The addition of four tablespoons of a good grade of aquarium salt should be added to ten gallons of water. It likes a temperature from 75 to 78 degrees F. A small flower pot, placed on its side with the opening facing the front glass, will help to put a pair in a spawning mood. The female becomes more colorful than the male when she is ready to raise a family. Changes of water also induce spawn-

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ing. The rather large eggs will be laid on the inner wall of the pot where they will be fertilized by the male. Hatching usually takes 5 days. Within a week the fry should be offered egg yolk infusion and newly hatched brine shrimp. Care should be taken not to allow the water to foul. The male usually guards and aerates the eggs and if spawning occurs in an aquarium containing more than the spawning pair, the outsiders should be removed as soon as the spawning is completed. Brine shrimp and other small kinds of live foods will keep this species in good condition.

From: Lawrence R. Mesarick, Maple Shade, New Jersey.

I have five aquariums in my apartment, all of which have been filled with tap water having a pH of 7-4. In one tank (10-gallon) I have two male Jack Dempseys separated by glass,

and in a 29-gallon tank, I have five black angels, two tuxedo swords, and a catfish. Since these fish are large, I feed them frozen adult brine shrimp predominately, and frozen blood worms every other day since they scorn daphnia and small dry food. I have noticed that the pH of the water in these two tanks has become increasingly acid. The latest reading showed a pH of 6.0 in the 10-gallon tank and a pH of 6.2 in the 29. My other tanks remain at a pH of 7.0 to 7.2. In these tanks a considerably less amount of brine shrimp has been used since the fish are smaller and accept daphnia and dry food. I suspect brine shrimp has some effect on the pH of water. Is this true? Presently neither the angels nor the Dempseys show any signs of distress or fatigue. **Answer:** Tanks that contain large cichlids have a tendency to go acid. I don't believe the brine shrimp has anything to do with it. You might try

changing a third of the water every two or three weeks as a regular routine. This will be good for your fish and will help maintain the pH.

From: Lance and Susan Boyd, Maryville, Mo.

We are moving from Missouri to Missoula, Montana, and are experiencing some misgivings as to whether or not our fish will be able to survive this trip. We plan to drive a U-Haul truck the entire distance and figure that it will take a minimum of three days to do so. We have been advised that the fish may be confined two days within plastic bags that have a minimum amount of water to restrict their movement. We have been told not to feed them during the trip as it will cause the water to foul. We plan to put the plastic bags into insulated styrofoam picnic coolers and drape and support the coolers with blankets to ease shock and maintain the temperature of the water. These coolers will be placed in the back seat of our towed car. These are our questions:

Question: Could the fish survive this trip at all?

Answer: You should not lose a fish.

Question: Can these particular fish be kept confined for this length of time?

Answer: Given enough water, and space, yes.

Question: Could our plants survive if they were immersed in water but lightless for three days?

Answer: Yes. They should be wrapped in soaking-wet paper toweling and placed in separate plastic bags.

Question: Are there any petshops in Spokane, Washington, that will ship items to Missoula?

Answer: Secure a telephone book from Spokane and search the yellow pages for aquarium shops in Spokane. We are sure you will find a dealer who will ship supplies to you.

Question: Would it be better to separate the fish in bags according to size or family?

Answer: It would be best to sort the fish according to size.

Comments: The bags should be two-thirds full—one-third remaining for air and tying, or sealing. If the fish seem distressed, it might be a good idea to aerate the bags during the night when stopping at motels. A pump should be left out of the packed items for this purpose. In his travels to South America, Editor Albert J. Klee aerates the water in his fish bags merely by lifting some water out with his hands and allowing it to fall back in. It might also be a good idea to carry a container or containers of extra water. Glass jugs with a capacity of 5 gallons could be used for this purpose. The jugs might be packed in cartons. This water will come in handy should leakage occur.

From: Mark Sikora, Union, New Jersey.

What color bettas should I breed to get black bettas in the first generation?

Answer: If you use black specimens, the chances are you would get some black offspring but what you get would depend on the fish you use. Those that come from a black line would produce the most blacks but unless you knew the colors of the generations before the fish you use and knew them to be a true-breeding strain, the chances are that only a few black fish would result, depending again on the colors of the ancestors of the fish you are using. Genetic charts take it for granted that you are working with known strains. You should also be aware that black appears to be both recessive and lethal. Gene Lucas, the betta geneticist, has stated "To recover black types, mate the original male to his daughters if you can keep him long enough, or else make brother-sister matings of his progeny."

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From: John A. Peterson, Worthington, Ohio.

Can distilled water be used in an aquarium with tropical fish? Our city water comes out of the tap rusty and is unsightly in our aquarium. One pet shop manager has told me that distilled water will kill the fish and two others have told me that it can be used. Which is correct?

Answer: Distilled water can be used in aquariums but as it is expensive, it is not practical to use it all by itself. It is generally used with other water. Rain water can be used but unless it is collected in an area free from air pollution it isn't considered fit for aquarium use. In that your water has an offensive color due to iron content, you might acquire an iron-removal resin from a water conditioning company that supplies such resins. You will find such companies listed in the yellow pages of your telephone book.

Most water has some dissolved

matter in it. Distilled water, of course, results from heating water and transporting the vapor into another container where it cools and condenses into water theoretically free of dissolved matter. In the natural state some water contains more dissolved matter than other water, but all water where life is supported contains some dissolved matter. The amount it contains determines whether it is hard or soft. Water containing a great deal is considered hard, and water with a lesser degree is considered soft. Distilled water, of course, would contain so little that it would be an unnatural medium for most living things. You are merely interested in clearing the water of the suspended matter that is discoloring it, and filtering it through a resin designed for this work should serve your purpose.

From: Anthony Kasavich, Calumet City, Illinois.

I have some banana plants—six in

a 15-gallon tank. How do they grow better, in the gravel or on top? And how can you tell them apart, male from female?

Answer: The banana plant (*Nymphoides aquatica*) can be either floated or planted. They can be kept in a temperature range from 60 to 72°F, in fairly soft water. In that you have several, you might plant one or two and allow the others to float so that the bunch of "bananas" is easily seen on each of the floating plants. The planted specimens should have the roots submerged in the gravel along with the "bananas" which are actually rhizomes. You can increase your crop when flowers in clusters appear on the leaf stalks. Cut the flowers and leaf together and either allow the cutting to float or insert the base in the gravel. Rootlets will form, and you will have a new, young plant. Good daylight is desirable, and if your plants are not receiving strong light, use artificial. In the banana plant, each plant contains both male and female organs.

From: Mrs. Joseph Fisher, Masury, Ohio.

I have been trying to breed my tiger barb. I chose a very heavy female and a male slightly smaller. One evening I put them into a 10-gallon tank, planted at one end only. Temperature: 78; pH 7.0. The next morning I was delighted to find them spawning. After about five hours, they lost interest in each other so I

removed them from the tank. The female was just as heavy as when I first placed her in the spawning tank. I did not observe any fry. After two weeks I again tried with the same results. Can you tell me what I am doing wrong?

Answer: Your procedure, as you describe it, almost sounds like the classic directions for spawning barbs. You do not mention, however, that you separated the fish for a period before placing them in the breeding tank together. This might be what you are doing wrong. Most breeders bring the fish together after having separated them for several weeks. Also, the tank should be well-planted throughout, not just at one end. This latter is minor but you might try separation and a well-planted aquarium. Everything else that you did, including your feeding program, which is not included here, adds up to good handling.

From: Jim Douglas, Orinda, Calif.

I have three *Corydoras aeneus*, two females and one male. The females are ready to breed because they are bulging with eggs. The other one has remained thin so I guess it is a male. I've set up a 15-gallon tank with just some rocks on the bottom and have two outside filters. For light I use a Gro-lux tube. There is no gravel in the tank and I've fed them tubifex worms for about a month. They are in the tank by themselves. How am



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I going to get them to spawn?

Answer: First of all, be sure the "male" is a male. He should taper down from behind the gills to the tail when you look down on him. The female widens at the gill plates and only begins to taper about midway along her length. The male should be separated from the females for a month before placing him in the tank with the females. Well-washed sand should cover the aquarium floor and the aquarium should be filled with fresh water. The tank should be planted with a few broad-leaved plants. A pair should be introduced early in the evening and spawning should take place the following day. Remove the pair after they separate and begin to move about the tank without taking notice of one another. Methylene blue or, better still, acriflavine should be added to the aquarium—about a quarter of a teaspoonful, and although many of the eggs

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turn white, many will hatch in about five or six days. The young are ready for brine shrimp (newly hatched) as soon as they are free-swimming.

From: John W. Holt, Winnemucca, Nevada.

I have just recently become interested in aquarium keeping and purchased a 25-gallon tank and have an assortment of fishes. Among them I have a pair of *Monodactylus argenteus*. The larger of the two began chasing and nipping at every fish in the aquarium including the other *M. argenteus*. I have separated the offender but wonder if this is characteristic of the species.

Answer: *Monodactylus argenteus* has a reputation for being a peaceful, almost shy species. Sometimes, an individual fish, however, as your experience bears out, becomes a recalcitrant bully. You certainly did right by separating this fish from the others. I should like to point out, however,

that this species likes a large aquarium and as it comes from brackish to salt water, it should have some salt in its water. I would not promise that if you set these fish up in an 18-gallon tank to themselves, it would reform your bully, but it may be that the crowded conditions of your 25-gallon tank, and the fact this species likes a lot of room may have something to do with your specimen's bad disposition.

From: Dianne Garver, Fanwood, New Jersey.

Question: I read somewhere that fish do not feel pain. Is this so?

Answer: According to a fish pathologist we know, a fish is as sensitive to pain as we are.

AUTHORS: continued from page 28
it comes to meeting water once again, this time in the form of ice and snow. Possessed of a good sense of humor (he remarks on his bachelorhood of 36 years. "My meager contribution

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to stemming the world population explosion"), we are happy to announce Mr. Chhappar's appointment as Contributing Editor of THE AQUARIUM.

ABBIE DAVIDSON

Abbie Davidson was born in Lampasas County, Texas, and received her schooling in San Antonio. After her two children were grown, poor health made it impossible for her to continue with her usual hobbies such as gardening. Her son's hobby of tropical fishes, however, interested her to the point where she ultimately acquired more than twenty tanks.

Her prize fish is a very large pacu (*Colossoma*), housed in a 125-gallon aquarium, but she has many other rarities as well. To date, she has spawned such fishes as Egyptian mouthbrooders, firemouth cichlids, bettas and angels. Her observations

on the blue *Botia* appearing in this issue marks the appearance of her first published article. ●

ADVERSARIA: continued from page 23
peated for my sailfin molly setup. Yet, my report is not proof of anything. It, too, lacks a scientific base.

The Kessler experiments, as reported, while well intended were hopelessly filled with so many variables that any results must be disregarded. To really accomplish anything, precise and rigid conditions must be established. Scientific results can only be achieved if there is only one variable, i.e., tubifex.

Even with this setup we have problems since there are different tubificids from different sources. Each must be carefully tested. Then, frozen and freeze-dried tubi-

fix should be tested. Bacteria cultures should also be taken and recorded.

I personally feel that the nutritional value of tubifex warrants research into how we can successfully use this food. My own methods of handling and processing may be part of the answer, or it may just be luck. Continual flushing with clean water and cold storage (40°F) may be too time consuming for many people.

I don't have any real answers, but I can suggest approaches. However, to condemn tubifex ("live, frozen or otherwise") because of personal experience only, adds more confusion to our already cluttered hobby literature and thought. *Joseph Trusso, Islip, New York.*

EDITOR'S NOTE: Although the editor is in considerable sympathy with

many of the points brought up by Mr. Trusso, we believe that he is a bit harsh on the Kessler experiments. If Mr. Trusso is looking for 100% confidence in any experimental design, then he will have a long wait indeed. The Kessler experiments clearly indicated that the tubificids used were harmful, although they did not prove, of course, that all tubificids are harmful. Finally, as a statistician myself, it must be pointed out that one-at-a-time variable experimentation is not generally the way scientific experimentation is carried out in this day and age. A statistically designed experiment will frequently vary five or ten variables simultaneously. We believe, however, that Mr. Trusso certainly has the right idea when it comes to the care needed in developing a valid experiment. **AJK ●**

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SOCIETIES: continued from page 27

plant vandalism, gravel digging, gross appetites, size, etc., are all gone into with candor, and after she disposes of the demerit list, she begins to sing. She likes their ability to change color at the drop of a hat but their courtship, spawning, and parental habits are what fascinate her most. She recommends the method of placing several specimens of the same species and age in an aquarium and allowing them a free choice to pair off, rather than having the marriages arranged by the hobbyist according to his whim. She moves the pairs into aquariums of their own when they have spawned a time or two in the community situation. No particular species of cichlid is the subject here but this is an informative piece for those who are considering the idea of working with some one of the many interesting fish who fall into this classification. There is an excellent profile in this issue on Bob Travers (unsigned), a Bronx hobbyist famous for his beautiful veil angels and his skill in inducing many species of fish to spawn. The list of fish he has worked with is impressive and includes spawning and raising crayfish. First-rate photographs enhance this story of a carpenter who has used his craft to complement his hobby and become a fishkeeper extraordinary. *The Wet Pet Gazette* continues to be an outstanding bulletin that is a pleasure to read and review. Write to Editor Jean Lucas at 361 Sylvan Knoll Road, Stamford, Connecticut 06902 for exchange requests and matters concerning *The Wet Pet Gazette*.

There is a brief but cogent article on the handling of *Ich* in the June issue of the *Colorado Aquarist* (published by The Colorado Aquarium Society, Inc.) by Editor Ella Pittman. By describing the cycle of the parasite which is sometimes dubbed the "white plague", the author stresses the importance of timing in its treatment. The parasite first manifests its presence by a sprinkling of white dots "looking like grains of salt" on the body of its victim. Actually, the culprit parasite is discovered by the hobbyist when it is in its second stage. In a few days the dots disappear and the hobbyist is often deceived into believing the bane has just gone away, only to be chagrined in a week's time by more white dots appearing on the specimens in the infested tank, this time in greater numbers. During the period of "disappearance", the parasite has merely gone into its third stage at which time it drops off the fish and sinks to the floor of the aquarium. Here it develops a tough shell and in this stage, as well as the one in which it appears to be a white dot on the fish, it defies treatment. Within its shell, it divides and subdivides until the shell can no longer contain so many newly developed individuals and it bursts. The new crop of parasites are now free-swimming and ready for a host. This is really the first stage of their cycle and the only time, the author tells us, they can

be reached by medication. She uses one to two teaspoons of ich in a gallon of water and does not change the water for two weeks to make sure that the medication catches all the parasites in their first stage of development. Of course, there are many preparations sold for ich but whether the hobbyist uses a commercial product or the simple home remedy suggested by the author, table salt, timing is the important element of the treatment. Raising the temperature of the water in the infested aquarium causes the parasite in its second stage (while under the skin of the fish and appearing to be a sprinkling of salt or a white dot) to develop faster and reach its third stage rapidly (the stage when it leaves the fish and forms a thick shell that sinks to the floor of the aquarium). The hobbyist should bear in mind that the parasite is impervious to medication while on the fish and while encased in a tough shell. Only in its stage of free-swimming will it succumb to whatever medication the hobbyist selects for its demise. This is reference material and should be earmarked for ready consultation should a need arise. In this issue also is a piece on *The Ever Popular Angelfish* by Alice Jean Eman which covers the spawning of angelfish thoroughly in the standard way. *The Lattice Cichlid*, by Bernard A. Ramsey, discusses *Nannacara anomala*, and recommends it for those cichlid buffs looking for a peaceful dwarf species. Personality, general maintenance, spawning and raising the fry are gone into, making this a notebook item for those interested in the species. The *Colorado Aquarist* is a well-produced bulletin offering original as well as reprint material. Those editors who select its original pieces for reprint are asked to send copies of the issue in which such reprints appear to the Colorado Aquarium Society. Editor Pittman feels that such recognition gives both the author and the society a boost. Address correspondence to the Colorado Aquarium Society, P.O. Box 19278, Denver, Colorado 80219.

A helpful and informative feature has been added to the *Duluth Aquarist* (published by the Duluth Aquarium Society). The society purchases new products and distributes them to various hobbyists to be used for testing. Later a report is written by the user and is submitted to Editor Betty Jane Ormsby who publishes them in the society's bulletin, the *Duluth Aquarist*. In the June issue, Josephine White reports on Picon, Filter Floss, and the Dirt Magnet Filter. All three products receive praise from this distinguished hobbyist and writer. Another new product used by a different tester did not quite make the grade, but it will be given another chance. This is an excellent service to the hobby and certainly the trade will benefit from it, too. In this same issue Mary Hanson discusses *Hygrophila* and encourages cichlid buffs to use it. Uprooting and even breaking it does not deter it from picking

up and growing. She also recommends it to beginners in the hobby. Correspondence regarding the *Duluth Aquarist* and the publishing society should be directed to the society at 2600 Ormsby Road, Duluth, Minnesota 55810.

There is a spawning account of *Tanichthys albonubes* (white clouds) in the June issue of *The Calquarium* (published by the Calgary Aquarium Society) by G. E. Minks, describing behaviorism having a new twist to this reviewer. Two males and a female were used and the males were seen to chase the female in turn for a short distance, one at a time. They turned on one another, attracting the attention of the female as she swam into the plants. Here she was accosted with "lightning speed" by one of the males and the pair went into a "true amantid" embrace, at which time about 15 eggs were released by the female and fertilized by the male. The author has used two tank arrangements successfully. One entails the use of white nylon wool which is placed on the surface of the water and allowed to sink. This is confined to one-third of the aquarium floor and is about one-half the depth of the water. The other utilizes plants (*Myriophyllum* and water sprite) rooted closely together in a one-third area of the aquarium floor. In both arrangements, two-thirds of the aquarium is free swimming space. We are told that a 1- to 2-gallon tank can be used if it is long and about 6 inches high. The aquarium should be covered, of course, and a 10-watt bulb can be used in the reflector. The author does not give water temperature but 75 to 78 degrees is the range favored by most breeders although this species has a remarkably wide temperature tolerance from 50 to 90 degrees F. As soon as spawning is accomplished, the parents should be removed. The eggs hatch in about 48 hours and in two days the fry seek the surface of the water. This author prefers Liquifry as a first food. Fine dry food may be offered the second week and brine shrimp, newly hatched, by the fourth week. This is excellent coverage of a most satisfactory species for the aquarium. In this issue, too, is Graham Wood's account of his conversation piece fish the Pacu (*Colossoma* species). He bought it as a piranha but as time went by, he discovered the dealer was mistaken in this identification. This specimen has survived two departures from its aquarium which indicates it should be kept in a covered aquarium. It is peaceful but a voracious eater. It has now attained the length of 12 inches and its owner is planning to move it to a 100-gallon tank. *The Calquarium* is a most rewarding bulletin to read and review. It is published by The Calgary Aquarium Society, P. O. Box 113, Calgary, Alberta, Canada.

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SCHOFIELD: continued from page 35



A study in aquarium store interiors, Singapore.

tanks as T-bars, scissortail rasboras, snakeskin gouramis and *Rasbora heteromorpha* come from its tropical streams.

Singapore aquariums and Singapore merchandising is a little strange by our Stateside standards. The aquariums are likely to be of painted metal, usually a bright passionate color. On the other hand, if it is not metal, then it has a concrete frame which makes it strong and heavy as well. This material, too, is painted a blatantly obvious hue. As Singapore has a climate which will make Hades seem a little icy when one finally reaches there, many of the shops are often moved right out into the street. It is very common indeed to see all sorts of aquariums on the sidewalks. Be this as it may, prices on everything are about 25% at the best, of what we are used to paying in the States.

Singapore is very proud of her tropical fish industry, which has been a fast growing one. Recently there was a large exposition along Queen Elizabeth Walk, a thin parkway which runs along the Straits of Johore. There was the usual carnival atmosphere about it, with many booths at which one could both see and sample the products of Singapore. Tropical fish took second place only to the foodstuffs displayed; the crowds around these fishy booths were often so thick that one could not penetrate them, much as a swarm of Oriental flies clustering around

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A street scene along a Singapore street, indicates the interest the hobby holds for both merchants and inhabitants of the island.

a row of sugar cubes.

In downtown Singapore there is a section in one of the large shopping arcades devoted to the Economic Development Board Product and Design Center. I can fully understand this impressive title in relation to most of their displays, but there is quite a portion devoted to tropical fish. I wonder just which Singapore artisan was responsible for "designing" these fish?

You aren't going to be in Singapore long before you begin to have a hunch that Sir Stamford Raffles had something to do with the place. His name appears on anything that doesn't move fast enough to get away in time. Most famous is the old Raffles Hotel which exudes shades of Somerset Maugham and Sadie Thompson. Even here, fish have their innings. In the bar, into which you momentarily expect Joan Crawford to sway, swishing her beads, is a large "thatched roof" aquarium with two tanks above and three slanted front tanks below. Over the bar is quite a display of fish and various types of shells in small cubicles. For all the world, this bar in the Raffles could be the backdrop for a stage production of "Rain".

In truth, fish have their wet little noses in every aspect of life in Singapore, on whatever level you care to seek it.

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DAVIDSON: continued from page 37



The hinged spine, which lies in a groove beneath the eye, is a vicious weapon. Also, it is believed to protect the eye when the fish burrows into the mud.

later, one of the other *Botia* was placed in a plastic bag and floated in the spawning tank. After fifteen minutes, the 3½ inch "female" ventured out and flashed to the bag. The other fish was about three-quarters of an inch longer and perhaps three times larger in mass. The smaller fish was very excited but showed no malice. The larger fish was frightened and made efforts to get free. The "male," or larger fish, was released after an hour of water adjustment.

Despite its fright, the male inspected the tank and began a long series of tail-standing followed by jumping vertically with its tail down. It often balanced on its tail for several seconds at a time, with as much as nine-tenths of its body above water. Alternately, it would clap its pectorals after the fashion of trained seals, clean the tank or take flowers to the female. After three hours, both fish rested for a few minutes. They were then fed, the female eating with more gusto than it had for months. The male watched and swam but did not eat until the female had finished. Such behavior was more evidence that the two fish were of different sexes because neither was notable for politeness around other fish.

Periodically retiring to the "cat" boat, both would somehow manage to get in or under at the same time. Both cleaned all through and around the retreat. The male crawled through openings smaller than its own cross section. It crawled under everything and moved the filter as well as the boat. At intervals, it swam to the female as if to seek

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The brilliant yellow of the tail is emphasized in this close-up.



The blue *Botia* can be expected to do a fair amount of jumping so a firm, yet not too hard cover, is recommended.

The Clown Loach, as the blue *Botia* and most loaches in this species, are nocturnal. They should be given suitable cover on the floor of the tank to permit the fish to avoid light.



approval but such approval was not yet granted. When the fish became quiet—after twelve hours together—the room was darkened.

Lighting was resumed three hours later and the fish were fed. They eagerly ate three meals that day. The female stayed in the "cat" boat and watched the male swim and jump. As if for approval, the male carried flowers in its mouth to the female. The approved flowers were placed around the boat and the rejected ones were made into a bouquet by the male. The female made occasional inspection tours through the flowers and returned to the boat to watch the male jump and slither through the tank. By late afternoon, the male had made an attractive flower garden. After seventeen hours of lighting, the light nearest the tank was turned off.

Seven hours later, the light was again turned on and the fish were fed. Several hours of swimming, jumping and tank cleaning followed. The jumping became more vigorous as the day passed; neither fish was still for more than a few minutes at a time. The spawning embrace began in midafternoon. The male lay on its left side and the female swam horizontally into the curve. He embraced the female by closing his head and tail almost together and in this posture, the two fish rolled and bounced on the bottom of the tank for an hour. A sudden outside noise frightened the fish and caused fatal slashing of the female. Removal of the organs from the belly of the dead specimen readily confirmed its sex.



A blue *Botia* has short barbels which enable him to feel for food when searching the bottom of the tank.

The male *Botia* was kept in the tank for a week and its behavior was observed. It ate normally and jumped often, but became more placid after the first two days. At the end of the week it was returned to its original tank where it behaved as it had before the attempt at spawning.

In conclusion, *Botia modesta* probably can be spawned in tanks. Furthermore, there appear to be visible sex distinctions in the species. Favorable spawning conditions seem to include a quiet, rather dark environment with considerable space for jumping. An acoustically-insulated tank might be helpful. Water pH may be of less importance since each fish had been kept under conditions different from those of the other. Although the effect of temperature is not clear, 77° F is a starting point. More significant is freedom from sharp edges and objects, together with a cover which is firm yet not too hard. Separate conditioning of male and female may be necessary. One account of the European spawning indicated a gourami-like affair which might mean use of a bubble-nest. Care of the young is uncertain.

Subsequent spawning attempts of other *Botia* species may benefit from examination of photos and drawings in the literature, which so far indicate that ray count varies with sex. The ratio of minimum caudal peduncle to overall length may be useful, but curvature difference seems to fail in these long-nosed species. ●

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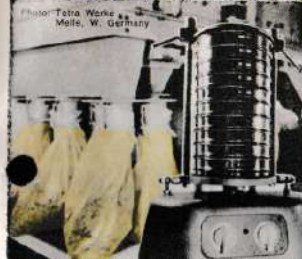


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