

THE

MARCH, 1968
VOL. 1 NO. 5

AQUARIUM

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MARCH, 1968
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THE AQUARIUM

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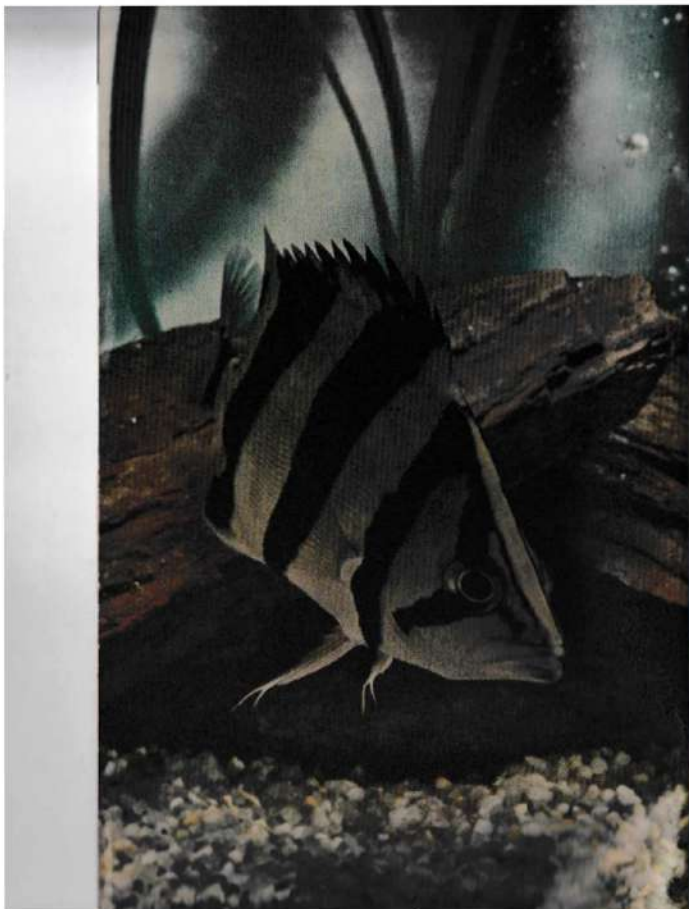
On The Cover

Curiously eyeing the photographer, *Dainioides microlepis* is caught head-on for the cover of the March issue of THE AQUARIUM. Your curiosity about it can be satisfied by turning to "The Mouth That Roared," beginning on page 4. (Additional credits appear on P. 69.)

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THE MOUTH THAT ROARED

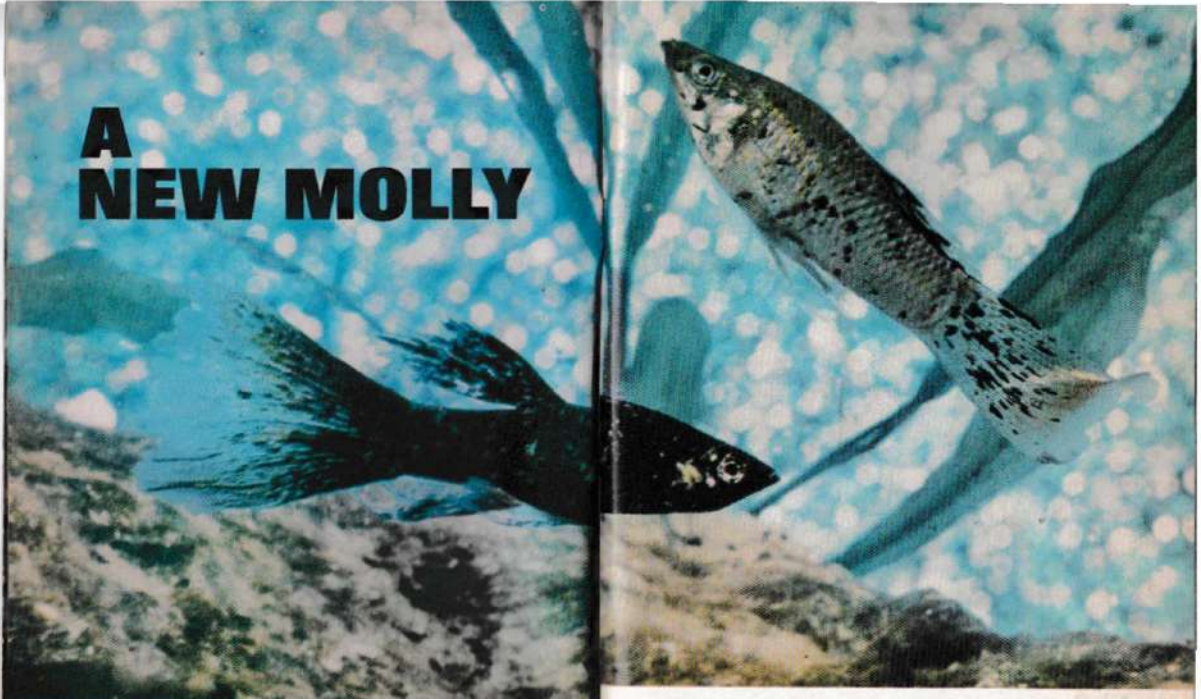
by BRAZ WALKER

The art of camouflage has many facets in the piscatorial game of hide-and-seek, for the winner's reward is existence. To the seeker it can mean sustenance; to the hider it can mean life. Although camouflage is usually thought of in terms of color and pattern, one family of fishes in particular incorporates with this a magnificent example of "method" acting. When stalking their prey, the leaf fishes of the family Nandidae seem actually to "live" the part, seemingly motionless pieces of fallen vegetation swept along at the mercy of fate and the current until suddenly one whole end of the leaf drops open and the victim disappears into a yawning gastronomical cavern.

For aquarists familiar with the leaf fishes it is somehow hard to reconcile themselves to the fact that the tiger fishes of the genus *Dainioides* belong to an entirely different family known as "triple-tails", the Lobotidae. Not only is there a remarkable superficial similarity in the shape of the body,

continued on page 40

A NEW MOLLY



by JOHN A. WOOD

This is one fish variety that came about entirely by beating great odds against it. In the first place, it was purely an accident that I happened to notice that one of the fish in a jar of pure black *sphenops* mollies which I was sorting had a little larger tail than the others. Since, like most fish fanciers, I am always responsive to some-

thing new, I decided that it might be interesting to see if she (it was a female) would throw any young which also had larger tails. She was released into a pool containing some sunset *variatus* platies, where she was isolated from any other mollies. It was not known at the time whether she had already been bred or not.

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CRYPTOCORYNE
TROSPIRALIS
CRYPTOCORYNE
RETROSPIRALIS
CRYPTOCORYNE



EXPERIENCES WITH CRYPTOCORYNE RETROSPIRALIS

by WILLIAM A. TOMEY

Although *Cryptocoryne retrospiralis* has been known to botany since about the year 1830, this beautiful plant is relatively new to the aquarium hobby. This is one of the most marvelous of its kind within the genus but it is kept in the aquarium with somewhat spotty success.

The leaves of *Cryptocoryne retrospiralis* are somewhat narrow and lineal with sharply-pointed tips. The base of each leaf tapers to the stem rather slowly; the mid-rib is quite prominent. As for color, this is variable. It ranges from pale-green to olive, with some specimens appearing bronze to reddish-brown and sporting a more brightly-colored middle rib. Imported specimens commonly have a very thickened rhizome, a rootlike subterranean stem which may produce shoots above and roots below, which usually is also strongly ribbed.

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Cryptocoryne retropiralis, one of the smaller of the elongated crypts.

These are the seeds (they are brown-colored).



continued on page 77

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The butterfly blenny (*Blennius ocellaris*) is found along the southern coasts of Great Britain. Its hardness, engaging habits and seeming intelligence, has made it a favorite in England and in other parts of the world where it has been made available. The specimen pictured is guarding eggs laid in a bottle.

BLENNIES IN THE AQUARIUM

by MILDRED D. BELLOMY

BLENNIES ARE SUCH INTERESTING fish, hobbyists should find them excellent candidates for the home marine aquarium. Not only are blennies "cute" to look at, they have endearing ways, marked learning ability, adapt readily to aquarium life, are hardy, and easily collected or, if a person is not in a position to collect his own specimens, various species may be purchased from individual collectors or dealers in marine fishes. If purchase price is a factor, blennies usually are less expensive than most other species of marine fishes.

The blennies proper (*Blenniidae*), never grow more than six inches long. They have small human-looking faces that wear a "mad" expression constantly. Many have elaborately crested heads, while others have whiskery or filamentous "horns" on their heads and snouts. They sport more different body markings and color patterns than almost any other family of fishes.

Some blennies have no scales; none are completely scaled. Thus, their bodies, although soft, are slippery.

Blennies have been described as swimming with an undulating movement. More appropriately, the swimming motion consists primarily

of a series of darts and dashes or sprints and leaps through the water. Blennies are quick almost beyond belief. In the aquarium, when not in complete repose as they often are, they "run" or "hop" across the sand, then vanish into small rocky caves or crevices so rapidly, the human eye is taxed to follow the maneuvers. Occasionally, blennies do swim and there is a slight rippling movement of the body then, but tide-pool blennies in particular tend to leap from one diminutive rock crag to another or across miniature ravines with the agile sure-footedness of mountain goats—and with quite as much grace. Sometimes, blennies are so completely devoid of motion you can look directly at them without seeing them or, if you do see them, you will believe them dead.

The vivid colors of some blennies reminds one of brilliant jewels. One species is fawn-colored with purple patches on the body; another has marble-like markings of brown and yellow; some have a mixture of broad and narrow cross-bars in several shades of tan and brown; some are grass green with tiny flower-like sprinkles of blue and gold; and, of course, some are more somberly hued, being brown, black, tan or olive-green all over.

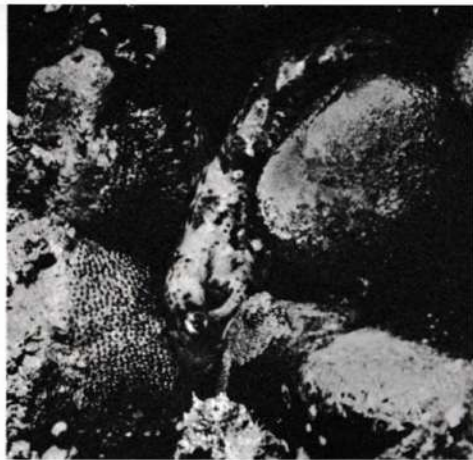
One of the most common blennies, the rock sitter, *Acanthemblemaria aspera*, also known in some areas as the roughhead blenny, is dark-brown shading to pale-yellow, speckled with a myriad of minute dark-brown spots. This rather dainty blenny is often seen "sitting" at the entrance of its own little cave or rock chamber, resting demurely on two wee "feet" that actually are muscularly-padded ventral fins.

Most North American blennies lay eggs which vary in shape, size and coloration, according to species. All share one thing in common, however. They are carefully attached, in clusters or ball formations, to rocks, coral, driftwood, shells, or other solid objects, or the inner walls of almost any kind of container—even discarded tires. Moreover, the eggs are never abandoned. Blenny parental solicitude is rather remarkable.

The parents take turns guarding the spawn, moving their tails continuously, thus creating a current that washes and oxygenates the eggs throughout the incubation period. When the fry emerge, each is temporarily taken into the mouth of one parent and given a thorough cleansing before it is catapulted out of the nest with a sharp spitting action.

Blennies have been taught all kinds of things. To name a few, they have learned to swim into food chambers, bottles and other special receptacles; to rest on shelves; to go to specific feeding stations, and to distinguish between pieces of cardboard bearing single- or double-letter combinations, e.g., "U" and "E" or "UU" and "EE", etc.

There is marked individualism among blennies and almost invariably, one will be the "boss" of an aquarium where only blennies are maintained. I have a 20-gallon aquarium which is home to five marbled



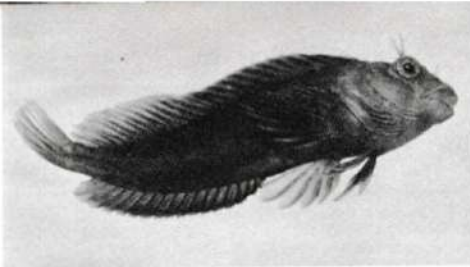
The shanny (*Blennius pholis*) is yellow to yellowish green and grows to a length of four inches. This blenny, like relatives in other parts of the world, voluntarily leaves the water for varying periods of time and roams the dry land near the tide line. In this photo a covering stone has been removed; the underside of the cover stone was covered with eggs. Note the eggs on the stones around the blenny.

blennies, *Paraclinus marmoratus*, and one freckled blenny *Hypsoblennius ionthas*. The latter—I call him Whity—is the boss of this aquarium, despite the fact he is by far the smallest occupant. Whity is always first to nestle in the palm of my hand when I hold it in the water; the first to get food treats; the first to do whatever is to be done. And, the other blennies go along with this, always according Whity No. 1 status in the aquarium. This seems comparable to the "pecking order" or social division of ranks so well-known in the barnyard.

Observance of the usual rules of good aquarium management will keep most blennies content, alert, lively, healthy, and happy in the home aquarium. They will, of course, need to be provided with salt water in which to live, and rocks in which to hide and play. An optimum salinity range seems to be from 1.020 to 1.025.

Blennies are good eaters and will feed with zest as long as they can get food to their liking. Freshly-hatched or adult living brine shrimp—depending on the size of the fish to be fed—are much relished by blennies and should be included in their diet, especially while they are adapting to aquarium life. When adjustment to captivity has been achieved, they

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The redlip blenny, *Ophioblennius atlanticus*, is common in Florida and West Indian waters. It adapts easily to the aquarium.



Blennius gattorugine in an empty shell, approximately natural size. Commonly called the tompot blenny, it is also native to the southern coasts of Great Britain. Natural coloring is reddish-brown to maroon on a light background.

will also eat shreds of lean beef, shrimp and raw fish, chopped-up blood worms, some dry foods, bits of frozen spinach, and dehydrated parsley which has been pre-moistened. If possible, place an algae-covered rock or two in the aquarium. Blennies like to perch right in the middle of such miniature grass beds, nibbling away the green blades until the rock is denuded.

Blennies have been maintained in community salt-water aquaria, but on personal experience I cannot recommend this. Although exceptionally quick when in the company of other blennies, most species of fish are shy and retiring when other fishes cohabit an aquarium. Usually the quicker, more aggressive species deprive the blennies of their share of the food if such companions actually are belligerent—snappers and demoiselles, for example—a blenny may be seriously wounded or killed

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outright. One exception to this general rule would be specimens of the *Gobiesocidae*. Two or three clingfish may be maintained quite satisfactorily with one or several blennies.

Hardier fish for the marine aquarium would be difficult to find. Blennies are able to survive great fluctuations of pH and salinity, and to cope with conditions that many other species find intolerable. European hobbyists have maintained specimens of *Blennius pholis* in closed-system aquaria for over four years. Two of my marbled blennies are well into their fourth year, and Whity is approaching his third anniversary in his present aquarium.

Blennies have been known to spawn in the aquarium. So, if you should have this happy experience, remember that the fry will grow best if provided with abundant living food—freshly-hatched brine shrimp is excellent—and they have sixteen or seventeen hours of darkness out of each twenty-four during the first two weeks of life. This amount of darkness for resting in analogous to sleeping time for human infants.

On the East Coast, blennies abound in shallow rock pools or hide in grass beds in South Florida and the Keys. Some other species are found northward as far as the Carolinas, in the shallows of the Gulf States, and in Bimini and the Bahamas. Several species are found in Pacific coastal waters, especially in Southern California. However, blennies are not restricted in distribution. Throughout the world, there are approximately five hundred species. Some very beautiful blennies are found in Hawaiian and Australian waters, and in the Indian Ocean. ●



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Views and Reviews



IT HAS BEEN SAID THAT WHEN A SPECIES passes from this Earth, a little of Man goes also. Certainly it is sad to reflect that the rhinoceros is becoming extinct and the pleasures we derived from viewing this quixotic beast probably will be deprived our grandchildren and their descendants. Occasionally, however, an accident of nature preserves a species whose relatives have long since gone. It is especially ironic in these cases, when their reprieve comes to an end.

With fishes, desert regions with permanent, valley-floor springs that once were part of an exterior drainage system often provide a last refuge for the development or survival of relict species. Such an area is the Chihuahuan Desert of southwestern Texas and northeastern Mexico. Near the central part of this desert, several particularly distinctive fishes formerly lived in a spring or springs about Parras de la Fuente. Today, they have disappeared. The proper but brutal term is "extinct." And why? Dr. Robert R. Miller of the University of Michigan answers, "Long usage of the original springs and outflows for washing clothes, destruction of the natural springs by increased tunneling into the mountains, and additional pollution from wineries and a textile factory have contributed to the extinction of virtually all of the original fish fauna." What a pity and, in a sense, tragedy!

The truly sad thing is that too few people really care about such things. Fishermen are concerned primarily with the conservation of game fish; aquarists interested in native fishes are in a minority. Conservationists are, of course, deeply concerned but Society seems too involved with new cars, color television and the like to provide the required support. A few devoted ichthyologists have volunteered their time and resources to this matter, however, and without minimizing the contribution of any individual in particular, we may point with

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pardonable pride to a man who has been a leader in the effort to save endangered fishes—Dr. Robert R. Miller. Just last year, Dr. Miller released a report on the status of five killifishes and four other fishes of the Death Valley system in California and Nevada. The former (*Cyprinodon diabolis*, *C. nevadensis*, *C. salinus*, *C. radiosus* and *Empetrichthys latos*) are the fishes most threatened in this area. Indeed, another species, *Empetrichthys merriami*, has not been found since 1948 and may already be extinct.

Last summer, Dr. Miller and his assistants counted 464 individuals of the Devil's Hole pupfish (*C. diabolis*). This represents the entire population of this species in the world! In times past, wanton persons have thrown trash in this pool and trampled down its guard rails. The thing that really frightens us is Dr. Miller's statement: "The principle danger to the Devil's Hole pupfish now is that some 'crank' or irresponsible person might try to wipe it out."

Probably the most endangered species, however, is *Cyprinodon radiosus*, the Owens Valley pupfish. At present, this fish is found only in one small, open and shallow marshy area in California. The total population is no more than 200, if that many. One answer is the establishment of refuges for endangered species and we are encouraged by the recent announcement by the California Fish and Game Department that it will designate a sanctuary for *Cyprinodon radiosus*. This is a constructive step, indeed.

Why do species disappear? There are a number of reasons but the two main factors seem to be environmental change and competition from other species. A good deal of this "environmental change," however, is man-made; we have already touched a bit on this. The introduction of competitive species occurs via many routes, some deliberate, some accidental. The deliberate introductions primarily appear to be the work of fishermen (the type locality of *Cyprinodon nevadensis mionectes* is now inhabited by largemouth bass only; the former habitat of *C. radiosus* now contains only carp, bass and mosquitofish), but aquarists have had their hand in this miserable business, also. Further, whereas the fishermen at least have had point to their action, aquarists have not.

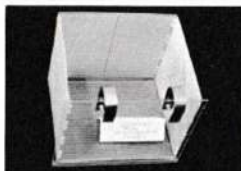
Hobbyists should be made aware that aquarium fishes are beginning to pose a serious threat to a number of native species. Not all of these introductions are deliberate by any means; indeed, such are in the minority. When an aquarist of the subspecies *nincompoopensis* (which we reserve for any clown who deliberately releases aquarium fishes into natural waters) lets loose a fish, it is usually a solitary unwanted specimen. Such fishes invariably come to a quick end. The major problem seems to be stocks released in quantity by aquarium fish farms, mainly

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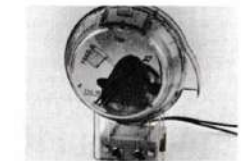
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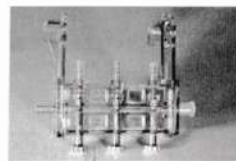
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due to overflow during heavy rains, although sometimes careless drainage of a pond is the cause. Aquarium fish farms are not the only culprits; bait and gamefish farms are also sources of accidental or careless release, as are public aquaria upon occasion. (Indeed, to illustrate the last-named point, we have scheduled publication of two actual case histories.)

What is needed, of course, is State (or Federal) inspection of all fish farms and certain public aquaria, and an insistence upon satisfactory preventative measures against accidental release. As for *Homo sapiens nincompoopensis*, we suggest that they be turned in to the nearest game warden whenever they are observed unlawfully releasing aquarium fishes into native waters.

Unavoidably, the matter of restrictive legislation against aquarium fishes raises its head at this point. We have commented on the "big brother" mentality and bureaucratic aspects of this legislation on previous occasions. We would now like to explore the logical considerations involved.

Not all State Fish and Game departments have lost their senses over this matter. Arizona, for example, does have a law on its books (17-306) which prohibits introduction of any fish or fish eggs into the State without authorization by the Arizona Game and Fish Commission (technically, therefore, every dealer in the State is breaking this law today) but, as Howard M. Basset, Chief of the Fisheries Division (writing in *The Fish Farmer*, Vol 1, No. 2, 1965) puts it, "We have tried to steer clear of restrictions on importation of aquarium fish species." California, however, and now Texas, have chosen quite a different path as we have previously outlined.

In the June, 1964 issue of *Copeia*, the quarterly publication of the American Society of Ichthyologists and Herpetologists, ichthyologists Deacon, Hubbs and Zahuranec reported upon the effects of introduced fishes on the native fish fauna of southern Nevada. A good deal of their paper is devoted to showing how three species of aquarium fishes endanger, or have eliminated, certain native species. Two of these aquarium species are the guppy (*Poecilia reticulata*) and the congo cichlid (*Cichlasoma nigrofasciatum*). In point of fact, the guppy threatens the resident population of *Crenichthys baileyi* (a very pretty fish which a number of members of the American Killifish Association have bred, including your Editor) at Preston, Nevada, and the establishment of the congo cichlid at Lake Mead may well adversely affect the sport fishery there. The three investigators point out that the introductions of these small aquarium fishes are likely to be more critical than the introductions of larger fishes. The State of Texas, however, in trying to regulate certain aquarium species, has concentrated on

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precisely these larger types (e.g., *Crenicichla*, *Ophicephalus* and *Osteoglossum*) when it is the smaller ones that present the greater danger.

The concept of restrictive aquarium fish legislation falls flat on its face then, if emphasis is not placed on the diminutive species such as guppies. Any attempt to make aquarists secure permits, fill out forms and other such nonsense for guppies and the like, however, is ridiculous. It would start a minor sort of war involving a good portion of the 10,000,000 aquarists in this country, encourage damaging acts of retaliation, breed contempt for law, set the cause of conservation in the United States back a century. It is ironic that those who favor restrictive aquarium fish legislation may very well be the greatest enemies conservation has ever had, and ultimately responsible for the slaughter of countless species.

The real solutions are, of course, those which are both scientifically and politically sound: (a) the elimination or reduction of water pollution, (b) the vigorous enforcement of laws prohibiting the release of exotic species into native waters, (c) the inspection of fish farms and other institutions to insure that proper safeguards are present to prevent accidental release, with authority to close down an unsatisfactory operation, (d) a program of establishment of refuges for endangered species, and (e) an educational campaign to explain to fishermen and aquarists alike, the sad consequences of introducing any animal into public waters.

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THIS IS MY PROBLEM

by HELEN SIMKATIS

FROM: Randy Hirsch, Gardena, California

1. In my five-and-a-half-gallon tank I have 3 zebras, 2 are 10 months old and one is six months old. They are constantly fighting. Can you explain this? 2. How can I get rid of fish if I bought them by mistake or they are not compatible? 3. Can tubifex be cultured like white worms? 4. What is the difference between tubifex and red worms? 5. I lost a Kuhli loach, and the only way that it could have disappeared was to have jumped out. I would like your opinion on this. 6. I have heard that catfish are easy to breed if a pair are obtained. Can you give me the size tank necessary?

ANSWER: 1. Zebra fish are active swimmers and very often chase each other. I don't believe your zebras are actually fighting. 2. Unwanted fish by other hobbyists. If you belong to an aquarium society you might find some takers and this might be a good reason to look into whether there is an aquarium society in your vicinity. You will find many benefits from becoming a member of an aquarium society in addition to finding someone who might like the fish you don't

want. Fish can also be donated to schools that have aquariums. Very often hospitals and institutions have aquariums and will be happy to accept new species or specimens. 3. Tubifex worms cannot be cultured the same way white worms are cultured. They are collected in areas that are not only difficult to duplicate near a home but would be undesirable even if it were possible. 4. Tubifex and red worms are, of course, entirely different species. However, the term "red worms" is used rather loosely in describing a number of different species of worms. Very often earth worms are referred to as "red worms". Earth worms are a common variety that often show up on lawns and in gardens. A hybrid type can be cultured and make good fare for fish. 5. It may be that your Kuhli loach is still in your aquarium. These elongated fishes very often hide by day in a well-planted aquarium and come out at night. Of course, you may have lost it during cleaning or taking down your aquarium. 6. There are many types of catfish and your question is hardly specific enough for us to give you a specific answer. If you are referring to any of the *Corydoras*, a 10-gallon tank will do, water should be slightly

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alkaline, and the temperature should be about 76 degrees F. The aquarium should be planted. The eggs take about 6 days to hatch and are not free-swimming until sometime after they are a week old. A first food then is brine shrimp.

FROM: Mrs. Betty Ryser, Rome, New York

I am interested in raising Mollies but have lost 3 mothers just before delivery time. They don't eat near the end and just sit on the bottom of the bowl and die. Any suggestions?

ANSWER: Mollies should not be moved after their owner discovers they are gravid. Actually this writer favors setting up mollies in a tank of their own and only removing males to another tank should they annoy the females too much. The tank should be well-planted and an algal growth should be permitted to grow on the rear and side walls of the

aquarium. A sunny spot is good provided the temperature is not allowed to climb over 85 degree F. during hot weather. They should not be crowded and it is important that the temperature should be thermostatically controlled in the high 70's. Do not allow these fish to be subjected to drastic changes in temperature. As soon as a brood of young reach three-quarters of an inch in length, they should be moved to a tank to themselves. The diet should contain some vegetable matter if an algal growth is not present. High protein food should also be supplied, and if brine shrimp is not used daily, crumbled pieces of washed canned shrimp may be used as a substitute. You mention the word "bowl" in your letter and we hope this does not mean a conventional old-fashioned goldfish bowl. A 10 or 15-gallon rectangular tank should be used.

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ABOUT OUR AUTHORS



JOHN A. WOOD

John ("Jack") Wood was born in East Liverpool, Ohio 44 years ago, moving to California at the age of seventeen. After spending three years in the United States Navy, Jack

decided to settle in the San Fernando Valley. Here, he became interested in aquarium fishes as a hobby but it was not long before the "hobby" developed into a part time business. After several years of raising fish in his garage and selling them to pet shops in the Los Angeles area, Jack made up his mind that he would try to make raising fish his life's work.

In 1954 he bought his present establishment, El Rancho Tropi-Cal, in the warm Coachella Valley near the Salton Sea. On his property is located a hot artesian well (water temperature 108° F) and with this supply, Jack has been able to raise tropical fish the year round in outdoor pools. He is married and has one son, aged 8. His wife, although knowing nothing about fish until they met, has been a major help in running the fish farm.

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THE GOOD SIDE OF FLUKES

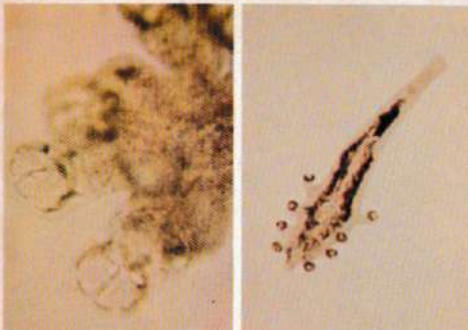
by ROBERT J. GOLDSTEIN, Ph.D.,
Emory University, Atlanta

A GREAT DEAL HAS BEEN WRITTEN ABOUT flukes, how harmful they are, how to get rid of them, and even *what* they are. Unfortunately this last item, *what they are*, has not received the attention it deserves. Our interest in various subjects generally depends on how much we know of the subjects. Thus, someone who knows about killifish is usually very interested in learning more, but if he knows very little about goldfish, he doesn't care to investigate them. And it seems to me, as a matter of fact, that few aquarists know about—or care to know about—flukes, other than how to get rid of them. With these simple thoughts in mind, I would like to take the aquarist through the world of flukes, so that the next time he has a tankful of discus wiped out he can at least say, "I really enjoyed that experience with those very interesting and wonderful little animals." Kidding aside, many of us don't mind losing a fish now and then for any good reason, but there is nothing so irksome as losing your fish and not knowing why!

The animal kingdom is divided into (or consists of) major divisions or natural assemblages called *phyla* (singular, *phylum*). All the major animals, from the most primitive fishes to man, belong to one phylum. This means that biologists believe that all these forms had a common origin, but that we are unable to relate the earliest type to any other large assemblage of animals with any certainty. Thus, all the jellyfishes are in a phylum together with *Hydra*, and all the insects are in a phylum together with crustaceans, etc. Any biology book (which every aquarist should have as an essential part of his library) lists the various phyla and what each phylum contains.

The phylum with which we are concerned in this article contains all the flatworms, and is called the Platyhelminthes (which literally *means* flatworms). There are three groups within the phylum. The first group you are already familiar with; these are the planarians—those little, dark, arrow-headed, cock-eyed rascals you find under rocks along the shore (and frequently in your tanks). Planarians typically are nice little critters, wanting only to graze on algae and decaying matter. They are absolutely harmless to your fish; as a matter of fact, they are good scavengers. There are many species in water, on land, and in the seas, and they are all classified together in the first of three divisions of the

A closeup of a fluke from the gizzard shad.
The head end is the pointed end.



An enlargement of the clamps of Diclid—A Monogenean from the gizzard shad. ophora.

flatworms called the Turbellaria. The second division most have heard about but very few have seen. This is the Cestoda, or tapeworms. Its members are all parasites (as adult worms), found in the guts of higher animals. Some attack your aquarium fish—rarely as adults, but occasionally as larval forms in the tissues. They are so rare as aquarium fish pests, however, that they may be ignored for all practical purposes. The third group is complicated. This division is the Trematoda. Biologists call them flukes, but aquarists use this general term for what amounts to just one specific group of Trematodes. This will become clearer as we proceed to subdivide and subdivide.

The flukes are divided into three subgroups, the Aspidobothrea, the Digenea, and the Monogenea. These are all very different, but it is with the Monogenea that we are concerned, for these are the animals which aquarists call "flukes."

These are complicated little flatworms, rarely looking wormlike at all! They vary from microscopic to the size of a quarter, but most species range from just big enough to see, up to about an eighth of an inch. They don't look like anything else, but it is kind of hard to say just what they *do* look like. In general, they are curved above and flattened below, and are about three or four times as long as they are wide. One end is tapered and very mobile (the head end), the other is usually expanded as a disc, shield- or star-like structure (the rear end). The rear end is modified for adhesion and is the single most important

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A Polystoma species from the bladder of a frog.



A History Of The Aquarium Hobby In America. Part Four

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by
Albert J. Klee

THE 1880'S WERE ACTIVE TIMES FOR Hugo Mulertl. In 1886, he wrote a book entitled, *How To Cook Fish*, a collection of translations of recipes by the *Verein Deutscher Fisch Haendler* ("Society of German Fish Dealers"). Further, he continued exhibiting at the Cincinnati industrial fairs. These were not trivial things, by any means. For example, from the period July 4 through November 10th, Mulertl displayed live fish and aquatic plants at the Cincinnati Centennial Exposition of 1888. His design, as the engraving shows, consisted of two rustic rock walls connected by an arch. The building material used was plaster, paint and old stumps from ravines. The left of the display contained six large and one smaller tank, three of which received aeration. The right side of the display contained eight smaller and one large tank. Below the arch was a pond for marsh plants and amphibious animals. Fabulous displays

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The Amazon River at Leticia, some 2,000 miles upstream.

AN AMAZONIAN ADVENTURE PART II

by ALBERT J. KLEE

AS WE WERE CONCLUDING NEGOTIATIONS for the services of a glass-bottomed boat, I glanced up at a corner of the boatkeeper's office and found myself face-to-face with a buzzard. Now parrakeets are one thing, but this Aruban pterodactyl eyed me as if I was the last morsel of food on earth. After checking with the proprietor who told me that it kept the mice and burglars away, I recalled Robert Burns' line: "The best laid schemes o' mice an' men gang aft a-gley."

Our glass-bottomed boat turned out to be a scow-like vessel, fitted with four glass-bottomed wells and an outboard motor. As the water was exceptionally clear, the wells were quite functional. We headed out to a coral reef a few miles away, and proceeded to change into our diving gear. Norm Knepper suggested that I wear my T-shirt while diving to

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protect against the sun. Although I took his advice, Norm didn't and he was to rue that inaction later.

We got into our swimming trunks on board; what the sight of eight or so naked "explorers" meant to the diving birds of Aruba we could not tell, but it certainly did not interfere with their own fishing. These birds would fly 75 feet or so above the surface of the water and, upon detecting a fish, would fold their wings and "dive bomb" into the water. I watched them for a while and concluded that they were successful about 50% of the time.

As for our own fishing, it was delightful. Coral fishes abounded in the reef and we had but two dangers to be wary of: the sharp coral itself which could slice a diver's skin like a razor, and the sea urchins with their sharp, toxic spines. No one was skewered on the urchins but Win Rayburn was cut up considerably by coral on one dive. The odd thing was that he didn't even know it until he had returned to the boat and we had pointed out to him that he was bleeding at numerous places over his body.

At lunch time we beached our craft and explored the tidal pools along the shore. One had to step smartly to avoid the cacti that grew profusely all over the beach. Doc Stone was busily engaged in picking sea urchins off rocks bare-handed, a sort of Russian roulette with loaded

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Our first sight upon landing at Leticia's primitive airport. This fellow didn't quite make it!



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WALKER: continued from page 5



As if the mouth isn't cavernous enough in its usual position, this fish is able to extend its lips giving it an added advantage over any tankmate sufficiently small and foolhardy to venture too near.

Small, highly reflective scales give the *Datnioides* their sparkling silver-olive stripes. These scales are clearly visible in this photograph.



Caught in the act of devouring a hapless guppy, this hungry predator more than lives up to its nickname, "the Siamese tiger fish."

(Left) *Datnioides* attain sizes large enough to make them usable as food fish. Their size, however, does not hinder their exceptionally graceful movements. These fish were each about five inches long when the photo was taken.

Datnioides look very much like the flat fishes, but the former often display more striking color and markings than do their look-alikes.



Although we are not (as yet) able to distinguish sexual differences in the specimens supplied to us for photography, the fish seemed to be able to tell. Their behavior, as typified by this photo, showed a degree of compatibility that might indicate a male and a female.

the fins and even the size and location of the mouth, but the same predatory disposition, almost identical stalking technique at times, appetite and oral capacity for amazingly large fishes and even the ability to "become" a leaf when hunting or hiding gives this striking creature the appearance of being a leaf fish in a convict suit.

There are two species of *Datnioides* which appear in aquaria from time to time although *Datnioides microlepis* is probably the most desirable and fortunately seems to be imported far more often than *Datnioides quadrijasciatus*. The latter has more stripes, somewhat less color and a tendency to fade as it grows older and larger. *D. microlepis* retains the vividness of contrast between the dark and light bands much better throughout its life, although in a dark setting the bands of larger specimens will blend somewhat in an effort to match the surroundings. There are reports of geographic variations of *D. microlepis* with seven bands, but six seems to be standard equipment. *D. quadrijasciatus* reportedly has 8 to 10 bands. The only specimens of the latter which I have seen were far less striking in appearance.

The tiger fish, as the Cambodians call *Datnioides microlepis*, is not only a beautiful and most friendly "pet" for those able to house an individual separately, in a community situation with other large and

combative fishes the stubborn and pugnacious nature of this member of the Suborder Percoidae is very likely to have it ruling the roost in spite of larger fishes. I have seen a tiger fish continually harass a male bluegill sunfish which was at least twice his length. Anyone who has kept any of the large native sunfishes (Centrarchidae) will realize that this is an impressive feat since sunfishes can easily take care of themselves with large and aggressive cichlids.

The tiger fish has a preference for bite-size fishes, but with a bit of patience beef heart and frozen brine shrimp will be gratefully accepted, especially brine shrimp. Because of the enormous appetite and rapid growth of the tiger fish, brine shrimp soon becomes economically unreasonable, so the switch to some substitute is just a matter of time. Strangely enough, although earthworms are probably as near to being a "perfect fishfood" as any live food besides live fishes, many large fishes not familiar with them will not eat them enthusiastically. *Datnioides*, like a number of others, does not seem particularly fond of them at first.

A day or two of meal-missing will usually bring them around, but an occasional stubborn or overly spoiled tiger fish may seem as if he would rather fight than switch. If he is given a bit of competition in the form of a couple of hungry sunfish or cichlids approximately his own size, there's a good chance he'll fight and switch also. Food always seems to look better if there may not be enough to go around.

More than one tiger fish in an aquarium will often lead to unmerciful bullying of the smaller one unless sufficient shelter is available. Floating plants are helpful, but caves made of rockwork or flower pots split in two are better. Make sure each cave has a back door for escape.

Datnioides are perhaps a bit specialized in their requirements in that they must be either kept by themselves or with the sturdiest of tankmates. However, their bright patterns, friendly nature and tremendous gusto for living combine with their longevity and individuality to often make them contenders for family status with old Fido. ●



WOOD: continued from page 7

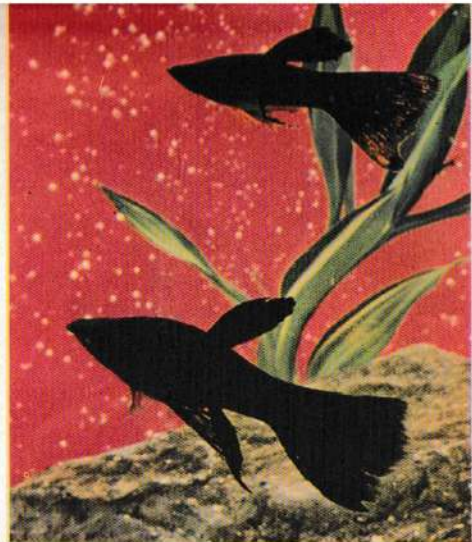
After several months, she was still the only molly in the pool, and had grown to about four inches in length. At this size, the enlargement of her tail was more pronounced, but it was not what one could call a "veiltail". I was at a loss in deciding with whom I should mate her. At first I considered mating her to an ordinary molly, then crossing one of the offspring back to her. I knew, however, that this would be a long-range affair and in my type of operation, I would most likely not be able to follow through with the necessary steps to have it work successfully.

At that time, there weren't any aquaria in my home; my fish house was used only to hold fish long enough to get orders together. I was busy with the pools and knew that she would be neglected if kept there. Consequently, she was just left with the *variatus*. Sometime later, while sorting a batch of marbled *sphenops* mollies, I noticed several males with exceptionally long ventral fins. They were really odd-looking things. Their fins were more like a long wet fine-textured feather than fins. When the fish swam, the fins trailed along behind them. When they stopped, they drooped down under. Now I had two different kinds of oddities on my hands. Would they make good mates for the female?

I decided it was worth a try; in the *variatus* pool they went. It wasn't long until a batch of baby mollies appeared. Some of them were pure black, some the light color of the young marbled *sphenops*. I didn't pay too much attention to them but soon it was time to clean this particular pool (which we must do to control the weeds and wild aquatic plants on our farm). We started trapping the fish to move them into a new pool, but what I saw when the first trap was emptied into a gallon jar made me realize that here was an accomplishment which might, in all probability, bring the same popularity to the molly that the veiltail brought to the guppy. These young fish were only about an inch long; about 50% of them had good veiltails and the other 50% were normal. None of them resembled the female with its but moderately oversized tail. (The long feathery fins have shown up in an occasional fish, but most of the veiltailed fish have longer-than-normal fins.)

Unfortunately for the veiltail molly program, but fortunately for the economy of our farm, we are also in the water lily business and there comes a time of the year when our fish operation must take a back seat to the water lilies. It was during one of these periods that I found these young fish and consequently, had only one pool available in which to put them. There was little time to do anything except cull out the normal-tailed fish so the blacks and marbles were put into the pool together. Most of the fish dropped by this generation were marble-colored. I wasn't too concerned over this at the time but realize now that the two colors should have been separated sooner.

We are now building up a fair stock of black breeders. In addition, we have crossed the marbled variety with the liberty molly and have a



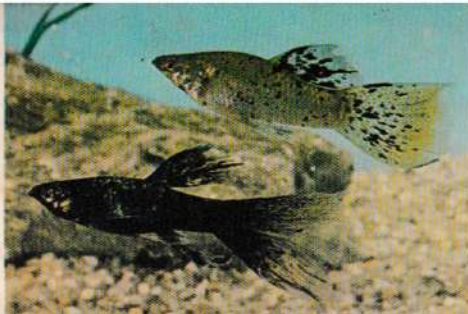
This particular pair of mollies is nearly all black. It is likely that one of the first fixed strains that will be developed by enterprising hobbyists will be a true midnight veiltail.

few fish with good red veiltails and red dorsal fins. I feel that they are going to be a very popular fish since they are very beautiful; so far they lack the aggressiveness of the regular liberty molly. We also have one female marbled veiltail which has a brilliant red spot in her dorsal fin and two red spots in her tail, very similar to the way guppies are spotted. There are also a few veiltails that have resulted from a cross of the *sphenops* variety with the *latipinna*; this opens the door for the development of more colors and larger sailfins.

EDITOR'S NOTE: Three pairs of the Wood veiltail molly were sent to the Greater City Aquarium Society show in New York City on May 15, 1967, and they took a first and a second place. This also seems a good time to comment upon recent changes in the scientific names of certain livebearers. In 1963, Drs. Donn Rosen and Reeve Bailey revised the family of livebearers, Poeciliidae (a tongue-twister pronounced PEE-SILL-EYE-EH-DEE) and in so doing, lumped several well-known

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Two striking examples of the new molly strain. Either fish offers interesting possibilities for future development. Note the yellow in the tail of the upper fish.

Variatus and *sphenops* coloration are the most often seen in the new veiltail mollies.



genera such as *Lebistes*, *Limia* and *Mollienesia* under *Poecilia*. For one thing, this changed the scientific name of the guppy back to *Poecilia reticulata*.

To date, there has been only one critical review of Rosen and Bailey's work (viz., by Dr. Luis R. Rivas), in which exception is taken to certain of this "lumping", viz., *Mollienesia* and *Limia* into *Poecilia*. Adopting a conservative attitude, *THE AQUARIUM* will continue to use the generic terms *Mollienesia* and *Limia* until such time as a clearer consensus can be obtained. As there has been no question regarding the return of the guppy to *Poecilia*, we shall, of course, continue to use *Poecilia reticulata* as its scientific name. ●

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GOLDSTEIN: continued from page 34



A, B, C & D. Various types of adhesive structures. In A it is a simple disc, divided into muscle-rimmed compartments and functioning as a circlet of suckers. In B, tiny hooklets rim the structure, and various hard parts (called sclerites) appear. In C the hooklets are supplemented with anchors, which probably do not hook into the host, but serve to raise the disc and increase suction. In D, the structure is divided into many extensions, and at the end of each is a highly modified set of sclerites called a clamp.

character used in identifying these animals, at all levels of classification. At the front end there is a mouth leading into a gut, but there is no anus. The opening at the head end functions for feeding as well as for expelling indigestible wastes.

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E. The newly-hatched larva of *Dactylogyrus*. Note the four eye-spots and the cilia enabling it to swim. The gut is wishbone-shaped, and there are holdfast specializations on the hind end.



F. A typical Monogenean with a divided adhesive structure, two suckers and a pair of anchors. The gut is a closed circular tube, and reproductive organs occupy the main part of the body.



G. *Gyrodactylus*, showing the modified circular gut, and the various generations of larval worms, one inside the other, occupying a region bounded by the gut. The head organs are not the protuberances, but are the glandular structures just below. The adhesive structure has hooklets and anchors, and cross-bars for stabilization.

Typically, flukes are ectoparasites on the fins, skin, and gills of fishes. There are some exceptions. For example, there are species known from the bladders of frogs and turtles, and from the intestine of fish. There is even one species reported from the eye of a hippopotamus.

correct to say that the mother fluke releases its daughter-son fluke. There is even a more complicated system among flukes and, I'm very sorry to say, this complicated system is not understood by biologists. And, worse yet, this system occurs in a genus of flukes that attacks aquarium fishes! Here is the problem. One can easily understand ovoviviparity. It occurs in many aquarium fishes all the time, and we have read plenty about it. But in one genus of flukes, at least, if one looks carefully at the embryo inside the mother, one can see an embryo within that embryo, and even another embryo within it! This business of one inside the other in which there may be as many as four generations within the mother has confounded parasitologists for a long time, and no satisfactory answer has yet presented itself. The genus is *Gyrodactylus* and it contains an enormous number of species, many of them on native fishes of North America.

Some flukes feed on mucus and skin cells, others on blood. Some of those that feed on blood are unable to digest it by themselves, and so have special bacteria in their intestines that digest it for them, much as termites have protozoa to digest wood, and cattle and horses have microorganisms in the rumen to digest cellulose or grasses. Not only that, but many of these same flukes have a special duct connecting the gut with the reproductive system so that every egg gets a few of these special bacteria. This is one kind of congenital infection that the flukes need to survive.

In nature, many species of fishes have flukes. Flukes are not very host-specific and thus can infect an enormous variety of fishes. This becomes an important problem to curators of public aquaria. The old New York Aquarium had this problem with marine fishes especially, and one man is credited with recording these observations of many years ago (when the old aquarium was at the Battery in Manhattan). His name was MacCallum, and today a number of parasites are named after him to honor his contributions to parasitology. Under aquarium conditions, fishes are associated which do not normally associate in Nature, and they are more crowded as well. Like a chain reaction, a few flukes on a wild fish can become an enormous population of them on everything in an aquarium. Recently, Mrs. Patricia Walker of Dallas, well-known breeder of cichlids, sent me a drawing of some little animals which covered the carcass of a fish that had died in one of her tanks from unknown causes. From her drawing I was easily able to diagnose the infection as flukes, and that the flukes were most probably the cause of death. In this case (and she was quite lucky), the flukes did *not* attack the other fish in the tank. Thus, she had an infestation with a fluke that displayed sufficient host-specificity to spare her the loss of some good fishes. To play safe, the tank was treated with a little formalin as a precaution. Like most serious aquarists, she has a microscope and uses it. (I'm forever trying

But the group is a very large one, and we shouldn't pay too much attention to these exceptional forms. It is pretty clear that flukes originated and have become very successful (in terms of numbers of species) on the outsides of fishes; this is their typical location.

Flukes, like all other flatworms (with rare exceptions), are bisexual. That is, each individual has a complete set of both male and female reproductive organs. We believe, however, that cross-fertilization is the rule. In most cases, the fluke then proceeds to lay fertilized eggs, and these typically have long filaments at both or just one end. Eventually the egg hatches and the larval fluke emerges. In some species the fluke swims about in the water seeking a host. In other species it crawls around on the bottom seeking this host. There is no specialization of different hosts for different parts of the fluke's life. Things are completely uncomplicated. One host is all that is required, and this host is used from the moment the larva finds it to the time it dies. As a matter of fact, this is the meaning of the term, Monogenea, i.e., *one form*. And, it has also come to mean *one host*. Now the monogenic flukes are a very large group, a very ancient group, so that one should not be surprised to find all kinds of variations and specializations. For example, there are live-bearing flukes in which the egg is retained (the shell is rather vestigial), the parent fluke then releasing its offspring. Some people like to phrase this as the mother fluke releasing the daughter fluke, but it is more

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to get aquarists to get themselves these 10 or 15 dollar microscope sets sold in toy or hobby shops. They are quite powerful enough for anything the aquarist will come up against, and are lots of fun to use with developing fish eggs, infusoria, microworms, brine shrimp, pond water, etc.)

Diagnosis of flukes is two-fold. First, if the fish do a lot of scratching and show blood spots on the body, you should suspect flukes, although certain protozoa can cause the same symptoms. Second, you may be able to see tiny white thread-like bodies on the fish. In all cases, you can save yourself a lot of trouble and time by examining the fish in a net with a strong magnifying glass for flukes. Anything suspicious should be scraped off, placed on a slide, and observed with a microscope. If nothing at all is seen, scrape some slime from the fish's side and observe it under the scope anyway. Protozoal infections will often respond to treatment with acriflavine, but flukes will not.

To treat flukes in a tank, Dr. Jim Thomerson has recommended formalin. The regimen given by Innes is to place 20 drops of commercial formaldehyde (37% or 40%) in a gallon of water, and to place the fish in the jar for five to 10 minutes, or until it shows signs of exhaustion. I would suggest that you don't bother with this procedure, but instead place formaldehyde directly in the affected tank, dropwise, until the fish show signs of discomfort. Then remove some of the water, and

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replace it with fresh water. By doing this, you have diluted the formalin concentration to just below the level where it bothers the fish. As the flukes are far more sensitive to the formalin than the fish are, you will be effectively hitting the parasites with a killing dose. Thomerson also warns that hornwort should be removed first, as it is extremely sensitive to low doses of this chemical, and will die and foul the water.

Every aquarist should have some formalin for two reasons. First, it is useful against certain diseases, and second, you may want to preserve a rare fish that is dying (not after it has died and decayed!) for shipment to a biologist for possible identification. Formalin is the very best preservative you can use. Any druggist can supply you with enough for your anticipated needs if you will just show him this article or reference to the use of formalin in your standard aquarium text book. It is very inexpensive.

The moral of the story is:

- (1) You should have a microscope.
- (2) You should keep some formalin on hand.
- (3) Flukes are not just pests; they are fascinating little critters abounding on native fishes, and just dying to find their way into your tanks of exotics.
- (4) Now you know what to do about them.

A CRITICAL REVIEW

OF THE AQUARIUM LITERATURE ON FLUKES

Exotic Tropical Fishes, by Axelrod, et al: The account is reasonably good, and *Gyrodactylus* is in general distinguished from *Dactylogyrus*, but there are a couple of erroneous or misleading statements. First, although both genera are common aquarium fish nuisances, there are so many species and so many additional genera, that a distinction based on location on the host and protuberances on the head is completely invalid. Second, the term *head organs* is misused; in this book they refer to the protuberances, but the term has a different meaning. Third, and this I really object to, is use of a photo of *Diplozoon paradoxum*. This is not a parasite of aquarium fishes, and is highly specialized in addition.

Prevention and Care of Tropical Fish Diseases, by Cohen: The discussion is apparently a synthesis of previously published misinformation. What I do not like at all is Cohen's analogy with Swimmers' Itch in the Great Lakes area. That disease is nothing more than an irritation with a completely unrelated flatworm of birds that penetrates but fails to develop in man. Comparing it with Monogenea is as bad as comparison with planarians. He also states that formalin cannot be effectively used in the aquarium. I say that such statements are nonsense. Yet, he recommends a copper treatment, which although effective, is much more dangerous to use than formalin because not only do organisms have varying tolerances to it but symptoms of discomfort do not appear as

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quickly with copper as with formalin.

Diseases of Fishes, by van Duijn: The coverage in this small book is excellent. Although he also discusses *Diplozoon paradoxum*, he indicates that it is not a parasite of aquarium fishes. Some of the material is dated in that new species of parasites on gills and skin have been found, but for a basic education in flukes, van Duijn can't be beat.

Exotic Aquarium Fishes, by Innes: The subject is discussed quite well for its day, and the section is presented quite reasonably.

THE PARASITOLOGICAL LITERATURE

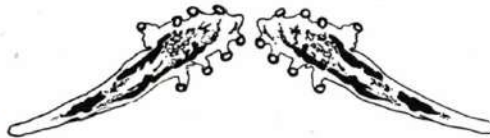
A listing of all known Monogenea and their hosts was published by Interscience (Div. John Wiley) as Yamaguti, S. 1963, *Systema helminthum, Volume IV, Monogenea and Aspidocotylea*. In addition, a number of papers have recently appeared, and a sampling of them will allow a partial list of flukes from genera of fishes of aquarium interest.

Cichlidogyrus arthrancanthus from *Tilapia zillii*;
Cichlidogyrus bychowskii from *Hemichromis bimaculatus*;
Cichlidogyrus cirratus from *Tilapia gallaea*;
Cichlidogyrus tiberianus from *Tilapia zillii*;
Cichlidogyrus tilapiae from *Tilapia nilotica* and *T. gallaea*;
Gussevius spiralicirra from *Pterophyllum eimekei*;
Gussevius minuta from *Poecilia reticulata*;
Gyrodactylus bullatarudis from *Poecilia reticulata*;
Dactylogyrus galilensis from *Barbus longiceps*;
Ancyrocephalus salinus from *Aphanius dispar*;
Quadracanthus voltaensis from *Clarias lazera*;
Enterogyrus cichlidarum from INTESTINES OF *Tilapia zillii* and *T. nilotica*!

In addition, the following information has just been published (Trans. Amer. Micro. Soc., 86, No. 4, pgs. 390-401, 1967). All are species of *Gyrodactylus* from North American fishes.

Cyprinodon nevadensis: *Gyrodactylus cyprinodontus*, *G. nevadensis*, and *G. saratogensis*;

Lucania goodii: *G. trematoclitrus*;
Umbra limi: *G. limi* and *G. cylindriciformis*;
Gasterosteus aculeatus: *G. alexanderi* (in North America);
Elassoma zonatum: *G. heterodactylus*. ●



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KLEE: continued from page 37



Mulert's display at the Cincinnati Centennial Exposition of 1888, described in the text. It was probably one of the most (if not the most) fabulous displays in the history of the aquarium hobby, devised by one man.

such as this one gave tremendous impetus to the aquarium hobby and fixed Mulert's reputation in the bargain. When, just prior to the Christmas of 1888, Mulert arrived in New York City to start his life anew there, he was already a famous man. Reports of his display at the Cincinnati Exposition preceded him, and he was welcomed into the small group of amateur and professional aquarists of the time. Within a few years he was to embark upon the last, but perhaps the greatest, of his contributions to the aquarium hobby in America. But first, we take time out to take a brief side excursion to the City of Philadelphia where we explore the life of another aquarium pioneer.

It is appropriate at this point to explore biographically, one of the most important aquarium pioneers in America, William P. Seal. Seal, born in 1845, was a resident of Philadelphia. In 1870 he was engaged in attempting to breed some newly-imported goldfish and fortunately, he happened to live at the very edge of acres of *Daphnia* ponds. It was Seal who first determined the value of this crustacean in fish culture. Some time afterwards, Dr. Wahl of the Franklin Institute heard of Seal's efforts and becoming interested in goldfish himself, visited him. This contact with a leading scientist of the day, started Seal into the business of collecting biological material for colleges and individual students. In 1883 Seal wrote *The Aquarium As An Aid To Biological Research*, and

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in 1887, authored *The Aquarium, A Brief Exposition Of Its Principles And Management*. In the meanwhile, other aquarists in Philadelphia followed the lead of Seal and started to use *Daphnia* as a fish food.

As a consequence of his growing reputation, he was engaged by the Bureau of Fisheries at Washington, D.C. (subsequently to write his *Observations On The Aquaria Of The United States Fish Commission*, in 1890). He was soon placed in charge of constructing and maintaining the exhibit of the U.S. Fish Commission at the 1893 World's Fair in Chicago.

A great deal has been written about Seal and the part he played in the story of the famous "World's Fair Fish." This fish was sold to the pioneer Philadelphia goldfish breeder, Franklin Barrett and it subsequently developed into a truly magnificent specimen, becoming the standard of excellence for generations to come. Fantastic appraisals of its worth were made but the true story is best told in Seal's own words.

"It may seem heartless to destroy the illusions concerning the so-called 'World's Fair Goldfish,' especially as it appears to have become a historical piscatorial celebrity, a sort of exalted standard of its kind. It was once heralded as 'The five-thousand dollar goldfish' in a full-page article illustrated in color in a Philadelphia Sunday newspaper. I have

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also heard its cost estimated at hundreds of dollars, as well as many other exaggerations concerning it.

"Insomuch as the history of the fish was of sufficient importance to inspire misrepresentations, the real facts concerning it should be at least of equal interest.

"The facts are briefly as follows. The Wisconsin Fish Commission brought two hundred imported Japanese fantail goldfish for their exhibit at the Columbian Exposition. Unfortunately, these were infected by the disease commonly known as 'tail-rot,' 'fin-rot,' etc., and died off very rapidly. When all were dead but seven they were given to me by James Nevin, Superintendent of the Wisconsin Commission. This was before the opening of the Exposition. I succeeded in saving three or four of them, which I brought to Philadelphia. Two of them, a male and a female, one the pure pearl fish subsequently exploited as the 'World's Fair Fish,' and pictured as red in color, were sold to a Philadelphia fancier for fifteen dollars; but this fish at that time had not attained anything like the later development of its fins. In fact, at that time it was not better than thousands of others that are imported every year and sold at low prices. It was not exhibited at the World's Fair, and would only have attracted attention as one of a tankful if they had lived.

"At that period of its development the apex or dorsal ridge of its tail slanted upward at an angle of about 45 degrees, and, altogether, it was a particularly symmetrical and promising type of fish.

"At that time these fish cost thirteen dollars per hundred at San Francisco, so that this particular fish began its career in the United States with a value of thirteen cents, finally attaining a mythical newspaper value of five thousand dollars. It might as well have been ten or twenty-five thousand. I have photographs of fish of the long-bodied type, with fins even longer than those of the 'World's Fair Fish,' that were bred from the stock brought from Japan for Admiral Ammen about 1878.

"The Japanese exhibit contained no specimens except for a few large and inferior type specimens in alcohol. Some live ones, intended as a present to the United States Fish Commission, died on the ocean.

"It is all a matter of small importance, but is interesting as an example of the unscientific attitude that promotes and fosters the birth and growth of myths and traditions."

Thus we put to rest the final story of the "World's Fair Fish" and remark only that William P. Seal's concluding sentence is true even today, applied to numerous aquarium "myths."

The following excerpt from an article written by Seal, not only indicates the breadth and depth of his achievements, but it is extremely important historically in the subject matter it treats:

the eggs would adhere together in masses and were soon killed by fungus, and also that it was liable to injure the fish.

"In a letter dated June 6th, 1881, from the late Prof. John A. Ryder, the embryologist of the U.S. Fish Commission, I find the following in relation thereto: 'I am much interested in your account of the breeding of the gold and pearl fishes. Why don't you write it up and send an account of your experience to the fish cultural department of *Forest and Stream*, edited by Fred Mather?' As the names are no longer used, it might be well to explain that the all-white variety was termed 'Pearl fish' and the white and red, 'Pearl and Gold.'

"And on August 16th, 1882, he says: 'The goldfish eggs (shipped to Washington, D.C.) were alive and have afforded me some new points for investigation.' Apropos of this I will say here that I have successfully sent fine goldfish eggs by mail as far as Dahlonga, Georgia.

"There is hardly the remotest possibility that any goldfish of the type called 'Comet' by us, was ever introduced into the United States from China or Japan, or even from Europe. If so it never became a matter of public knowledge.

"The first fine goldfish introduced were seven fantails called 'Kingi-yo's'. These were brought from Japan by Mr. M. Gillet Gill of the tea importing house of Martin Gillet and Co. of Baltimore. One of these was presented to the New York Aquarium established by W. C. Coup and Reiche and Bro. The *Guide to the Aquarium* which is profusely illustrated, contains a cut of this fish which appeared later in Mulert's book and *The Aquarium*, a small monthly paper published by him, as the 'The Fringe-Tail'. This cut I have also seen used to describe the 'Schleirschwanze' or 'Veil-Tail,' the German name for that type of fish. The *Guide* is not dated but some letter heads illustrated with a picture of the interior of the Aquarium, which was located at 5th St. and Broadway, are dated 1876 and 1877.

"Mr. M. Gillet Gill had many years before told me his experiences in bringing these fish over but the details had escaped my memory, so in 1909 I asked his nephew, Mr. Ernest A. Gill, what he knew concerning the matter and I insert his answer: 'It is rather hard for me to give you any positive dates or description of the bringing of the Japanese fish to this city as it was a little before my time, but my older cousin, who has a good memory, tells me that my uncle, Mr. M. Gillet Gill, brought the fish I think you have reference to, in himself on his last trip from Japan about 1875. They came to San Francisco and he used to tell some very interesting stories about the numerous troubles he had in bringing the fish across the continent. At one place in Nebraska my cousin tells me that the train was stalled in the snow for several days and my uncle had the fish packed in snow to keep them to show the people

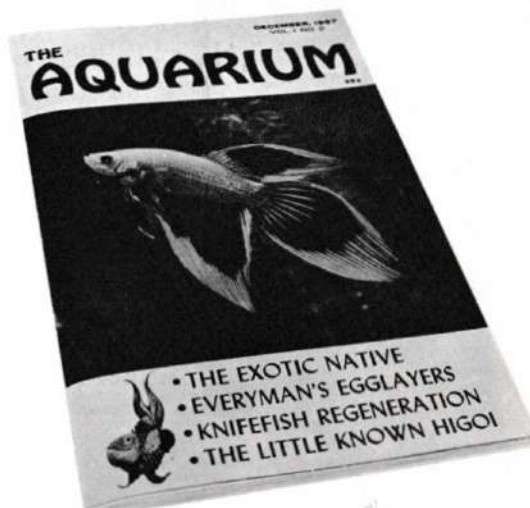


William P. Seal, a pioneering American aquarist and the man who gave us daphnia.

"Inasmuch as the origin and history of the type of goldfish known to us as the 'Comet' is inextricably interwoven with that of all the other varieties, the straight-tail being the form from which they were all derived—it was inevitable that this article should be a sort of reminiscent hodge-podge, so to speak, concerning the genesis and development of both the amateur and commercial breeding of fine goldfish.

"In the summer of 1880, I noticed some goldfish spawning in a ditch in the 'Neck.' I succeeded in catching a male which had very prominent horny protuberances on the opercles and pectoral fins. I at once recognized the significance of these characters, as I was familiar with them on the chubs and suckers, but had not noticed them on the goldfish, as I took no interest in the common form. Up to that time in Philadelphia there was probably no one who could tell a male from a female goldfish, except by seeing them spawn in ponds or ditches. One dealer in goldfish insisted that the male was distinguished by having a shorter dorsal fin, which deformity was quite common among them. I immediately began to experiment with small specimens in tubs and found that they would spawn readily. I also tried stripping them, but found that

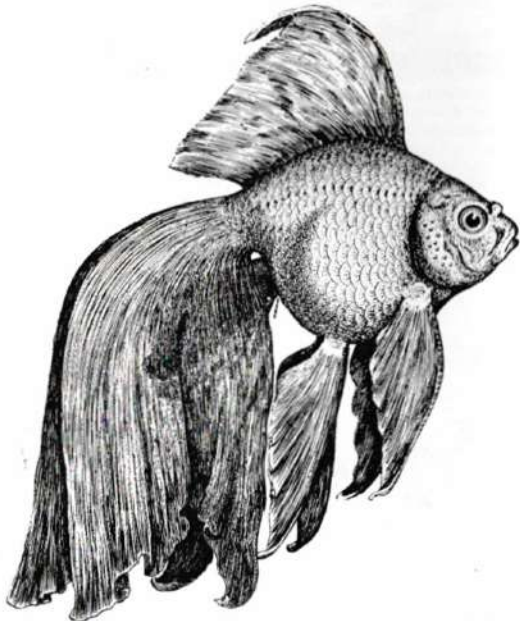
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The comet goldfish, developed by Hugo Mulertt in 1881, and named after a long-tailed comet seen in U.S. skies that year. (Herman T. Wolf)

at home, but to his surprise they survived this hard treatment and lived to breed in ponds he had in his yard in the city. He afterward stocked the fountain that was at the Centennial Exhibition and was bought by the City of Baltimore, through him. This is all I can find out about them except that Henry Bishop got what fish were left in the fountain. The others died for want of proper care and interest.

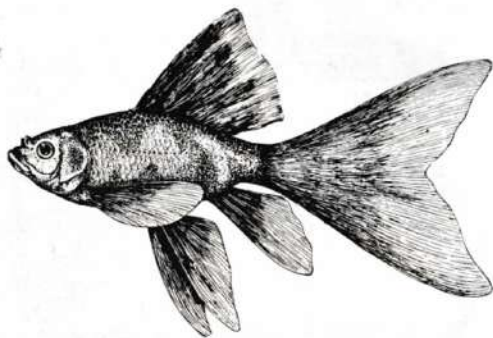
"In *The Aquarium* for January 1880, Mulertt says: 'In one of

guished the various grades which were based on the sizes of the fins. I remember that those with the biggest fins were called 'Gorgeous-Tails.' They were in fact very superior to those of the scale variety imported today. McCarty had begun to make sale exhibits in northern cities, when unfortunately having made the mistake so common in undertaking fish culture, of locating his ponds wrongly, a freshet of unusual dimensions swept away all the results of his enterprise.

"The next to appear on the market were from Mt. Airy, near Cincinnati. Hugo Mulertt undoubtedly started fine goldfish breeding there but his experience was very short as his partner, the man who owned the ponds, soon found means to dispossess him after getting an insight into his methods and control of the stock. So far as I could ever see or find out this brief experience of Mulertt's in pond breeding, and his book, were his sole contributions to fine goldfish culture. In that, however, he deserves credit, and the sympathy that should go to all such as are balked in their endeavors to advance any form of human endeavor.

"At all events the first long straight-tails to be sold in considerable numbers came from Mulertt's ex-partner and another man who took up the industry in the same vicinity."

Seal's account obviously provides much information regarding the



The World's Fair Fish, one of the most famous goldfish in history. The true story of this fish is told in this installment of our history series. (Herman T. Wolf)

the tanks at the Cincinnati Aquarium the visitor will observe some odd shaped and beautifully marked goldfish. They are Japanese goldfish and belong to the 'Kin-gi-yo' tribe. Their parents were brought to this country two years ago by a gentleman of high rank who now keeps them for his pleasure.

"This refers to Rear Admiral Daniel Ammen, U.S.N., who made the second importation of these fish. I have somewhere among my papers a written description of them and an account of their transportation from Japan made for me by the late Captain Z. L. Tanner, who commanded the Pacific Mail Line Steamer that brought them over. I think 'The City of Pekin' or 'The City of Tokio,' and who afterwards for many years commanded the U.S. Fish Commission steamer Albatross.

"From the stock of Admiral Ammen, which was bred on his estate at Ammendale, Md., came that of the U.S. Fish Commission which was bred and distributed in large numbers by them for a number of years until discontinued several years ago. A few of the Ammen stock were brought to Philadelphia from Ammendale and were bred in pools for several years, the output being sold in that city for fine prices.

"The first of the long straight-tails to appear in the market were bred from Fish Commission stock in the early eighties by William McCarty, of Loudoun Co., Va., who graded them as well as the fantails, giving them distinctive names which I have forgotten but which distin-

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early days of the goldfish hobby in America. Apparently he did not have access to copies of the *New York Aquarium Journal*, for he refers only to that establishment's *Guide To The Aquarium*. By combining Seal's narrative with the *Journal* article published in the third of this history series, the reader will have a rather complete story of this first importation of the fancy goldfish to the United States. We now know it was M. Gillett Gill, not Admiral Ammen, who deserves the honor of priority in this matter.

According to Seal, it was Ammen's fish that formed the basis for the fancy goldfish hobby in this country. Although this is substantially true, the fact must not be overlooked that Henry Bishop obtained the last of Gill's fish and that Bishop remained in business for many years. One must also recognize the fact that Seal unfairly represented Mulertt's accomplishments. Seal maintained that as far as he could see, Mulertt's "brief experience" in pond breeding and his book were his sole contributions to fine goldfish culture. Seal even cites the supposed priority of William McCarty in distribution of stock bred from Admiral Ammen's fish. But Mulertt had offspring from Ammen's fish in 1879 and although his fish may not have reached eastern markets before those of McCarty, Mulertt produced his "comet" as early as 1881. Certainly it was Mul-

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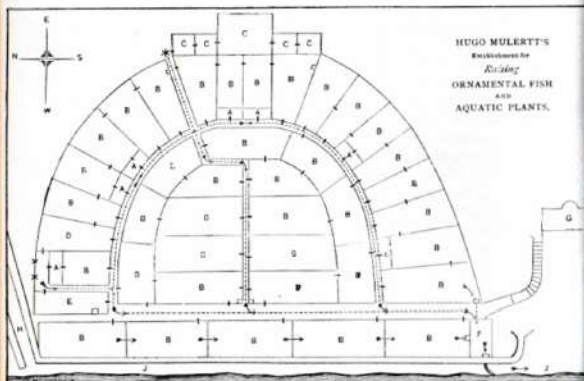
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Mulertt's goldfish hatchery at Cincinnati, Ohio. The description of the plan is as follows:

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 - E. Isolated pond for special purposes
 - F. Catch-basin for stray fish
 - G. Lodge, where the eggs are hatched
 - H. Wind-brake and guard against freshets
 - I. Creek, passing the hatchery
- Star Location of springs
 Arrow Direction of water flow
 Dotted Lines Supply drain
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ertt's name that stuck, not McCarty's "gorgeous tails." It is true, however, that Mulertt was not the founder of fancy goldfish culture in this country. This was strictly the province of the Philadelphian aquarists just prior to the turn of the century. As a goldfish breeder, however, Mulertt need not have deferred to anyone (see sketch of his breeding establishment). That Seal should downgrade a man of Mulertt's accomplishments is strange indeed. The fact that Mulertt had produced an aquarium magazine in 1878 was brushed aside without any comment

AA

whatsoever! Part of the problem may have been with the man himself. Seal's own account debunking the World's Fair Fish states that he sold a fish originally costing thirteen cents for fifteen dollars (quite a sum in those days) is a bit of an anomaly in itself. We do not know if this had any bearing upon the situation but Mulertt looked with a critical eye upon the practice of the U.S. Fish Commission in giving, upon the request of Congressmen, a globe of goldfish to specified persons as a gift. It was remarked by Mulertt that nearly a third of the homes in the District of Columbia had been supplied with goldfish at the Government's expense. Seal, being associated with the U.S. Fish Commission, may have taken offense at Mulertt's displeasure in this. Or, the truth may simply be that both Seal and Mulertt were highly individualistic (there is evidence to suggest that both were a bit "crusty"), producing a natural competition between them. In any event, William P. Seal must be reserved a significant niche in the history of the aquarium hobby in America, not only "as the man who gave us daphnia," but as a remarkable aquarist besides.

To be continued

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Due to unforeseeable circumstances, Helen Simkatis' regular department, "SOCIETIES AT WORK," does not appear in this issue of THE AQUARIUM. It will return in the April issue.

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KLEE: continued from page 39

invertebrates. We discovered a German tanker that had been sunk during World War II and ran our boat out to it. The hull was covered with algae, barnacles and sea urchins, but colorful marine fishes were everywhere. It was our misfortune that we were headed towards South America on our next leg and could not bring any of these marine fishes back with us to the States.

After four hours or so we started back. At this time we discovered that almost everyone aboard had a bad case of sunburn. I was in fair shape, thanks to Norm's advice, but he resembled a boiled lobster. As he limped his way past the hotel, a native intercepted him and offered assistance. For 50c, the native assured Norm that he had a sure-fire remedy for sunburn. The deal was consummated and stripping Norm to his shorts, the native took his machete and cleaved a large cactus in two. He then proceeded to rub the sticky juices all over Norm's body. This had the effect of turning Norm into a piece of human flypaper, for now everything stuck to him. Further, the odor of the cactus juice was frightful and no one would approach within 6 feet of him. Much to his discomfort, the juice failed to wash off completely in soap and water, and he remained "fragrant" for several days.

A number of us drove off to the windward side of the island to see "the Bridge," a natural bridge fashioned over the centuries by the action of the waves. This side of the island was no place to swim as it was full of

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sharks; indeed, the Arubans used it as a sort of garbage disposal site upon occasion. Our evening meal back at the hotel was punctuated by the scampering of lizards across the floor. The food, however, was superb. A few hardy souls ventured forth in one of the cars for another tour of the island after dinner, but most of us retired to our rooms to nurse our sunburned bodies. As I was in the room that contained five of us, the pitiful moans and groans of the afflicted were a hindrance to sleep.

Early the next morning we drove to the airport, filed our flight plan and checked the weather. The weather news was not good. A storm was brewing to the south, over Venezuela, some 15 miles away. As soon as the plane was fueled, however, we spotted a break in the clouds and decided to take off against the control tower's advice. Our decision to take off turned out to be the right one as in another 15 minutes, the weather would have made it impossible to clear the mountain range on the Venezuelan coast. We flew through a rain squall and then prepared for five solid hours of flight over Venezuela and Colombia. We were on our last leg of our trip down at last.

Venezuela appeared to be mostly grassland but as we approached Colombia, the familiar Amazonian rainforest became quite apparent. The sky was misty, making photography difficult; consequently, most of us dozed or read. Our destination was Leticia, on the Amazon River some 2000 miles from its mouth. It was founded as a military port in 1867 by the Peruvian, Benigno Bustamante, but at that time it was called "Puerto de San Antonio." As a consequence of the Treaty of Lozano-Salomon in 1922, the port was ceded to Colombia but this did not become fact until August 27, 1930, when Colombia resolved the question by force of arms. To this day, there is friction between Colombia and Peru over this matter (more about that later).

As for the name "Leticia," there are two versions; legend and history. Legend has it that the great Amazonian explorer, Francisco Orellana, arrived in the region and decided to take some prisoners. One of them, a native girl, was especially pretty and Orellana inquired of her name. She replied that she was called "Leticia," and Orellana decided to name the whole region after her. The historical version is that the town was named after the bride of the Peruvian engineer, Manuel Charcon. Romanticists and pragmatists may take their pick!

We approached the Amazon River and spied the town. The landing strip at Leticia is not the smoothest in the world; as soon as our wheels touched ground we bounced past the wreckage of a Colombian airliner (a C-46). It had slid off the runway two weeks prior to our arrival after its brakes had locked. It was *not* a heartening sight!

As we taxied to a halt we were met by the "Aduana" or customs people, and started to unload our baggage. Unfortunately, we unloaded the nose and mid-section first; suddenly, someone yelled: "The nose is



The main street of Leticia. The Amazon River is in the background.

The courtyard of the hotel Victoria Regia. The tower-like structure was supposed to store water but it was usually bone-dry.

A pet macaw belonging to the owner of the Victoria Regia. Very tame, this beautiful bird would steal the fountain pen from your pocket if you weren't looking!



going off the ground!" Sure enough, the nose wheel was about a foot off the ground and still rising. Several of us dashed into the mid-section and weighted the front of the plane down while the tail was unloaded. Colombian customs cleared us quickly, and we boarded a truck for town, about a mile away.

The climate at Leticia varies from a low of 60°F at night, to a high of 95°F in the afternoon. We had arrived just as things were getting hot. Our hotel was the Victoria Regia, a run-down but quaint edifice (Note: by "quaint" I mean that if located in Cincinnati, it would have been condemned by the City) named after the fabulous Amazonian water lily whose pads are four to seven feet across (fully capable of supporting a man). It was run by a gal, formerly married to a Hollywood celebrity, who "wanted to get away from it all." Well, she certainly did!

Our room arrangements completed, we settled right in. John Chapman, Win Rayburn and I shared a room plus shower (cost, about \$2.40/day), the others distributing themselves among various other rooms. Our first shock was on finding the food rather expensive. Beef, for example, had to be flown in from Bogata; the typical meal cost about \$1.00 which, for a jungle town, was outrageously high. We most likely could have supplemented the protein in our diet by the animal life we found in our mattresses, but daily DDT spraying prevented this. A couple of the fellows looked into the kitchen of the hotel with the result that they switched to the C-rations which Ed and Vern had brought, for the duration of our stay.

The second shock was that the water was turned on for only 1 hour a day; theoretically, that is. The town pump very seldom did work and often there was no water at all. Many was the time that we would soap up in the shower, only to find no water with which to rinse. Consequently, we often appeared half-rabid. We all got used to brushing teeth with beer or strawberry soda, however!

The population of Leticia in 1934 was 402 and today it is about 5,000 ("mas o menos" as the Latins are used to saying—"more or less"). It consists of about 50 blocks and 14 or so streets, 2 of the latter even being paved for a 100 yards. However, streets in Leticia are not exactly like streets in the United States. They are marked with water-filled potholes which are favorite cooling-off spots for the pigs which are allowed to run about the town. The few cattle that are in the vicinity are sometimes herded cowboy-style right through the center of town; one must be careful before crossing any streets in Leticia!

We found the stores interesting, however, and after getting our hands on some Colombian pesos (worth about 6c each), we cut our cost of living considerably. The local soft drinks could be had for 1 peso, Cokes for 1½ pesos. For about three weeks, most of us existed on canned cheese and sardines, and "cerveza" (beer) when we were not actually in the jungle.

(To be continued)

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Dr. Richard L. Stone holding a sea urchin which he worked loose with his fingers from the rocks in the background. Another very common sea urchin in this area is colored black and has extremely long spines.

Preparing to depart for an afternoon of skin-diving in our glass-bottomed boat. The water is so clear that the pontoons seem as if they are suspended in air.



Natural Bridge in Aruba, a natural formation etched into the rock by centuries of wave action. The noise of the surf rolling through under the bridge was deafening.



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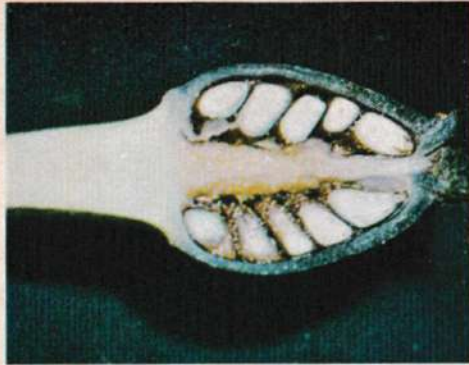
TOMEY; continued from page 10



Seedlings of *Cryptocoryne retrospiralis*, showing the roots.



The fruit of *Cryptocoryne retrospiralis*, unopened.



The outer husk of the seed pod of *Cryptocoryne retrospiralis* is stripped away in this photo so that the seeds are easily seen.

Cryptocoryne retrospiralis has a wide natural range, being an inhabitant of India, Laos, Vietnam (the Mekong Delta), Burma, Thailand and the southern portions of China. Although *Cryptocoryne retrospiralis* is related to a group of rather tall-growing plants within the genus, the form imported is rather small. It might just possibly be that what is being imported is either *Cryptocoryne costata* or *Cryptocoryne albida* (both of which can be considered as but small forms of *retrospiralis*). In any event, these smaller forms are native to rather shady situations, in gravel beds of brooks.

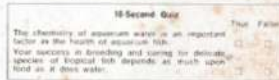
And now we come to the experiences by aquarists of this rather new plant. As I have already mentioned, success has not always been certain. One thing is sure, however; in excess light, they will not grow. Another interesting observation is that, kept underwater for a while, the plants become smaller although their beautiful reddish-brown coloration is retained under these circumstances. Growth in aquaria with but moderate lighting is better.

Generally, the proper bottom (substrate) for *Cryptocoryne retrospiralis* consists of coarse river sand (unwashed), mixed with small pieces of peat plus some loam. In this way we produce a somewhat soft, well-oxygenated bottom (due to the air pockets so formed) in which the rhizome and roots may grow. Although these remarkable plants are not easily cultivated, they are very suited to the more experienced aquarist who appreciates fine aquatic vegetation. ●



Photo by Smithsonian, Mass. © Gardner

We weigh what even the fish can't see



The answer to both questions is True, as most breeders and fanciers of tropical fish will know. But here's one not so easy. What about the effects of food on the chemical and physical properties of water?

Finding out is a bit of a chore. In our research lab, we boil aquarium water, then drive off the steam. What is left—the residue—is placed on a special glass-enclosed scale, shown here. Its measurements tell us exactly the amount of dissolved mineral and organic substances contained in the water—and, by comparison, the widely varying changes that occur with different fish foods.

Is this important? Definitely! Fine fish food is not enough. It should be nourishing and provide a balanced diet, of course. But it should certainly be compatible with the environment—the water—in which it is taken. So count on this: Your fish food is safe both ways when you feed TetraMin. By any test it's the world's finest.



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