the AQUARIUM

Founded 1932 by William T. Innes

The world's standard monthly work for hobbyists and dealers, highlighting tropical and marine fish, goldfish and related pet news.

Vic Fisher's prize-winning photograph of his mated pair of Discus. (See story of the Mid-West Aquarists' photography contest in SOCIETIES AT WORK, page 28)

JANUARY 1967 VOL. 36, NO. 1 PRICE 50¢

THE AQUARIUM

Published by

PET BOOKS INCORPORATED
Formerly
THE AQUARIUM PUBLISHING CO.

A monthly magazine for all aquarists.

Founded by William T. Innes in 1932

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January, 1967
Vol. 36, No. 1

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The Aquarist's Calendar

January, with its blizzards and no promise of spring in the air, offers hobbyists a quiet time to work with their fish and to study the literature devoted to their hobby. It is a time when records can be brought up to date and improvements can be made on aquarium maintenance and management. Very often an appraisal of working habits can lead to better methods and rearrangement of aquariums in the area available for them can generally increase the aquarist's efficiency. The time saved can be used for broadening the scope of the hobbyist and allow him more hours for the creative aspect of his pursuit. There are many articles written on aquarium management and although many of the suggestions given may not seem practical to the reader, if one can be utilized, the article has served its purpose.

In the months when time has to be made for the hobby, we often neglect watching our fish and miss a good deal of the pleasure they can afford us. In a month such as January, however, when outdoor activities are not attractive, and the holidays are behind us, we can take time out for fish watching which is an art in itself. The experts wouldn't be experts if they hadn't learned it early in the game. In fact, very often, those of them who write articles on fish-keeping find it difficult to put into words what they have learned from it. It is a subtle, tricky skill, requiring the concentrated power of observation and the ability of learning from what has been seen. This is how the expert can distinguish between the sexes when fry are still very young. This is how he is alerted, long before trouble is apparent to the average fishkeeper, that all is not well in a given aquarium. We have known experts who have casually glanced at a photograph of a fish and can tell us more about its condition and how it was raised than the owner of the fish can. In fact, although the expert will probably remain silent on most of what he sees in the picture, by one glance he has appraised the skill of the owner as an aquarist. His appraisal, of course, is a generalization, but the odds are in his favor that he is right.

Fish watching can be fun, too, because when we have really learned to see our fish, we discover personality traits that are both amusing and educational.

January is a good month for becoming more knowledgeable in our hobby. It is a time for taking stock of what we have, and then making the most of it through study, observation, and application. What better way could we start the New Year?

The Editor's Letter...

by Helen Simkatis

Aquarists have a Story to Tell

Looking back on 1966, we can label it as a memorable year in many ways from a hobbyist's point of view. One aspect came to our attention over and over again which is a matter that we take for granted more or less, and for this reason do not discuss it or exploit it as much as we should. It is simply that aquarists have a story to tell to the uninitiated, and the story is well received in the many forms it takes.

For instance, Gene A. Lucas, a hobbyist well known to readers of society bulletins and other aquarium literature received attention from the *Des Moines Tribune* in September of 1966, in a five-column spread captioned: *He Breeds Fighting Fish for Research Project, A Battle He Has Never Seen.* Lillian McLaughlin developed her story around Gene's research project on Betta genetics in connection with his work as a laboratory instructor at Drake University. Drake faculty members are participating in 10 research projects, and grants have been made available to those instructors from the Drake Research Council which has been set up to encourage creative and advanced studies. Gene will use the funds allocated to him to launch his *Betta Breeder's Newsletter,* a publication devoted to promote communication between those concerned with the biology and genetics of *Betta splendens.* The *Des Moines Tribune* found in this story enough reader appeal to warrant it considerable space, and the reader found in it not only a glimpse of the fascination that tropical fish hold for aquarists but that these colorful little creatures are subjects for careful and serious study by a member of the faculty of reputable university.

Another such story appeared in the *Washington Post,* written by staff writer William Shumann, but from an entirely different angle. This is a four-column piece showing the attractive tanks set up by Thomas Joy, a retiree at 53 as a result of a heart problem. He started in the hobby when his wife gave him two goldfish. "It's wonderful therapy," he told the *Post* interviewer, and the rest of the story is devoted to his observations of the many species he maintains in his sizable fishroom.

It goes without saying that local newspapers both city and suburban are hospitable to unusual news stories, and that often this source of publicity is untapped by societies holding tropical fish shows. It is always pleasant to read in such publications what individuals are doing in the hobby but we would like to see more articles on the activities of groups devoted to our avocation.

Sincerely

H. S.

NANNACARA ANOMALA

Photographs by Author

by Bob Goldstein

INTRODUCTION

Nannacara anomala has long graced the pages of aquarium hobby textbooks as one of the more beautiful dwarf cichlids, its most common colloquial name being given as "the golden-eyed dwarf cichlid." The name is unfortunate, as it implies the eye color as being the dominant characteristic for identifying this fish. As a matter of fact, the eye color is not especially remarkable, and the name is of questionable value and pertinence. A better name would be the Slate or Gray dwarf cichlid, which emphasizes the usual and distinctive color of the fish.

Two species of *Nannacara* are known to the hobby, *N. anomala* and *N. taeniatus*. The latter species is not usually in any kind of supply. The former species, however, is becoming increasingly common in shops throughout the country, and is not expensive. I purchased mine in Dallas at 75 cents each and at one dollar each in two different shops. These fish are not plant destroyers nor diggers. They are not pugnacious toward other smaller fishes in the same aquarium, and they take any kind of food I have used, including BiOrell, Tetramin, beef heart, adult brine shrimp (frozen), and mosquito larvae. They should be kept in clean tanks.

DESCRIPTION

The usual adult size is two inches for the male (but they get much larger on occasion), and an inch and a quarter for the female. They can be sexed at about three-quarters of an inch or slightly less. When not in nuptial colors, both are gray, with a thin red margin to the dorsal fin. The male's dorsal is markedly drawn out and pointed, even at smaller sizes, and the female's dorsal is rounded. One must choose individuals carefully, however, as the female's dorsal may *appear* pointed unless it is completely extended, the rounding being only slight, and complete extension not occurring frequently. Both fishes are deep-bodied, and resemble the marine genus *Pomacentrus* in general body shape.

1. *Nannacara anomala*, male.

PRE-SPAWNING BEHAVIOR

When in nuptial colors, the male is greenish-gray on the lower half of his body, and greenish-gold on the upper half. The lateral line is the approximate boundary for these two distinctively different colors. The female becomes a very light tan, and her body becomes crisscrossed by vertical and horizontal intense black lines which give her a checkerboard appearance. This pattern is most pronounced on the upper half of the body. The male will chase the female extensively, never damaging her, will corner her, spread his gills and extend his finnage, swimming close to her not unlike a male *Betta* trying to encircle its mate with undulating motions. He seems to try to smother her with his charms (if that's the proper word).

SPAWNING BEHAVIOR

They will spawn in their own five gallon tank or in a community tank with equal likelihood. They do not mate for life, a common misconception about cichlids in general. Each will take what-

ever is available. They are easy to breed and to raise.

The spawning site is the vertical inside wall of a rock cave or flower pot. They prefer small, tight areas in which to spawn, and a number of such set-ups gives them a choice to pick the one they like best. In my experience they have never spawned on a horizontal

2. *Nannacara anomala*, female with eggs. Note flower pot has been turned for the photograph. The eggs were spawned on the vertical wall of the pot, *not* the floor.

surface or on the tank glass. I have never observed their spawning tubes.

After spawning, in which about 30 to a 100 small, tannish-yellow eggs are deposited and fertilized, the female drives the male off. She remains in her intense checkerboard phase from now on until she is separated from her young or her eggs. If one slowly removes the flower pot (or rock), she will remain with it, neither biting your finger nor eating the eggs. She does not seem to get excited by this activity either. If a small private tank is used, she will beat the male to the extent that his fins become ragged. In fact, the best sign that spawning has occurred is the finding of the male crouching in a corner, off-color, ragged, and seemingly afraid to come out to feed. In a community tank, he will not be hurt, just driven off.

If the female is allowed to remain with the eggs, she will be an excellent parent, and I recommend this method to anyone breeding them for the first time. Another method, which I now employ (to raise quantity), is to remove the eggs on their substratum (rock or flower pot) and place them in a gallon jar of tank water with methylene blue and an air stone. *They should not be incubated in a cool place, as colder temperatures will kill the eggs or fry.* Following this method, the parents should spawn again within two or three weeks. At warm temperatures the eggs hatch in two and a half days, and the fry become "scooters" in four more days. The next day they are free-swimming. I feed brine shrimp nauplii and micro-

3. "Scooter" stage—the fry will become free-swimming in one more day.

4. First day after the "scooter" stage. Fry are now free-swimming.

worms from the start, and keep plenty of algae in the tank as a place where infusoria will propagate. The fry seem to enjoy browsing among the algae, but do not seem to eat the algae itself. The fry school, and are about half the size of *Pelmatochromis kribensis* fry of the same stage.

A female kept with her fry will keep them herded into a compact school beneath her or around her, but never above her. At night they rest on the bottom below her, and in times of dan-

ger she signals them (in some way) and they rapidly congregate into a compact mass on the bottom, usually hidden in some rocks. In typical cichlid fashion, she will warn off intruders with rapid flicks of her head. She will not attack your finger, however, as will many other cichlids.

I (and probably many others) have made an interesting observation regarding the behavior of juvenile females. At slightly over a half inch in length, a number of females in a tank (sexed by this odd behavior and by their assumption of the checkerboard pattern) will protectively brood small cichlids of other species in their tank. I have two tanks with *N. anomala* juveniles, in which there are also smaller fry of *Pelmatochromis kribensis* and an *Apistogramma* species. Several of the *Nannacara* have assumed the typical checkerboard pattern and hover over their own clutches of mixed cichlid fry, appearing to protect them from larger fishes in the tank. They flick their heads when others get too close to where the fry are browsing on the bottom, and viciously drive off any fishes that come into the area. For this reason, I have not had to separate my fishes by size as differential growth has occurred. These juveniles are not frightened by flash photography or by my insertion of my hand into the tank (during feeding or cleaning).

5. Juvenile female displaying "protective" behavior with young *Apistogramma* sp. and *Pelmatochromis kribensis*. Note the checkerboard pattern.

CONCLUSION

I recommend this species as an ideal dwarf cichlid to the person who wishes to breed a cichlid of outstanding coloration, but has little room or little patience with diggers or pugnacious species. Their only requirements seem to be clean water (in the absence of which they are susceptible to head infections, rarely fatal), and regular feedings.

TIDE'S IN

by Helen Simkatis

This column deals exclusively with the care of SALT WATER FISH. If you have any problems regarding YOUR Salt Water Fish, we would be glad to hear from you.

From: Lanae Pink, Rhinebeck, New York

I have bought a piece of coral and have placed it in my 10-gallon aquarium. It has been in there for quite a while. During this time it has collected a large amount of moss on it. I have tried to get it off with a scrubbing brush and cleanser, but it just won't come off. It acts as though it has been glued on. Could you please advise me on how to solve this problem? I would also like to know what the average number of fish you can have in a 10-gallon tank.

Answer: *From your letter I assume your coral is in a fresh-water tank. The fact that you have scrubbed the coral with a brush and cleanser alarms me. I do hope that it was thoroughly rinsed when it was returned to the tank. A residue of detergent or soap could be fatal to your fish. Actually, I would not advise cleaning the coral. The algal growth on it will make excellent forage for your fish. It is much better to have the algae anchored rather than suspended. If you must have it clean, I am afraid only weathering it for months out-of-doors will do the trick. I am including your letter in this column as most coral pieces are used in salt-water tanks and what I state here applies to either salt or fresh-water tanks. If you are working with fresh-water fish, you might follow the rule an inch of fish to a gallon of water. If you are working with salt-water fish, however, only two very small specimens (measuring no more than 2 inches in length) may be kept in your tank.*

From: Jay H. Tabachnick, Fair Lawn, New Jersey

I have recently purchased a pair of large Sea Horses (four inches) and since I have them home, which is about a week, they have not eaten. I feed them large live brine shrimp. The water is carefully controlled at 74 degrees, the salt content is also carefully maintained at the same degree of salt as the water in which they were living at the store where they were purchased. There is no metal contact with the salt water. I am using marine salt in my water. The fish appear to be healthy at this time. The male is heavy with young.

Answer: *Of course one of the problems when working with large sea horses is to get them to eat. The large live brine shrimp, however, should do the trick. It may be that this is a strange food to them and that eventually they will accept it. However, as much as I dislike recommending it to you, you might try them with some new-born guppies. The most important achievement you can make at this point is to get them to take sustenance. If you live near the ocean, you might be able to collect the tiny shrimp that attach themselves to clumps of seaweed. I also suggest that you ask your dealer if they were eating when he had them. If they were, then you should suspect the type of water you are using, or the tank in which they are being maintained.*

From: Robert D. Stone, Fayetteville, North Carolina

For many years I have vacationed at Carolina Beach, North Carolina which

PELMATOCHROMIS GUENTHERI

by Paul V. Loiselle

It is customary for aquarists to think of mouthbreeding, or buccal incubation, to be restricted to the genera *Haplochromis* and *Tilapia* of the family Cichlidae. This is a somewhat restricted picture, for several members of the South American genus *Geophagus* practice buccal incubation, and it has been reported but not confirmed in the closely-related genus *Biotodoma*. While there are no known non-mouthbreeding *Haplochromis* or *Hemihaplochromis*, there is a large group of non-mouthbreeding *Tilapia*, of which two, *Tilapia sparmanni* and *T. zilli*, are reasonably common aquarium fishes. There are dozens of other African cichlid genera that practice buccal incubation, including all the fishes of Lake Nyasa and a sizeable proportion of the fishes in the other Rift Lakes. But one would hardly suspect that the genus *Pelmatochromis* would have in its midst a mouthbreeding form. However, *Pelmatochromis guentheri* (Sauvage) is a mouthbreeder through and through, and a remarkably handsome, as well as a behaviorally fascinating, aquarium fish.

The genus *Pelmatochromis*, when judged on the basis of living organisms rather than preserved specimens, provides an excellent example of a comprehensive genus. A comprehensive genus is a taxonomic entity that contains within its parameters a number of forms of insufficient genetic proximity to constitute a valid biological grouping. Such genera are generally based upon a single morphological trait common to many species, a fleshy pad in the pharyngeal region among the branchiospines of the fish's respiratory apparatus in the case of *Pelmatochromis*. As time passes, and later workers can bring to bear on these problems the accumulated insight of past research and their own particular knowledge, these genera are customarily divided into several genera, each of which hopefully expresses a more valid set of evolutionary relationships. As an example, at one time all of the highly distinctive cichlids of the endemic Nyasan *mbuna* complex were classified as *Tilapia* on the basis of a few general features common to both the *mbuna* and the earlier-described *Tiliapia*. When C. T. Regan undertook his study of the African cichlids, and of the Nyasan fauna in particular, he reduced

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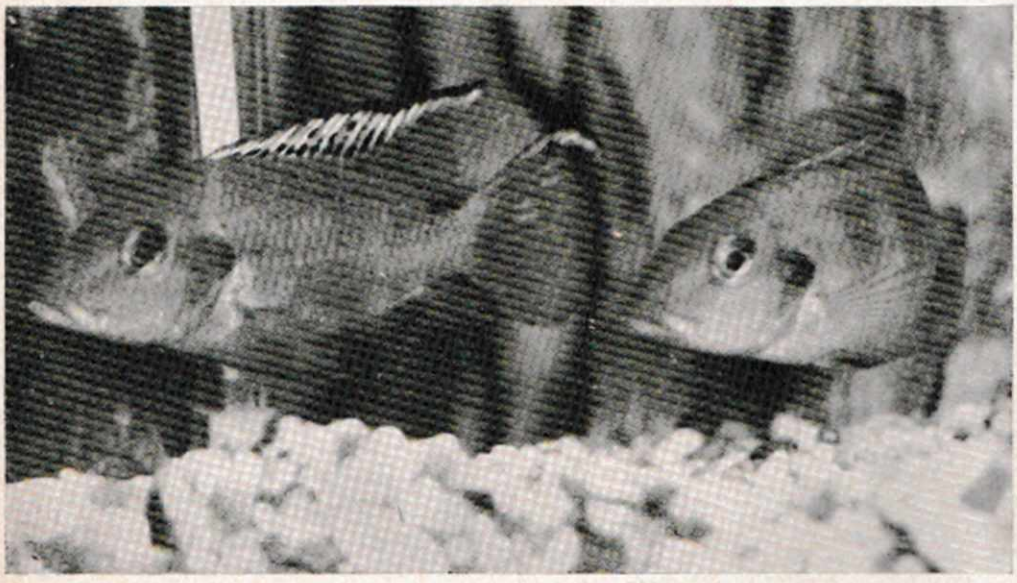
Tide's In . . . Cont'd.

is in the south-east corner of the state. At nearby Fort Fisher there are two or three areas where small fish, hermit crabs, anemones, etc. can be collected. I now have five small fish that I collected there two weeks ago. Here is my question: Can Sergeant Majors be collected on the N. C. coast? They exactly match the rather bad pictures I have of these fish but I understood they came only from Florida. This year the tide pools in the rocks were well supplied; in other years there were a few at times and none at others.

Answer: *We have seen Sergeant Majors as far north as North Carolina in the Harker Island area. We have also seen common butterflies in this area. I am quite sure the fish you have are Sergeant Majors and am not surprised that you found them in the area you describe. Actually, if you will read Breder's book (Field Book of Marine Fishes of the Atlantic Coast), you will find that many of the more hardy Florida fish follow the Gulf Stream up the coast during the summer. In fact they go as far north sometimes as Cape Cod.*

the genus *Tilapia* to the fishes we know under that name today and recognized the uniqueness of the *mbuna* complex of fishes, which itself contains many closely-related genera. Examined in this light, the genus *Pelmatochromis* is found to be divisible into three groups on the basis of reproductive behavior. The first group, represented by such species as *Pelmatochromis arnoldi* and *P. annectans,* comprises pit-spawners, which practice a basically biparental pattern of brood care. The second group, represented by such common aquarium fishes as *P. kribensis, P. subocellatus,* and *P. pulcher,* are cave-spawning forms, with a markedly gynocentric (female-oriented) biparental pattern of brood care. The last group is represented by the subject of this article, *P. guentheri. P. guentheri* practices what can best be described as an androcentric (male-oriented) biparental buccal pattern of brood care. If this seems a large mouthful to swallow, the author urges patience; the meaning of this string of polysyllables, and the reason for using it, will hopefully become clearer with the forthcoming description of this species' reproductive ethology. The author believes that there is no systematic argument that can justify the retention within the parameters of the same genus species with such distinct and different patterns of reproduction, and expresses his hope that eventually such problems in classification will be awarded the benefit of a comprehensive approach, using knowledge in all fields of biology as an analytic instrument rather than restricting systematic research to comparative osteology and simple anatomy alone.

The subject of the present discussion was described by Sauvage in 1882 and was first imported in 1913. It is found over a broad coastal belt running roughly from Guinea and Sierra Leone to Nigeria, and possibly as far south as Brazzaville, Congo. In their excellent work on fishes of the Ivory Coast, Daget and Iltis include *Pelmatochromis guentheri* in their estaurine fauna, comprising fishes that are habitually found within areas of tidal influence, although *P. guentheri* is by no means solely restricted to a brackish water habitat. As might be expected, this da-



***Pelmatochromis guentheri*—female in foreground and the beauty in this species.**
Photo by Paul V. Loiselle

tum has a profound bearing on the maintenance of this species in aquaria. Apparently this species is subject to considerable local variation in color, for the present specimens available in the Los Angeles area, presumably from the vicinity of Lagos, Nigeria, originally, bear little resemblance to the specimens figured by Innes or to his color description, although both are patently members of this species.

This species bears little physical resemblance to such members of the genus as *P. kribensis or P. subocellatus*. The large head, long snout, and large, elevated eyes are more those of a *Geophagus* than a *Pelmatochromis*. The outline of the inferior profile of the head is quite flat, as is that of the ventral surface as a whole. The body is quite deep and moderately laterally compressed. Its base color is a warm ochre or brown, marked with two horizontal dark bands, one running from the rear of the orbit to the posterior portion of the soft dorsal, the other running from just aft o the operculum to the base of the caudal peduncle. The operculum has at its distal tip a large, metallic green to orange spot, and the opercular region has a green or bluish cast. The ventral region of the female supports a large, vivid carmine area. The ventral region of the male is a pale buff, occasionally assuming a rosy violet flush under intense excitement. The dorsal of the male is a pale buff to olive, with a vivid carmine edging. The caudal has a similar carmine edge on its upper proximal margin. Its base color is a warm buff, with radial blue streaks in its lower half. The anal of the male is an intense violet distally, with a cerise to magenta base. His ventrals are carmine to magenta, with a Prussian blue leading edge. The dorsal of the female is in its spiny portion a solid metallic rosy gold, with three to seven black spots present basally and a black-edged carmine or magenta margin extending into the soft dorsal, which is warm golden-buff with intense carmine spots forming a reticulate pattern between the rays. The upper proximal margin of the caudal sports the same black-edged carmine magin as the dorsal, and the remainder is colored as the soft dorsal. The anal is magenta, becoming deep violet distally. The ventrals are carmine, with a blue-black leading edge. The large pectorals are hyaline in both sexes. The large, expressive golden eyes have a slanting dark bar that passes through the iris from rear to front. It is not continued beyond the eye. The black basal spots in the dorsal are present at a very early age and constitute the most reliable criterion for sexual differentiation in specimens under three inches in length. Sexing fully adult pairs is no problem; size alone easily separates the sexes. The author has never seen a female larger than four and a half inches, but males can attain a length of up to eight inches.

As previously mentioned, this species is characteristic of brackish waters throughout its range. It is hence considerably more euryhaline than many other cichlids from the same part of the world. The author's specimens find softened tap water, pH 7.2-7.4, hardness c. 10ppm., to which a teaspoon of salt per gallon has been added, quite suitable, and the specimens in a local dealer's tanks seem just as satisfied with unsoftened tap water, same pH, c. 232 ppm. hardness. The addition of some salt seems necessary to induce successful spawning, however happily the fish get along without it at other times. Temperature-wise, this species does not appreciate any temperatures below 65° F., and is happiest at c. 75° F., with a temperature of 80°-85° F. for spawning. When kept under proper water conditions, this species is resistant to virtually all of the complaints that seem to afflict other members of the genus. It is quite prone to either ich or furunculosis when kept in water that is too cool or lacking in salt, but is easily cured when proper conditions are supplied. Occasionally specimens will be encountered with one

of the nastier forms of furunculosis, characterized by the presence of a bloody red line at the base of the vertical fins and bloody streaks in the region of the caudal peduncle and vent. This affliction can be scotched with 250 mg. of tetracycline hydrochloride or tetracycline phosphate complex per fifteen gallons of water at a temperature of 78°-80° F. Tetracycline has the advantage of not sterilizing the fish under treatment even at twice the dose, but does give the water a distinct yellow coloration that entails at least a partial water change once symptoms have disappeared. Imported specimens will sometimes show white cysts on their vertical fins, often in the shape of a tiny ring. These are apparently protozoan in origin, and under most circumstances appear benign and incapable of either spreading over the body of the afflicted fish or infecting other fishes. However, under some circumstances, some forms will spread rapidly over the body and fins of the fish. This malady, whatever its cause, neither responds to treatment by massive doses of tetracycline or tetramycin nor to sulfa drugs. It does not appear capable of being transferred to other fish, but infected specimens should be destroyed for their own sake and to prevent the possibility of this gruesome disease ever becoming established in aquarists' tanks.

According to Daget and Iltis, *P. guentheri,* at least in Ivory Coast, is a micropredator, feeding upon insect larvae and small crustaceans. In the author's tanks, this species takes both *Tubifex* and live *Artemia* enthusiastically, and also responds eagerly to the flake food Tetramin and to a shrimp-base pelletized food. Boiled lettuce and chickory are devoured ravenously, and even duckweed is occasionally appreciated. The author finds this species adept at working over the bottom of an aquarium in search of edible detritus, and recommends it highly as a scavenger in the large cichlid aquarium. Although the author has never kept soft-leaved plants with his specimens, it would be well to consider the fate of the boiled lettuce before attempting to keep the two in juxtaposition. In spite of its ceaseless activity in the upper layers of the gravel, this species does not uproot plants. or undertake any large-scale excavation outside of breeding season.

Pelmatochromis guentheri behaves quite equitably towards its tankmates. The author's specimens were encouraged to develop a taste for small *Gambusia,* and considering both the ease with which they learned to take this food and the size of their mouths, the author wonders whether small fishes may not be taken with some regularity in the wild as well. In any case, it might be tempting fate to try to keep specimens over three inches in length with anything smaller than an inch and a half. Territoriality in this species seems closely correlated with reproduction, and outside of breeding season this fish is not adamant about the matter. There is a considerable degree of social agonisis between nonbreeding individuals, however, and a stable peck order is quite noticeable when more than a single pair is kept per tank. The only source of friction with other species outside of spawning time seems to involve the distribution of food. In this matter, *P. guentheri* brooks no argument from any fish. This species is given to long periods of inactivity, hanging in the water under the shelter of plant leaves or near the bottom next to a large rock, followed by periods of intense activity, mostly bottom-grubbing. This activity seems to be correlated with the onset of dusk, and this species may be crepuscular in the wild.

Pair formation is a complex, long-drawn-out process, and pairs, once formed, seem quite permanent, a state of affairs which is not usually the case in forms practicing buccal incubation. The initiative in pair formation is tak-

en by the female, who begins things with a lateral display before the male. There is little distinction apparent (to the author, in any case) between this pre-sexual display and the ordinary displays involved in the establishment of a pattern of social dominance, but the male's response is never as vigorous as would be the case in a non-sexual display. The male responds with a series of lunges towards the female which may lead to a series of nudging or mouthing motions against her flanks. This ultimately devolves into a head-to-tail display accompanied by much tail-slapping and butting. This may go on for several days, but ultimately devolves into the jaw-locking so characteristic of the family's reproductive behavior. These bouts of jaw-locking are prolonged and quite intense, and it is at this point that pairs are made or unmade. Jaw-locking usually reaches its peak a day or so after its initial appearance and tapers slowly off from this point to the actual spawning. However, as spawning approaches, the lateral displays by the female increase in frequency, duration, and intensity, and the same applies to the male's response, which is now directed towards the considerably-enhanced red ventral area near the female's vent. By this time, both sexes have adopted a distinctive pre-reproductive coloration. The female's base color deepens to a dusky umber and her carmine ventral blotch assumes a warm glow. The coloration of all of her fins deepens and two distinct changes occur in the gular regions of her body. The outer edge of her branchial membranes becomes a fiery red, and her throat becomes a dusky blue-grey. The male, on the contrary, becomes decidedly paler, with five to seven vertical bands running from his dorsum to the midline of his body. The coloration of the fins is enhanced and his branchial membranes also take on an orange-red cast. However, the dusky coloration in the gular region is absent at this point. As the actual moment of oviposition approaches, the male begins to assume a rosy cast, until his entire body is a rich rosy magenta just prior to spawning.

Two or three days prior to spawning, the male begins to excavate a depression in some sheltered spot, usually between two rocks. The female may aid in this labor, but it is a predominately male undertaking. At this point, both fish become quite territorial, and intruders are vigorously chased away. The female is considerably the more aggressive member of the pair in this respect, and her sensitivity to trespass becomes progressively greater as spawning approaches. As spawning approaches, the rate of excavation becomes more frenzied, as do the displays of the female. Eight to twelve hours prior to oviposition, the male begins to develop a genital papilla, and shortly thereafter the female begins to show her ovipositor.

Spawning is initiated by the female, who circles the depression, fins spread, branchial membranes extended, colors enhanced. The male responds by mouthing and butting her now-fiery carmine ventral blotch. The male apparently begins to fertilize the ova, which are extruded in lots of a dozen or more, as they appear. The male picks up the ova somewhat casually, and the female may re-initiate oviposition before he has mouthed all of the previous run's production. This goes on until thirty or more ova are deposited and picked up by the male. As the author writes these words, a pair of this species is completing the process of oviposition, some fifty ova being deposited, and as the male seemed to have have difficulty finding room for them, a dozen or so were mouthed by the female until the male had settled his load, and were then spat out in twos and threes for the male to snap up, mostly before they reached bottom. The author has never noticed this behavior before in this species.

The eggs are cylindrically ovoid, pale tan and about the size of a small

printed "o." Once the male has stowed them all away, he has quite a mouthful, and an ovigerous, or egg-bearing, male is easily spotted because of his swollen gular region. The male's branchial membranes become quite vividly orange at this juncture, and his gular region assumes a dusky coloration, analogous to but not as intense as that of the female. The female retains her spawning coloration in its full intensity, in contrast to the male, who becomes quite pale and drab. Her behavior now centers about keeping other fish as far from her ovigerous mate as possible, and the sight of a large, tight-lipped male of this species being vigorously defended by a bellicose little female two-thirds his size is somewhat ludicrous.

Unfortunately, this species is less than constantly devoted in its parental care, and males usually consign their first three or four broods to the interior before finally rearing a successful clutch of babies. Hence the author is indebted to a number of conversations with his friend Dick Stratton for the data on the remaining portions of *P. guentheri's* reproductive pattern, for his pair has yet to manage the task of raising a brood to the free-swimming stage.

The period of buccal care lasts from eight to ten days, after which the male releases his brood for their first meal. From this point on, both sexes are actively engaged in the care of their offspring, and the fry will be sheltered in the mouths of both members of the pair. Stratton has had pairs rear their fry to a length of almost an inch in a mixed cichlid tank, which seems to indicate that this species can be a very good parent indeed when the impulse dictates.

The fry are capable of managing initially on *Artemia naupulii* and grow rapidly on such a diet, attaining a length of three inches in six to eight months. Females seem to mature earlier than males, but at three and a half inches both sexes are patently capable of reproducing.

There is little question that the buccal incubation practiced by *P. guentheri* is extremely unsophisticated, and probably represents a stage through which all mouthbreeding forms passed in the evolution of their present behavior. Despite its similarities to the reproductive patterns of *Geophagus jurupari* and *Tilapia macrocephala*, there seems little doubt that this particular reproductive pattern is a strictly intra-*Pelmatochromis* development. The ancestor of the present-day *P. guentheri* was probably a large member of the *kribensis-subocellatus* group occurring in an environmental situation that exerted strong selective pressure towards a buccally-incubating type. It is a pretty good principle that in non-mouthbreeding forms, the most brightly colored member of a pair is most closely connected with brood care, and that the reverse is true for mouthbreeding forms. A little thought will reveal the necessity of this development. Bright coloration is of little use to whichever member of a cichlid pair is engaged in policing the territorial parameters of the pair's breeding area; in fact, they are apt to invite a lot of unwelcome attention. However, bright color patterns may be of considerable value in the direction and control of the movements of a school of fry, and they are less apt to be spotted by predators if kept near the bottom or between a cluster of rocks. Hence a female *P. kribensis*, who spends virtually the entire incubation period of her ova within an enclosed space, is far more brilliantly colored than her mate, who stands guard over the nesting area. In a mouthbreeder, however, bright coloration on the egg-carrying member of the pair is an invitation to racial suicide, for the fry or eggs, as well as the parent, are destroyed when the parent is taken by a predator. Hence the strong selection in favor of inconspicuous coloration in the ovigerous sex

of a mouthbreeding species. Given the brilliant coloration of females of the *kribensis-subocellatus* group, it is not difficult to picture selection pressure gradually pushing towards a reversal of roles culminating in the present-day arrangement of *P. guentheri*, with the brightly-colored female courting the drabber male and protecting him from attack while he is engaged in carrying eggs. If she should fall prey to some predator, the male, with his precious burden, is unjeopardized, and the next generation has another chance at survival. Once the hazardous period of buccal incubation has passed, the coloration of the two sexes facilitates the relative reversal of roles, with the female leading the fry and the male mounting guard. This particular pattern of mouthbreeding seems an ethological dead end. Unlike those species that practice a maternal pattern of incubation, the effective ratio of males to females can never drop below 1/1, for while a single male may be able to fertilize the ova of more than one female, he patently cannot carry the ova of more than one. Such a course of action would make the species perilously susceptible, its future riding on comparatively few males and their burdens, in addition to being physically impossible for a single male, with his limited mouth capacity, to undertake. However, in a maternal mouthbreeding form, a ratio of one male to as many as 30 females is quite practical. Given the usual 50/50 ratio of males to females in every brood, this reproductive pattern places a premium on intraspecific competition among males, and by permitting the rapid dispersal of successful genetic combinations widely among a population encourages rapid evolution. Hence, it is no coincidence that the fantastically-evolved cichlid faunas of the Rift Lakes consist in the most part of maternal mouthbreeding forms, and that at the same time there are no living examples of a maternal mouthbreeding form that characteristically operates on a single-pair basis, as do the paternal mouthbreeders known to science. Under such circumstances, polygamy is so much more sufficient that the monogamous forms were "forced out of business" in an evolutionary sense very early in the game. However, the primitive pattern of buccal incubation practiced by many paternal mouthbreeders, by virtue of its own evolutionary limitations, contained the instrument of its own preservation over the centuries. As is often the case with "living fossils," these forms are sufficiently well-adapted to particular environments to have survived into the present—to become a datum for scientists and a delight to aquarists.

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FISH DISEASE CLINIC

by Robert E. Gossington

FROM: Mr. and Mrs. James Melvin, Beverly, Washington

For two years we have had a persistant and distressing condition that attacks our Black Lyretail Mollies. A small swelling appears often just behind a side fin. The skin then bursts to show a single white spot slightly smaller than a pin-head. Within three weeks the white spot becomes a hole in the fish with the spot still at the center; healing over leaves a small indentation; or is joined by one or more additional swellings and white spots. It occurs only on mature fish, striking females most often. We have had four fish recover, three killed by the condition (the spot was on their heads) and 15 we discarded when they became affected with multiple spots.

ANSWER: *There are several disease organisms which cause white spots upon their victims. Among them are a certain virus species, and several species of Protozoa, the one-celled animals. The most common of these, of course, is* Ichthyo-

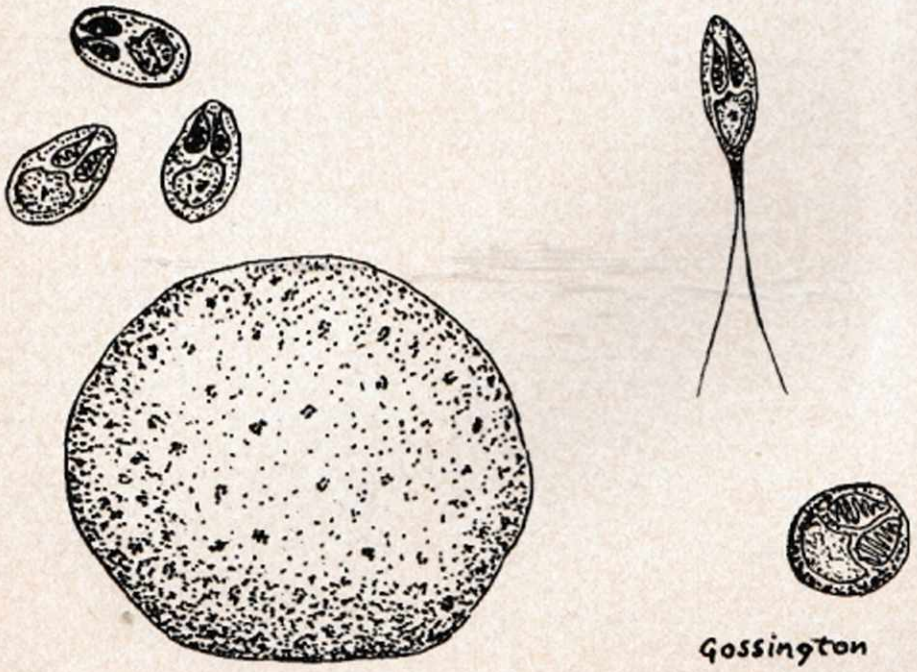
phthirius, *"Ick", but from your description this is not the culprit plaguing your Lyretails. Instead, the blame here probably goes to another of the* Protozoa *belonging to a group known as the* Sporozoa.

One of the genera of these animals is Myxosporida, *which causes a lot of trouble among both aquarium and food fish. During one of its stages it produces external swellings on the fishes' bodies which grow out among the surface tissue cells. The fish become infected by eating a spore-like stage of the* Myxosporida *from the bodies of infected tank mates or free-living* Sporozoa *in the water.*

The new victim's digestive juices then break down the spore's cell wall, liberating the tiny young parasite which oozes itself between the cells of the fish's stomach and enters the bloodstream. Once here it takes a free ride to almost any part of the fish's body where it finally lodges and grows again into the stage we started with. This may take place within the muscle cells, unseen within the body, or it may occur in the skin cells, the dermis, resulting in swellings or spots.

Within this growth a process of nuclear division takes place which eventually leads to the formation of the spore stage. The parasite is again ready to infect more fish.

Now comes the crusher; there doesn't seem to be a good remedy for infections of Sporozoa *at the present time. Van Duijn, in his book,* Diseases of Fishes, *suggests that Atabrine might be effective in a concentration of 300 milligrams per* 100 *litres of water. At present I am working on another drug, still in the experimental stage, which may also be successful in treating these cases. We may hear more about it later. Judging from the method of transmission, I would say removal of all obviously infected or dead fish is the best control. You did the right thing in discarding the affected individuals and could eventually break the cycle, cleaning up the whole thing, that way.*



Myxosporida species, showing large amoeboid and three spore stages (left). Spores of two other species are seen at right.

"THIS IS MY PROBLEM"

In which we print the answers to questions that some of our thousands of readers are asking. Let us know YOUR aquarium problem.

From: E. W. Sturman, Augusta, Georgia

I am interested in purchasing a used 50-gallon aquarium that is made of 1/8 by 1-inch angle iron. The ends and sides are 1/4-inch plate glass. The bottom is made of 1/32-inch stainless steel that is painted with a coating of Sherwin Williams underwater paint that is supposed to be permanent. Will this metal bottom be harmful to fish? Will it poison the water? Will the paint hold up under water without having to replace it?

Answer: *The tank that you describe in your letter seems to be a good one except for the stainless steel bottom. I don't know whether or not the paint will hold up but I would suspect that it will not. A small crack or chipped area will expose the water to the metal and even though stainless steel has been used, even the best quality breaks down when in constant contact with water and this is especially true of aquarium water. The result of such breakdown will result in a condition injurious to the well-being of your fish I would be inclined to advise you to either place a glass floor in the tank, or a Plexiglas shield. If you do this you can cement the edges of the Plexiglas or glass to the frame of the tank with rolls of aquarium cement. You might also use Dow Corning aquarium sealant if you are going to use glass, I am taking it for granted, of course, that you are going to use this tank for fresh-water fish.*

From: John Sebold, Plainfield, New Jersey

I would like to know how I could raise Vallisneria. I don't have luck growing it. The water is hard in this area. Does it need hard or soft water? And at what temperature? I've had a cryptocoryne for 10 years.

Answer: *Vallisneria likes hard water. It requires good daylight or artificial light and from my experience with it, likes water in the mid 70's. I am surprised that you have done so well with Cryptocoryne when your water is hard. Ordinarily, this plant does best in soft water. One thing that occurs to me is that if your Cryptocoryne is doing very well, it may be that your Vallisneria is not getting enough light. The Cryptocoryne does not require as much light as the Vallisneria.*

From: Mike Chastain, West Covina, California

I live where the winters are very mild, not going below 40 degrees F. at night. I would like to know if there are any tropical fish I could keep outdoors all year round. I have had success but only in the summer. Also, do you know what kind of food is used to feed brine shrimp?

Answer: *You might try the White Cloud Mountain Fish in your outdoor pool, and there is also a possibility that Paradise Fish would take the temperature you mention in your letter. Of course, goldfish are not tropicals, but if your pool is 14 to 18 inches deep, you might try goldfish in it. Brine shrimp can be fed wheat germ, lima bean flour, or small pieces of dried yeast.*

From: Mrs. A. J. Lanouette, Newport News, Va.

I would like to know what to do

FISH HEALTH C. O. D.

By Jerry Currier and Martin Smith

Did you ever stop and think that we in America have what almost amounts to a phobia about germs? Witness the ads you see and read and hear everyday. Soaps that wipe out armies of germs with one swipe, room sprays that send millions of the little beasties to germ heaven with one push of a button, toothpastes and mouthwashes and hundreds of other things that would take Louis Pasteur's breath away! (To be truthful, some of them even take our breath away!)

All of this just goes to show that the average American has become very conscious of the importance of personal health and cleanliness.

So what does it have to do with fish? Well, stop and consider for a moment. The tropical fish in the home aquarium is not in a situation that is really healthful, primarily because his environment is *artificial*. Oh sure, we try to match his requirements but in most cases we can only be partly successful.

Someone once said that our fish probably survive in spite of us. There is no doubt more truth than fantasy in that statement. As an example imagine yourself caged in a comfortable but not overly large house. Although all of your basic requirements are supplied and you get the same diet but you are not allowed out of the house. You are subject to the whims of some outside observer who manipulates the air you breathe, the temperature and even the light. This situation could eventually lead to some very abnormal reactions in your physical makeup. But to expand the analogy lets say that you suddenly had to share this same space with 4 other people. There is certainly room enough for all of you but if one should catch cold, the chances of spreading it would be tremendously magnified. (Why do you think astronauts have to be so healthy?)

Your aquarium is a kind of house for your fish. It has a closed cycle for supplying oxygen and eliminating wastes. You, the observer, control the food, light and heat.

Let disease strike and it can, and usually will, spread to most of the inhibitants of the aquarium.

We are not going into a discourse on the treatments of various diseases. This has been amply done by many others. What we are attempting to point out is the value of *prevention*.

Prevention is the first tool in wiping out disease. You take shots, sterilize your eating equipment, brush your teeth and bathe. All of which are forms of prevention against disease. If you practice prevention on yourself and family why not on your fish? After all, they are living animals that are just as susceptible to their diseases as you are to yours.

There are a number of steps you can

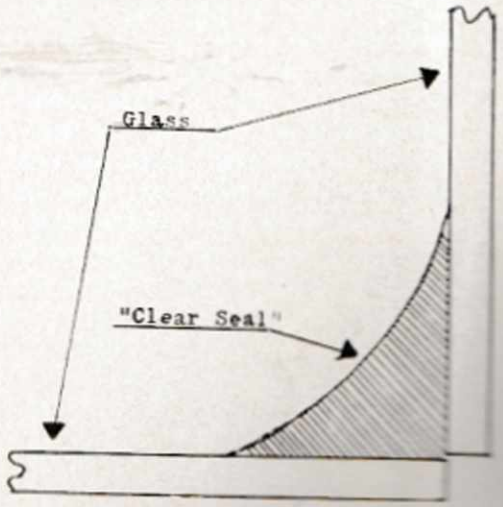


FIG #1

take that can add to the health of your fish. First let's examine your tank. Empty, it is just a few pieces of metal with some glass cemented into it. But take a look at the inside seams. The chances are that you'll find there are spots where the cement is oozing out. This in itself is perfectly normal, but from the standpoint of cleanliness, how clean can you get all of those little crevices? There is no doubt a lot of dirt left even after vigorous scrubbing. You can be sure that where there is dirt you are bound to find bacteria. Obviously the answer is to smooth the seams so that dirt is easily removed. One of the silicon rubber cements is ideal.[1] (General Electric's "Clear Seal" or Dow's "Silastic"). Trim off the oozing portion of original cement and apply the rubber to the *entire* length of the seam. Run your finger along the seam with a steady stroke. You will get a cross section shown in figure #1. Do the same to all the seams in the tank. When the cement has cured you will have a smooth, even surface that is very durable. And more important a surface that cannot harbor dirt and bacteria and cleans with great ease.[1]

Another safeguard is to sterilize the tank. There are a number of ways to do this. One of the simplest is by washing it thoroughly with a strong salt solution. This will kill most organisms such as "ich", "velvet", etc. The effect on bacteria is open to question. There are a number of commercially available sterilizing formulas for aquarium use that are more effective. The problem with these compounds is the expense which can be alarming when you have a number of tanks to clean. If you decide to use one of them, it is best to follow the instructions. We have found that potassium permanganate is an effective germicide and it is inexpensive. It can be purchased in quantity at chemical supply houses and possibly drug stores. (You may find that it requires a prescription at the drug store and here the family doctor can be of help to you.)

Fill your tank with warm water and add permanganate until you get a deep purple color, usually a teaspoon per gallon is more than sufficient. Let this stand for an hour or so. Empty the solution and scrub the tank thoroughly. You can see slime deposits, etc. as they will be stained a brown color. After all of the brown is scrubbed off rinse the tank completely to remove all traces of the chemical. (One word of caution. Potassium permanganate is a very effective dye. Don't splash any on you or your clothing. It won't come out. If you get some on tile or porcelain use "Clorox" or one of the other chlorine bleaches to remove it.)

Probably the most effective disinfectant for aquarium use is chlorine. This is available in the form of liquid bleaches for laundry purposes ("Clorox", "Purex", etc.). Fill the tank with warm water and add 4 tablespoons of bleach for each gallon of water. Let soak for at least 15 minutes. Then scrub thoroughly and rinse. *You must take great care to rinse until all of the "slimy" feeling disappears and the chlorine odor is* gone! Otherwise you run the risk of poisoning any fish you put in the aquarium.

We should mention that you must be cautious in the choice of tools you scrub with. DON'T use steel brushes, steel cleaning pads, etc. These can scratch the glass and cause damage to the frame. Use a soft sponge and an old toothbrush for the hard to get at corners.

Another often overlooked source of infection is the gravel you use. Since gravel is very uneven and has many surfaces it can harbor millions of "beasties". The only safe and positive method of sterilizing gravel is heat. Wash the gravel first to remove the loose dirt and impurities. Wash under running water until all sediment is gone. This is indicated by the clarity of the overflow from the container you are washing in.

Drain to remove the excess water. (*DO NOT* use disinfectant solutions or soaps. It is almost impossible to clean these solutions out of the gravel.) Then spread the gravel about an inch deep on a cookie sheet or cake pan and bake at 250 to 400 degrees until dry. Allow to cool before putting into the tank. Very few harmful organisms can survive this treatment.

The most difficult problem is sterilizing plants. Because plants absorb chemicals in the water you must use extreme caution in this step. The chlorine added by your public water department has a certain disinfectant potential which you can make use of by allowing water from your cold water tap to flow over the plants for a few hours. This perhaps is the safest method for the plants, but snails and certain parasites will survive. Another more positive method is to soak the plants in a weak solution of 2 tablespoons of salt per gallon, or use potassium permanganate in a solution of one teaspoon per gallon. Five minutes is the maximum time you should leave the plants in either of these solutions and thorough rinsing after is an absolute must. You can also use one of the disinfectants made for aquarium purposes. *Be sure and follow the instructions exactly*. Otherwise you will have a bunch of dead plants! Please–REMEMBER TO KEEP ALL CHEMICALS OUT OF REACH OF CHILDREN–some chemicals are very toxic to people as well as germs!

Setting up the aquarium with disinfected materials and plants insures that the bacteria level is low to begin with. The aquarium should be allowed to stand for a few days before adding fish as most harmful organisms require fish to multiply. If fish are absent the organisms will die. You needn't worry about bacteria for activating an undergravel filter, as the introduction of fish will bring this about.

Before putting fish in the newly set up aquarium, they should be segregated. There are even steps you can take to insure against infections the fish themselves may have. The best method is place the fish in a completely bare tank. That is to say, a tank with no gravel, plants or ornaments. The water should be fresh and the tank sterile to guard against infection from outside sources. Place your fish in this tank and add a germicide. Methylene Blue is ideal for this. Although many people discount the use of Methylene Blue, Mr. C. Van Duijn, Jr. in his Book *Diseases of Fishes* indicates it has a good anti-bacterial action as well as helping carry oxygen in the fishes blood. You will also find that Argucide Company's, Arguicide, or Tropicals Research's, Bacticide or any of the numerous antibiotics available for *general* treatment of fish diseases will aid in reducing any infection the fish may aleady have. Here again you should always follow the instructions on whichever drug you use. It should be recommended with all drugs and chemical treatments that air be supplied by use of an airstone as some drugs reduce the available oxygen in the water. The fish should be left in the *isolation* tank for at least a week before transferring them to the aquarium that is to be their home. This helps insure they are healthy as most diseases will show in that time.

There are some other aspects of "preventive medicine" we can examine here which are often overlooked by the most meticulous hobbyists. For instance, the tools you use in the aquarium can become a dangerous source of infection if they are dirty or if they are used in an infected tank and then transferred to a healthy one without disinfecting. All tools such as nets, scrapers, dip tubes and the like can be easily disinfected by soaking them in a germicidal agent. Methylene Blue, potassium permanganate, salt (heavy solution or commercial aquarium sterilizers. After soaking in one of these solutions they must be rinsed thoroughly to prevent contamination of aquariums with the chemicals.

Another very important facet of health

in fish is diet. A healthy fish has natural resistance to diseases. Diet is one of the principal factors in proper health. Dry foods or one kind of live food do not meet all of the requirements for most fish. You must try and feed combinations of live, frozen, and dry foods. This variety increases the chances that you are meeting all nutritional requirements. You may find that one of the vitamin additives available today will improve the resistance of your fish to infection. We have found that Tropicals Research's, Vita Trop is a very good product as well as Aristo Product's Vita-Min-Bricks. All of these things help decrease the incidence of disease by building the natural resistance of the fish.

In breeding fish the importance of sterile conditions becomes paramount. Fortunately most fish will spawn with artificial plants and grasses in bare tanks. This means that through use of these in the case of egg-laying fish, you can insure sterile conditions for the eggs and cut down on losses through bacterial attack. The artificial plants are easier to sterilize and the bare tank offers few sources of contamination when it is properly cleaned and disinfected.

Another helpful thing to keep in mind is the use of fungus retarding drugs such as Methylene Blue when spawning egg laying fishes. The addition of one of these drugs to a tank after spawning is completed helps combat bacterial destruction of the eggs and yields a proportionally higher hatch. (These suggestions refer to fish which do not guard their eggs and not to such fish as Bettas and cichlids).

In community or show tanks a few minutes time spent in cleaning out plant and animal debris each day will decrease the chances of disease striking as dangerous organisms have fewer places to multiply. Properly maintained filters also are of great importance. Undergravel filters clean themselves for the most part, but inside or outside filters using charcoal and glass wool should be cleaned at least once every two weeks and oftener if they show signs of heavy dirt buildup. A dirty filter harbors many dangerous organisms as well as being ineffective in its main purpose of cleaning.

One of the most useful tools in keeping contagious diseases from turning into an epidemic is to maintain a sharp eye for the first signs of infection. If some indication of sickness is noted or suspected, the fish in question should be immediately removed and quarantined until the disease is cured. After you have had any variety of fish for a time you will notice any unusual activity that may be the first sign of sickness.

We realize that all of this sounds rather ominous and foreboding. The purpose here is not to frighten nor to turn you into a fishy Dr. Kildare. Rather we are trying to point out the value of *prevention*. It is much simpler and certainly less dangerous to prevent disease from happening than it is to treat and cure after it has struck.

It may appear that we have dwelt a great deal on the use of chemicals and drugs, and it is obvious that over use of these substances can be more dangerous than the disease they are to treat, or prevent. When using any drug, caution and temperance must be the formost consideration. Because of this we have also experimented with nonchemical means of preventing and combating disease.

In our experience one of the best methods available to the aquarium hobby today is the Douglass Filtration System. The term "Water Polisher" is given to these filters by the Manufacturer (Douglass Filtration Systems, Inc., Elyria, Ohio) and certainly is descriptive of the actual value of the filters. The use of one of these filters will greatly reduce the incidence of disease and parasitic (i.e. ich, velvet, etc.) infections. This is especially true where care has been taken to insure sterile conditions in an aquarium as well as the introduction of healthy fish.

In summarizing let's say good health

HOLY CATFISH!
NO, PINK CATFISH!

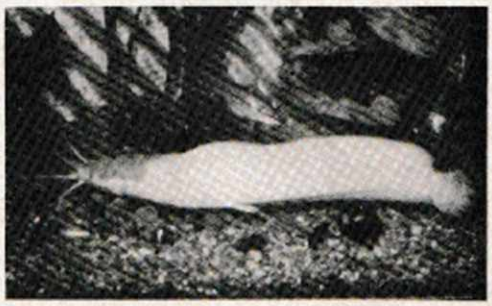
by D. E. Dyer

I think every tropical fish fancier gets the urge now and again to get a fish that's a little different, and I found a dandy! The dealer selling this fish sold it under the name of Albino Catfish, *Clarias batrachus*. You probably won't find this fish too often, the albino or the original colored variety, being that it is somewhat rare.

Today most hobbyists recognize two types of fish which are called "albinos". First there is the apparent albino, which is a fish where the pigmentation is very weak. That there is any pigmentation at all can be seen in the dark-colored eyes. Then there is the true albino, every speck or trace of any dark markings is gone, and the eyes are pink, not dark.

Albinism, though rare, occurs in approximately 1 out of every 10,000 of the species. This failure for the secretion of the pigment is mysterious in nature. The pigment is partially of completely absent in the tissues which in the normal eye blocks out extraneous light. This allows light to be reflected from the back of the eye which produces a pinkish pallor. The transparency of the background permits the blood vessels to be plainly seen. The light shines through the iris, thus preventing its usual function, viewed as a camera, of sharp definition and focus of the image on the retina. It also accounts for its extreme sensitivity to light.

Nature always providing for its own, when it can, realizes the disadvantage this animal has in his normal habitat. The albino with his pink eyes lives in a constant glare where he must hunt his food mainly by his sense of smell. While his brothers and sisters with normal eye characteristics are able to see their food plainly.



***Clarias batrachus* has become a popular conversation piece among aquarists. Author Dennis E. Dwyer gives us some new observations on this aquarium subject. Photo by the author**

Let us assume that an albino occurs in a *Cichlid* family where one or both of the parents are present to care for the young, the light-colored fry looks like an intruder to the parents and is devoured. With poor eyesight it becomes an easy target for any predatory fish, bird, reptile, or amphibian that happens to spot it. Hence, albinos seldom survive.

The distribution of *C. batrachus* extends from Africa and Madagascar over the whole of southern Asia to east Asia and further includes the Philippines and Malay Archipelago. It belongs to a small family of catfish, called *Clariidae*. This fish grows at a considerable rate in a

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. . . your FISH can be gotten C.O.D., Cleanliness, Observance, Diet. By practicing these simple rules you'll be able to spend more time watching your finny pets in the certainty that you have done your best for them.

1. Ed. Make sure Silastic seal has completely cured or set up. Then rinse well before filling tank. Un-set sealing material is toxic to fish.

matter of months. With good conditions they grow from 9 to 12 inches. The *Clarias batrachus* in the natural state reaches a size of 18 inches in length.

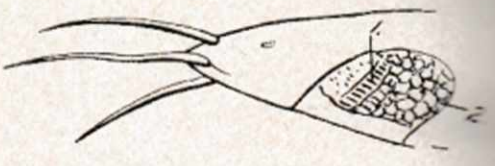
The normal color of this albino catfish would be brownish to green-blue, the back being a little darker with a greenish lustre. The under side of this fish is pale brown to a delicate reddish cast, with the Caudal fin and Anal fin a gray-green. The Dorsal fin seems to have a more yellowish tint to it. The body is eel-shaped with a broad flat head and transverse mouth with very long barbels, which consist of 2 nasel, those being the upper barbels, 2 maxillary, the ones extending from the side of the month, and 4 mandibular, and these are the barbels on the under side of the fishes head.

One characteristic of the whole family are the accessory air-breathing organs. These may be developed either as paired tubular blind sacs which extend backward from the gill-chamber on either side of the vertebral column, or as cauliflower-like, projecting into an extension of the gill chamber. These accessory air-breathing organs not only enables the catfish to live in very poor oxygen waters, but also permits them to exist for hours at a time out of the water. Even more extensive land excursions may be observed. During the dry season many species burrow for days in the mud.

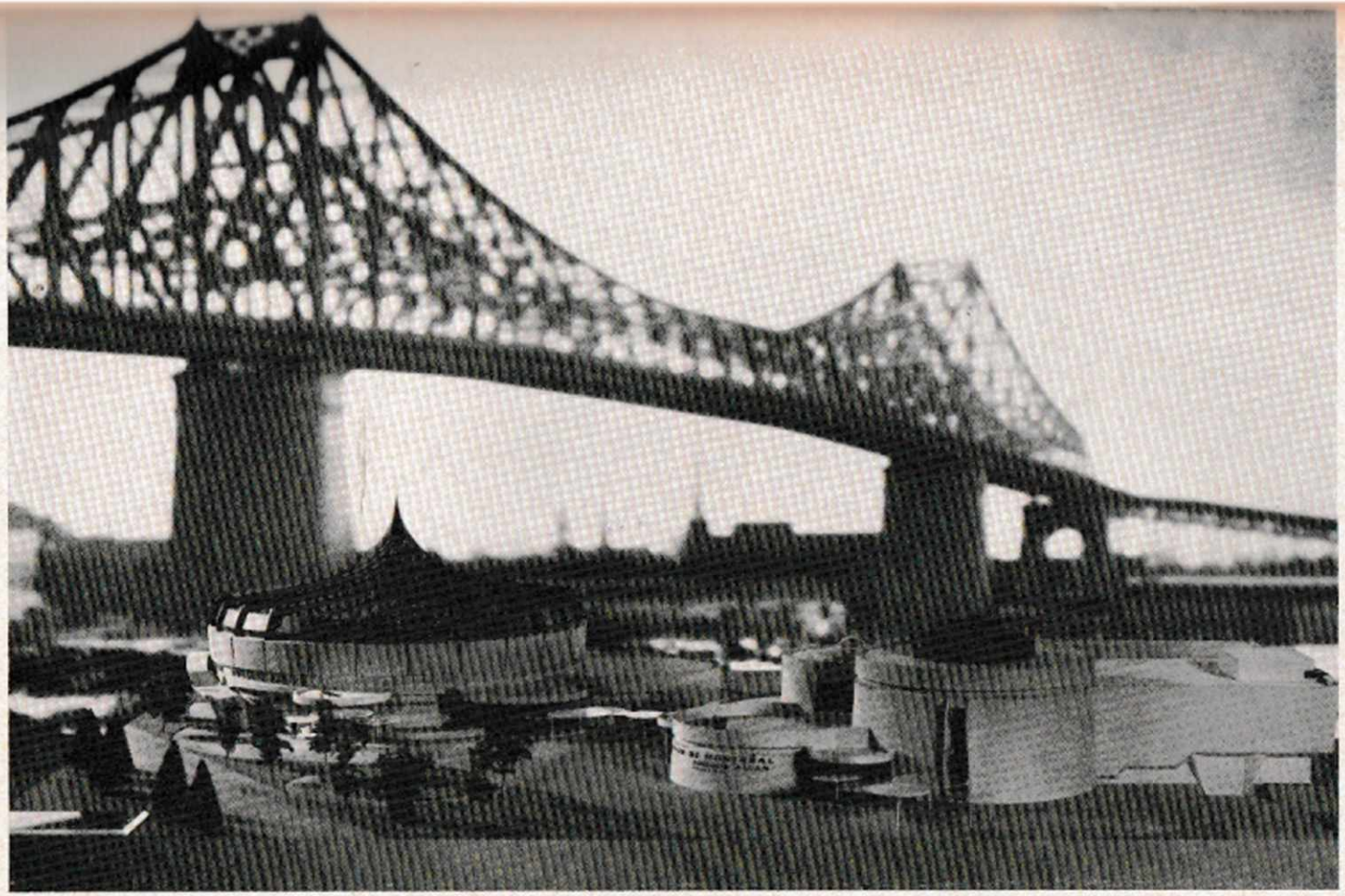
Fortunately the *Clarias batrachus* is a very healthy and robust strain, which will probably be with us for a long time to come. It is suitable for a domestic aquarium, but only with larger fish, such as the *Anostomus, Plecostomus,* and most large Barbs. The albino also needs a place for shelter, such as a cave and he has a keen sense of property rights and may bully or kill any other fish which tries to take away his home.

It is always a good idea to give albinos special treatment. The tank should be set up with an outside filter, and a dim light. He also should be placed with strong and sparse plants. The *Clarias batrachus* also has a tendency to dig the plants up, but I found that placing rocks under the gravel and around the plants stops him from burrowing. The temperature should be between 50° to 90° Fahrenheit. Their feeding is easy and they like all kinds of live food, such as worms, mussel, fish, and mammal flesh. Many species will accept potato and softened rolled oats, and very often these fish will eat so much that their bodies become spherical.

The *Clarias batrachus* is one of the most fascinating of all tropical fish to watch. And I sincerely hope that the time is not far away when we can all own this albino catfish, in that the supply will become more plentiful.



accessory air-breathing organs of the Clarias Batrachis
1. Gill
2. arborescent accessory respiratory organ



Pictured above is a model of the Aquarium which will be one of the permanent buildings of the many that will comprise the Expo 67, scheduled to open late in April 1967, in Montreal, Canada. The theme of the Exposition is *Man and His World*, and there will be 70 governments participating. The Aluminum Company of Canada, Ltd. and the City of Montreal are building the aquarium where a variety of marine life will be displayed. George F. Eber, a Montreal architect studied the world's leading aquariums as a background for the design he created for the aquarium pictured above. Porpoises and penguins will be some of the stars of the aquatic show.