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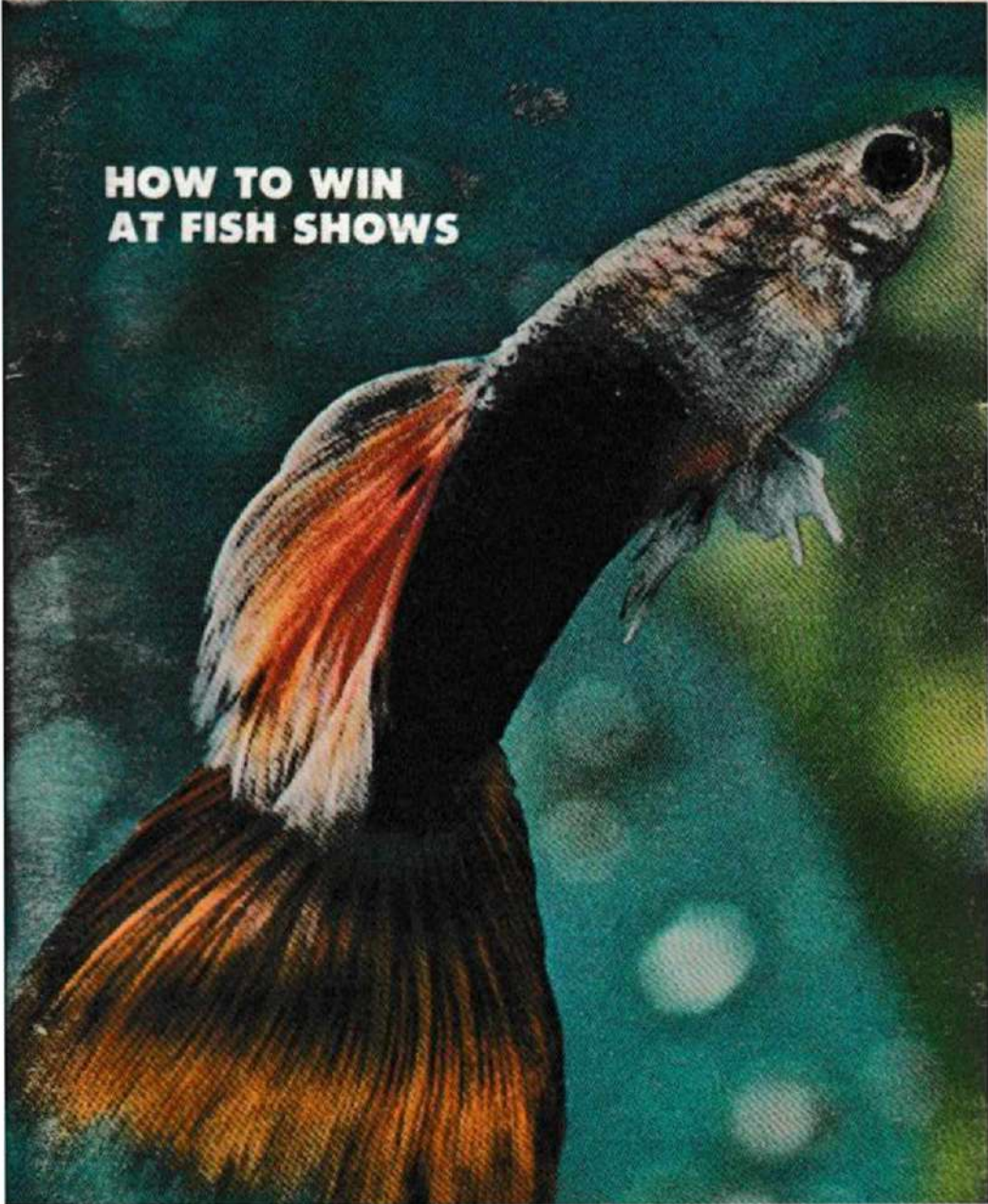
SEPTEMBER, 1968

VOL. I NO. 11

AQUARIUM

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**HOW TO WIN
AT FISH SHOWS**





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Contents

HOW TO WIN AT FISH SHOWS	4
THE REDSTRIPED SNAKEHEAD	6
THE FIRST DAYS IN THE LIFE OF CORYDORAS PALEATUS	8
MALACHITE GREEN	16
THE KILLY CATALYST	20
ADVERSARIA	24
ABOUT OUR AUTHORS	26
THIS IS MY PROBLEM	28
SOCIETIES AT WORK	30
FISH HATCHING IN VIETNAM	32
A HISTORY OF THE AQUARIUM HOBBY IN AMERICA	34
POINTERS ON PLANTS	36

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On The Cover

Using a motorized Nikon F on Kodachrome Film our photographer, Andrey Roth, captured this brilliant half-black guppy that adorns this month's cover. (Additional credits appear on page 69.)

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HOW TO WIN AT FISH SHOWS

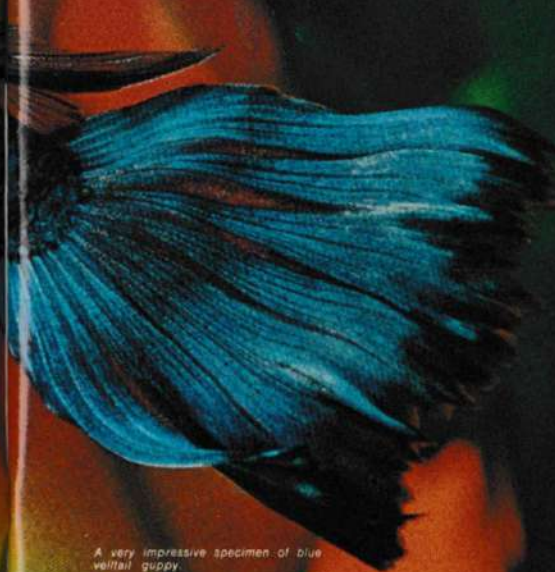
by RON & TINA AHLERS



IT TAKES JUST A LITTLE SOMETHING EXTRA to win consistently in today's fish competitions. So many hobbyists have acquired both the superior stock in their favorite species, and the knowledge and skills to raise them to near perfection, that just coming in with good healthy fish is no guarantee of going home with an award. Just a little over a year ago we started showing guppies and bettas. After only eight shows, we have collected 30 awards, 7 for bettas and the rest for guppies. As they say, "We must be doing something right!"

We first began to formalize our technique for increasing our chances of winning when Ron was asked to judge the bowl show at a monthly meeting of our club, the Bronx N. Y. Aquarium Society. First place

narrowed down to just two fish. One had the edge in color, the other superior in size. On points it was a tie. Then Ron noticed the larger fish seemed to be swimming with a motion that reminded him just slightly of a shimmy. The other seemed to move through the water with a somewhat firmer stroke. The difference was almost imperceptible, but because the fishes were so close otherwise, this hairline difference was used to break the tie. *continued on page 38*



A very impressive specimen of blue veiltail guppy.



THE REDSTRIPED SNAKEHEAD

THE ASIAN TROPICS, which might be considered to center about the area of Thailand, are well represented by fishes equipped for drastic conditions, for the annual monsoon season creates vast lakes of water into which the fishes migrate for the purpose of proliferating their respective races. These lakes, however, are seldom more than temporary, and as the water recesses pockets and ponds become isolated. Even these are often doomed for dessication, and those which have been left behind are relegated to an existence in a swamp which may become muddy, hot, weed-choked and low in oxygen. For survival a number of them have become equipped for breathing atmospherically such as bettas, gouramies and other anabantoids (Suborder Anabantoides), the clariid catfishes and the snakeheads or serpenthead fishes of the family Channidae (pronounced KAN-EH-DEE). *Continued on page 44*

A standard specimen of redstriped snakehead, *Channa micropeltes*, with mouth paired open to show the size of its gape.

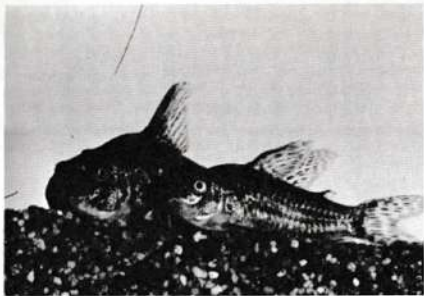


THE FIRST DAYS IN THE LIFE OF CORYDORAS PALEATUS

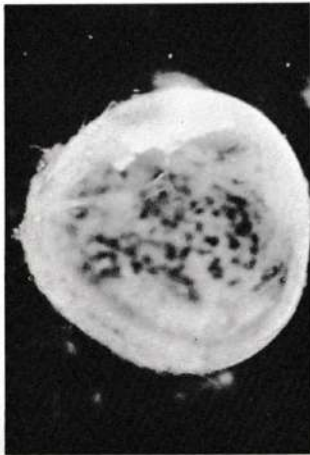
By WILLIAM A. TOMEY

THE VARIOUS SPECIES OF *Corydoras* have been, without doubt, among the most popular aquarium fishes in the hobby. There are both small and large (relatively speaking) species within the genus, and one that seems to fit about in the "middle" category is *Corydoras paleatus*. If fully grown and well-fed males and females are present in the tank, the aquarist may be pleasantly surprised one day to find a rather large quantity of grayish-colored eggs deposited on the glass or on the plants. Most times, however, these eggs are eaten by the other fishes that may be in the tank, or the snails, and thus few or none may reach the hatching stage. However, if one were to breed this fish in a tank set aside especially for that purpose, then the story of the development of the eggs and fry, from the beginning to the end, could be unfolded before the hobbyist's eyes, much like the accompanying pictures show.

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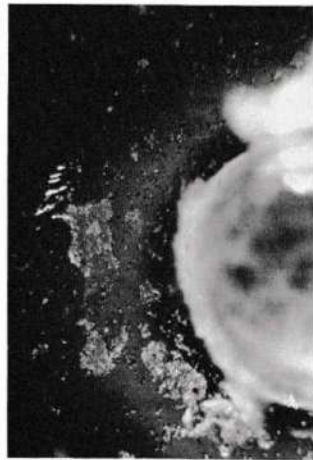


A pair of mature
Corydoras paleatus.

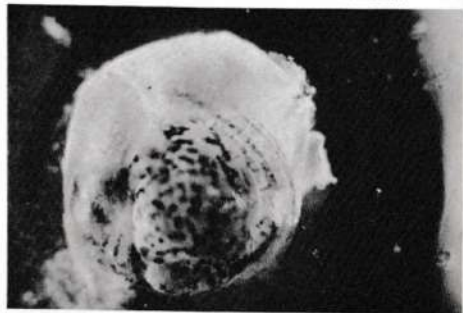


This is a *Corydoras paleatus* egg with a fully developed embryo. When the egg was first laid it was spherical, but at this stage it is somewhat pear-shaped, a consequence of the tensions produced by the movements of the embryo.

10



The embryo is protected by a double membrane. The outer cover consists of numerous, small chitin cells which break into patches at hatching time. Such patches appear as the beaded debris all around the egg in this photo.

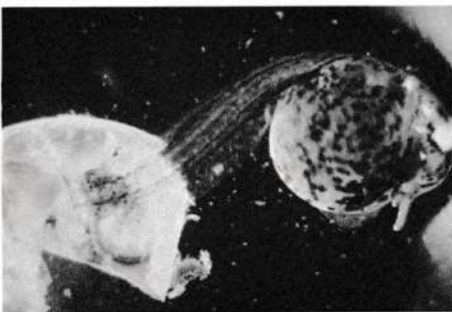


Egg development takes from 7 to 10 days, depending upon the temperature, after which an opening appears in the inner membrane.

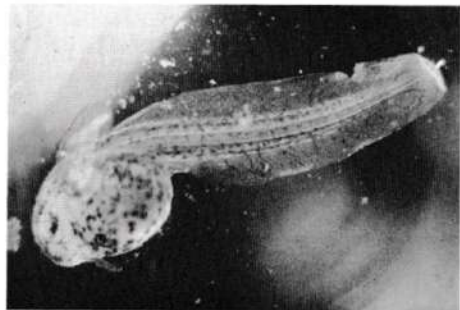
Here we observe the fry emerging from the egg through the opening in the inner membrane, still in a more or less rounded posture.



At this moment, the fry is free of the egg shell, ready for its struggle with life.



11



When just born, each fry seemingly consists of two parts — a tail and a yolk sac.



The body of the newly-hatched fish is covered with black pigment cells, a form of camouflage since the fry are helpless as they lie on the bottom of the aquarium.



Long whiskers are a distinguishing feature of the young fish, even at this early stage.

A closeup of the whiskers indicates the many tactile "buds" that provide the young fish with a sensitive structure that serves to locate food that is on the bottom of the tank.



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MALACHITE GREEN

By HARRIET CONNELLY

THE DYE MALACHITE GREEN IS ONE of the compounds used to prevent or combat the effects of pathogenic organisms on fish. It was first brought to the attention of the aquarium hobby in 1952 as a result of a report by the U.S. Fish and Wildlife Service on preliminary experiments to prevent fungusing of pike eggs in hatcheries. The pike eggs, hatched in running water, were treated for one hour with the chemical at a strength of 1:200,000. The eggs turned green but were not adversely affected. Treated eggs gave 100% larger hatches than untreated ones. Actually, some earlier work on salmon eggs had been done in 1949 at which time several chemicals were investigated, including formalin as well as malachite green. The conclusion was that malachite green was very effective and had the greatest margin of safety in use. The concentration used also was 1:200,000, for a period of one hour. Subsequently, successful applications have been reported involving the occurrence of fungi, bacteria and protozoa. The reported treatments vary from a dip-bath of ten seconds in a 1:5,000 concentration, to an exposure for several days in a 1:700,000 concentration.

Three questions naturally arise with regard to the use of malachite green: (a) It is effective? (b) It is safe? (c) What is the proper dosage? Unfortunately, these questions are not easily answered because there exists a complicated relationship which might be referred to as the fish-bath-chemical-pathogen "quadrangle." In other words, the variables are the species and age of the fish involved, the time-concentration dosage, the properties of the aquarium water, the grade of chemical used, and the type of pathogen (i.e., disease organism) involved.

To illustrate the time-concentration effect, Table I is helpful. These experiments were performed on immature sand whiting (*Sillago ciliata*), ranging in size between 10 and 25 cm, contained within plastic-lined wooden tanks of 2½ gallon capacity, 5 fish to a tank (these are marine fish and were, of course, kept in salt water). The Table shows that safety is related to both exposure time and concentration. It is meaningless, therefore, to talk merely about concentration.

TABLE I

Influence of malachite green on survival of fish. Each test used five fish. "D" denotes that some or all died; "S" denotes that all survived. The last column is the average survival time, in minutes, when the fish were left in the concentration indicated.

Concentration	Exposure Time In Minutes				Unlimited
	10	20	40	80	
1:80,000	S	D	D	D	89
1:160,000	S	S	D	D	126
1:320,000	S	S	D	D	156
1:640,000	S	S	S	D	189
1:1,280,000	S	S	S	S	225
1:2,560,000	S	S	S	S	324

Another interesting experiment with these sand whittings involved a study of body size of fish and temperature on the survival time (see Table II). Although the results are not statistically significant, as temperature increased, survival time decreased for both "large" (mean weight 131 grams) and "small" (mean weight 14 grams) fish. Similarly, the survival time for large fish was greater than that for small fish at all temperatures studied.

TABLE II

Influence of body size of fish and temperature on toxicity of 1:80,000 malachite green solutions. Figures indicate survival time in minutes. Each experimental condition represents five fish.

Temperature	Large	Small	Average of Large and Small
14-8°C	109.8	95.4	102.2
17-8°C	87.2	85.8	86.5
18-0°C	79.0	77.4	78.2
Average	92.0	86.2	

Water temperature is an important factor in any disease control

scheme. (The temperature is not limited to dyes. A distinct increase in toxicity of insecticides, for example, has been noted in other investigations.) Although body size is a factor, the differences to be expected are not important enough to warrant special care in disease control schemes using malachite green.

A great deal has been said about the type of malachite green used in the control of fish diseases (especially with regard to the so-called "zinc-free" dye). Two types of malachite green are commonly available, viz., a chloride salt and an oxalate salt. No significant differences, however, have been found between the two. As far as purity of the dye is concerned, this is apparently a needless concern. The typical impurity content of commercially available malachite green varies from about 1/4 to 5%. Even if these impurities are toxic to fish, the quantities of dye employed are such that the impurity quantity is largely irrelevant.

Aquarists familiar with malachite green know that the bluish color of its solutions gradually fade. Among other things, the degree of decolorization or fading increases with increasing pH. Experiments to determine whether fresh or decolorized solutions are more toxic have generally proved inconclusive. There seems to be no significant difference. With regard to bacteriostatic activity, i.e. the ability to slow down the growth and reproduction of bacteria, however, fresh malachite green demonstrates a stronger effect than the decolorized solutions. The dye, fresh or faded, has relatively little bactericidal (i.e., killing) effect on either gram-negative pseudomonad bacteria or gram-positive coccus bacteria. Typical results are shown in Table III.

TABLE III

Results of tests on bactericidal and bacteriostatic activity of 1:80,000 malachite green solutions on two species of marine bacteria.

A: Number of organisms/ml immediately after addition of dye.
B: Same, 20 minutes after addition. Growth rate is in generations/hour.

Treatment	Pseudomonad			Coccus		
	Viable Counts A	B	Growth Rate	Viable Counts A	B	Growth Rate
Fresh	360,000	460,000	no growth	540,000	620,000	0-16
Faded	420,000	470,000	0-38	560,000	540,000	0-22
Control	430,000	222,000	0-57	500,000	unchanged	0-55

Table III shows that, although malachite green has no bactericidal

18

effect, it does slow down (or stop) growth, and that fresh solutions are better than decolorized solutions (which, in turn, are better than no dye at all). It should be noted also that other investigators have found malachite green to inhibit, but not kill, the growth of the gram-negative fish pathogen, *Vibrio piscium*, commonly infecting rainbow trout.

Malachite green, however, is not the only member of this general group of dyes (i.e., the triphenyl aminomethane group) used for the treatment of fish diseases. Both crystal violet and brilliant green are very effective bacteriostatics to gram-positive bacteria, and somewhat less so to gram-negative bacteria. This implies that a much broader spectrum of fish pathogens could be reached with a mixture of these dyes than with the single dye, malachite green. Indeed, a strong triple dye mixture consisting of 0.8 grams of malachite green, 0.8 grams of brilliant green, and 0.6 grams of crystal violet in 10 liters of water has proved satisfactory in checking bacterial infection when the fish were immersed in the solution for 10 seconds two or three times a week. This works out to a concentration of 1:12,500 for the malachite green and brilliant green, 1:16,700 for the crystal violet, and a total of 1:45,500 for all three together.

In summary:

1. The safety of malachite green is a function of both time and concentration, i.e., use dilute solutions in long immersions or concentrated solutions in the form of short dips.
2. The toxicity of malachite green is a function of temperature, i.e., the higher the temperature, the greater the toxicity.
3. Body size of the fish, type of malachite green and impurities are of much less importance.
4. Fresh malachite green solutions are more effective than older, decolorized solutions; toxicity, however, is about the same.
5. Malachite green is not a bactericide but is effective as a bacteriostatic agent.
6. A mixture of malachite green, brilliant green and crystal violet is very useful in the treatment of bacterial fish diseases as a broad spectrum remedy when the exact nature of the infection is not known.

THE KILLY CATALYST

by RICHARD M. LANGWORTH

KILLFISHES ARE OFTEN NEGLECTED by aquarists, owing to their comparative inactivity in the average aquarium. Many are shy, and tend to disappear when kept with large, pugnacious or active fishes, or even with fishes of their own family. A killy fancier for many years, I thought this trait a regrettable necessity until recently, when I discovered a method that all but negates it in the killifish, and even among other varieties with similar habits.

In a lushly planted, long-established ten gallon tank, I had placed four newly acquired *Aphyosemion* "vexillifer", a beautiful blue variety similar to, but smaller than, the popular *A. nigerianum*. The new environment had the routine result, and the sapphire-like killies immediately disappeared. They were rarely seen save at feeding time, and then just long enough to snatch a liberal bunch of tubifex worms and dart back into their retreats.

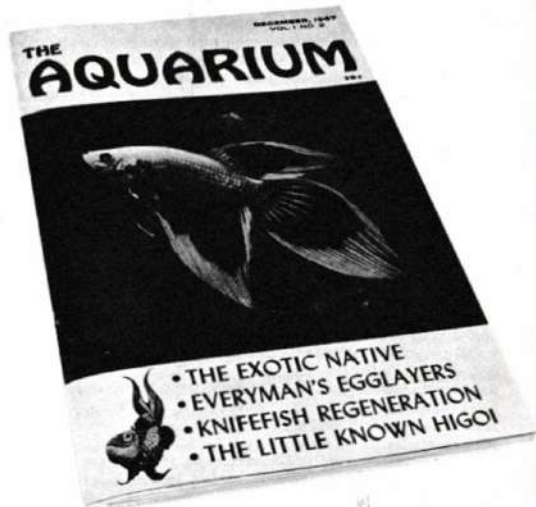
Soon after their introduction, however, I added a pair of cardinal tetras for temporary conditioning. Their effect on the aphyosemions was astounding! The cardinal, as we know, is a peaceful but active little characin, constantly on the move but entirely inoffensive. This pair was no exception. Almost immediately, the four killies emerged from the thickets and gleefully joined in the fun. This continued for the duration of the cardinals' stay. Though the vexillifer foursome accompanied the antics with their formidable jumping techniques, they suffered no apparent ill effects.

The startling fact was that upon removal of the tetras, the killies continued their very un-killy-like behavior for many weeks! Not only were they extraordinarily active, but spawning immediately followed. Subsequent experiments, using cardinal, neon and bloodfin tetras with other varieties of killies, produced similar results.

Interested, I tried the cardinals with some fellow characins, *Neolebias ansorgi*. This small, uncommon species resembles a barb in shape, but a killy in behavior. Extremely shy, they are sensitive to light, water

20

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chemistry and any undue disturbance. When conditions are right however, they display gorgeous hues of gold, green and crimson.

Alone in a heavily planted, properly adjusted five gallon aquarium, well shaded with floating vegetation (pH 6-6, DH 5), my four *Neolebias* had refused to appear for any length of time. Immediately upon introduction of two cardinals their manners changed. Flashing vibrant Christmas colors, they dashed about the tank, playing with their brilliant comrades. Spawning was not induced, but the scene the two varieties created was unheralded in any small community tank I've yet seen. The startling neon red-green of the cardinal tetras was beautifully contrasted with the softer, richer colors of the *Neolebias*. Combined with thick plant life, the tank became the highlight of my small bank of aquaria.

In all my "experiments" no change was made other than the addition of the tetras. This "catalyst" phenomena was invariably produced, particularly successful with killifish of shyer natures. Apparently, the combination of activity and peacefulness inherent in such tetras as the cardinal and the neon acts to eliminate the innate prevailing shyness of the smaller killifish. I repeatedly induced active behavior with various peaceful tetras among *Aphyosemion bivittatum*, *A. petersi*, *A. multicolor*, and two varieties of *A. australe*. From what I observed, however, certain principles are important when selecting the "catalyst" fishes:

1. One must give priority to peacefulness over activity. Members of the characin family are usually ideal in this respect. Naturally, one must avoid exceptions, like the various "serpae" types; but more often than not, characins possess the temerity and tact necessary to enliven their shyer brethren without damage.

2. The aquarist should select fishes of similar size. I noticed that the induced activity is strongly diminished if the "catalyst" species is larger than the subjects of the experiment. This especially applies to killies.

3. Allow no more than 30% "catalyst" fishes per total tank population. This phenomenon has a law of diminishing returns, and too many active fishes will drive the shyer ones back into hiding.

These experiences clearly indicate that we aquarists, despite our clumsy imitations of nature, can still beneficially enhance the spirits and looks of our subjects in unexpected ways. Following the simple rules above, hobbyists can better enjoy the beautiful and varied members of the killie group, and observe them more than is normally the case. Knowledgeable and conservative use of such fishes as the cardinal tetra is an apparently sure-fire means to this end; moreover, it lets us truly enjoy the subtle but unique beauty of their bashful cousins.

EDITOR'S NOTES: The fish known as *Aphyosemion "burundi"* is identical with that currently referred to as *Aphyosemion "vexillifer"*. Neither name, however, is correct and the fish remains unidentified at this date. Either spelling, "killie" or "killy", is correct, with the latter preferred. ●

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adversaria

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

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



To The Editor: I feel compelled to offer a few comments regarding the article by Hans Mayland titled, "Experiences in Keeping Discus", which appeared in the April 1968 issue of THE AQUARIUM. Mr. Mayland seems to consider no connection between the feeding of tubifex worms and the onset of what he calls "hole disease". In fact, it would appear to the reader that he has fed this worm to his fish as a matter of course, and observed no ill-effects as a direct result.

Let me recall for you the general trend of a conversation between myself and Mr. Carl Naja, of Wisconsin, which took place over the telephone several years ago. My interpretation of this conversation is something like this: Mr. Naja, a breeder of discus in respectable quantity, in order to induce pairing and spawning, planned to feed a small quantity of tubifex to his breeders. He expected, however, to lose a large percentage of these fish as a direct result of this practice. He inferred that the subsequent "head worms", "ulcers", and other fatal or crippling diseases that occur after, and only after, a tubifex feeding are caused by something in the tubifex itself.

This was my first indication of the connection between tubifex and discus "problems". Further reading and

experience over the years solidified my suspicions, and I vowed never to feed tubifex, in any form, to discus that I might own. As a tropical fish dealer in the Boston area, it is my pleasure to sell many discus during the course of a year. It is our practice to inform the customer that we do not stock tubifex, live, frozen or otherwise, and strongly oppose its use. We do not buy discus that have been fed tubifex, and of the hundreds that we have bought, stocked, acclimated and sold (many having been here from three to eight months), we have never had a case of headworm, ulcers, severe fungus, popeye, or any other externally evident disease on any of our discus!

Most of our customers are in and out of our shop at least twice a month, especially those who have enough interest in the hobby to purchase discus. It has been my further observation, through these regular customers, that those who have not followed our advice and used "the worm", invariably have had the type of problems discussed here, and the others who have not used the worm invariably have not had these problems.

This can hardly be considered a controlled experiment; however, I believe that there is enough evidence here to rule out most of the possibility

continued on page 68

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back of any aquarium, whether that of a beginner or professional. We couldn't make one better, so now you know why we had to make one bigger.



ABOUT OUR AUTHORS



RON & TINA AHLERS

Ron and Tina Ahlers are both second generation aquarium hobbyists as Ron's father was an avid guppy breeder for many years, and Tina's mother always maintained one or two community tanks in their home. Natives of The Bronx, New York City, the Ahlers were married there shortly after Ron finished a stint in the U.S. Air Force during the Korean War. They presently have three daughters.

Five years ago, when they moved to Deer Park (in the center of Long Island), the aquarium bug really bit them. They now have a large fish room containing 120 tanks in the basement of their home, and breed guppies, bettas and angelfish on a semi-professional basis.

Ron is a systems analyst with the Grumman Aircraft Engineering Corp., and a good deal of the Ahler's success in breeding their show-winning fish can be attributed to Ron's computer-orientation. Visitors to their fish room note that detailed records are kept not only of the pedigrees of their breeders, but even feeding and tank maintenance records.

While they enjoy working with

betas and angels, both admit to having strong feelings of partiality towards guppies. The basic guppy stock they are working with came from Ron's father, but the current breeding program has resulted in true-breeding strains of reds, blues, blue-greens and half-blacks with red tails; they are now developing a blue-tailed half-black. Currently, Ron is Vice President of the Bronx Aquarium Society.



JAMES S. MIGHELLS

James S. Mighells was born in 1940, in Salamanca, New York. He later graduated from Alfred Agricultural Tech in Alfred, New York, and has lived both in Rochester and the southern tier region of the State. Jim is married and has a son 3½ years old. Prior to his stint in the Army, he operated a small beef herd and worked as a machinist. He is now preparing to go back into farming and plans on devoting full time to it this time.

The Mighells presently share their apartment with an Alaskan Malamute and a small collection of killifishes. Jim's principal interests in the hobby are killifishes, betta and sev-

continued on page 68

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THIS IS MY PROBLEM

by HELEN SIMKATIS

From: T. E. Wisor, Jr., N. Miami, Florida.

I lose baby swordtails and fancy-tail guppies at ages from 2 weeks to 3 months. I raise them in a 5-gallon tank and then put them in a 10-gallon tank, making the usual adjustments. They become sluggish, and some swim at the top or on the bottom appearing to have closed fins. The tails of some guppies are dark colored and there is also a whitish appearance on some swordtails and guppies. I have tried various remedies, different aquariums and temperatures. I have made pH changes, used permanganate and changed the filters when needed but still have no luck. I had 150 fancy-tail guppies at one time and now have only 10. The only thing I haven't tried is a complete change of water from a distance source, or to purchase distilled water. These are means I am trying to avoid as both would be quite involved. Dealers have not been helpful.

Answer: To solve this problem or to put a finger on what is the cause of your loss of baby guppies and swordtails would be most difficult in that you say you have tried many different ways of transferring the fry. There is one method, however, which you have not tried and in that you lose your fish as a result of transfer, it

might be worthwhile considering. Set up 10-gallon breeding tanks, and as soon as the youngsters are born, remove the parents, using the same precautions of making the proper adjustments for the adult fish when they are removed from the young. We might add, too, that you do not mention your method of feeding the fry. Newly hatched brine shrimp the first week will give them a very good start in life. Such feedings should be frequent. Professional breeders recommend as many as eight feedings a day, using just enough brine shrimp to be consumed at each feeding.

From: Robert Wolfe, Harrisonburg, Virginia.

Is it possible for an amateur aquarist to sell fish that he has raised? Answer: It is possible for hobbyists to sell their surplus fish but, of course, there are no set rules for such transactions. Sometimes a local dealer is willing to purchase tank-raised fish and hobbyists often trade and sell fish among themselves. If you desire to do this as an extra source of income or to help offset the cost of your hobby, a word of advice. Concentrate on a single species and develop a strong, vigorous strain. We would suggest one of the "bread-and-

continued on page 65

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Societies at Work

By
HELEN SIMKATIS

ONCE IN A WHILE A WRITER BECOMES SO entranced with a species that the word portrait he creates becomes more than a mere description of the fish with an outline of its requirements and its habits. Such is the case with an article entitled *The Masked Marauder with a Yellow Streak down his back* by Gerhard Michael Bernacsek in the May issue of the *Montreal Aquarium Society Bulletin*. The title, of course, is merely a physical description of *Colisa chuna* (male) "dressed in his courting duds", and in case the reader is misled by this somewhat incriminating title, the author in his first paragraph reassures us that his subject "has a most congenial and pleasing personality." When the honey dwarf gourami (*Colisa Chuna's* popular designation) first came on the aquarium scene a few years ago, it was predicted that it would become a favorite among hobbyists, and Author Bernacsek's coverage of the species certainly explains why. It is, he tells us, a very willing spawner, and in peaty water at 80 degrees F. will go about the business of reproduction in a community tank with little fuss or bother. Unfortunately such spawns are lost before the hobbyist becomes aware of what has happened. The author explains how spawning may be discouraged in a community situation, and then goes on to the details of setting up an aquarium with the planned parenthood approach. A covered 10-gallon aquarium filled to a depth of from five to six inches, containing floating plants is used. Temperature is maintained at 80 degrees F. He uses two females (well-rounded with eggs) to one male, and removes the

30

females immediately after spawning takes place, exercising care not to upset the bubble-nests. Rich infusoria is a first food for the fry and only a fine stream of bubbles is employed. Growth is slow, he tells us, and it may be two weeks before the youngsters can take newly hatched brine shrimp. This is a well-written article, a delight to read, and a must to save for reference if you have honey dwarfs on your mind. Appearing also in this issue is L. W. Hayter's *Xenocara dolichoptera, Its Care and Breeding*. The author's first-hand experience of spawning this oddball catfish is detailed and as conscientiously handled as his care of his spawning *X. dolichoptera*. He guesses that his specimens were about four years old when purchased, the male at that time being from 5 to 6 inches, and the female 4 to 5 inches. They were kept in a 50-gallon tank furnished with many pieces of cured driftwood. The fish were fed on regular fish food, supplemented with boiled spinach and crushed lettuce leaves. He believes that unless the fish are well-fed with quantities of leafy vegetables, they will eat wood if it is available! He had provided caves as hiding places for the fish and it was here in one such place the large yellow eggs were placed. At the end of five days the eggs disappeared and whether the male ate them or they met some other fate, the author does not know. It wasn't until almost a year later the pair spawned again, choosing the same place. This time the piece of driftwood along with the male and the eggs were moved to an 8-gallon tank containing water from the 50-gallon home tank. The male fanned the eggs for 10 days until the last egg hatched. This is the cue to move the male, the author tells us, for all during the incubation period, the male fans the eggs without taking a break for food. His removal to his home tank is warranted not because he is apt to eat the fry but because the small tank will not accommodate both him and his family and also because his work is actually finished. The young are light-sensitive and stay in dark corners of the aquarium, we are told, and have a clay coloring. They were fed soaked dry food and boiled spinach and lettuce. Good sanitation was maintained in the small tank by removing 20 percent of the water from the bottom every other night. This amount was later increased to 50 percent. *The Montreal Aquarium Society Bulletin* is a well-produced publication and information regarding it and the publishing society may be had by writing the society at P. O. Box 653, Sta. B., Montreal, P. Q., Quebec, Canada.

There are few songs sung in favor of algae but once in a great while someone challenges the conventional by murmuring words in

continued on page 61

31

FISH HATCHING IN VIETNAM

by JAMES S. MIGHELLS

WHILE SERVING WITH THE 4th Infantry Division in the highlands of Vietnam, I was fortunate to be able to spend part of the tour as Civil Affairs Officer for a Division unit. Our work included a broad range of activities from health and hygiene to livestock improvement. Part of the work included the construction of food fish ponds to increase the available protein to the villagers.

Our villagers were Montagnard people, the tribe being Jirai. The Montagnards are a diverse people of several different stocks; the people of this tribe were of Malayo-Polynesian stock. Other tribes are of Mon-Khmer origin. One of the more popular projects we had was the construction of fish ponds. The labor is performed by the village with the help of some borrowed American equipment, the fish being supplied by the Vietnamese Government. The hatcheries are constructed under the sponsorship of the United States Agency for International Development and operated on a Province basis by Vietnamese nationals.

The fish used for stocking are mainly carp, a variety of *Tilapia* and a small catfish resembling the American bullhead. The carp range in color from brilliant gold to dull gray, and appear to be several closely related species which freely interbreed. In one spawning one will find both smooth and rough scaled fish, and all colors including an occasional black fish.

The *Tilapia* are particularly deserving of mention for although primarily a food fish, I believe they also hold promise as an aquarium fish. Their body conformation resembles to a marked degree the American yellow perch, being slightly less elongated. Their coloration is their most noticeable feature. In mature specimens there is an overall violet sheen to the top, sides, and tail. The fins are grayish-blue and edged in the males with black or orange. In some specimens the belly shows a deep orange-red. They obtain a length of 6-7 inches, and although I am told they go up to 10 inches, I never actually saw one that large. They are very prolific and breed freely in the carp rearing ponds, not seeming to bother the young carp. I made a number of visits to the Pleiku Province hatchery and found them in all the carp rearing ponds there. These ponds have mud bottoms, fairly soft in the spring and summer, and very

continued on page 58

32



Sorting out young *Tilapia* too small to be moved. Author facing the camera.

Jirai villagers at the village water point (a spring), Plei Chem Neh.

A fish rearing pond at Pleiku Province Hatchery. Note that water plants also are being cultivated. The water depth at this stage, the first month of the monsoon, is about 1 to 3 1/2 feet.





A HISTORY OF THE AQUARIUM HOBBY IN AMERICA PART 10 BY ALBERT J. KLEE

THE AQUARIUM WAS PRICED at 10¢ per copy and \$1 for a one-year subscription (the magazine was published monthly, with the exception of July and August, at Philadelphia). Its editor was Eugene Smith, its Business Manager W. F. DeVoe of Long Island, New York. This very first issue (some 16 pages) contained articles on the chanchito (*Cichlasoma facetum* but referred to as "*Heros facetus*"), darters, the household aquarium, and the feeding of aquarium plants. Those advertising included the old firm of Jacob C. Cassel in Philadelphia, William L. Paullin, Harry P. Peters, Charles Paullin, Franklin Barrett, William Macke, Innes & Sons, Hermann Rabenau, and numerous others. Society lecture announcements were as follows: Brooklyn Aquarium Society—"Persuading highly-developed male goldfish to breed", by S. C. Chester Lloyd; Chicago Fish Fancier's Club—"The aquarium", by William Kopp; and "Aerating devices", by F. S. Young and Carl Fossetta; New York Aquarium Society—"The freshwater molluscs of the vicinity of New York City", by Silas C. Wheat; Philadelphia Aquarium Society—"Varieties of tropical aquarium fish", by Isaac Buchanan. The last-named lecture was probably the most significant ever delivered in the aquarium hobby. It was a milestone as it marked the beginning of the tropical fish hobby in Philadelphia, and the relative decline of the goldfish. Buchanan, who was President of the New York club, was invited by William T. Innes, then President of the Philadelphia society, to present a stereopticon lecture. It was a tremendous success, and Philadelphia was never the same again!

The Aquarium boasted a number of firsts. It was, for example, the first such publication to have an "exchange" column (it exchanged with publications such as the *Nature-Study Review*). One "first" which lasted but one issue, however, was the matter of the "new spelling". At the time, there was an attempt on the parts of some to simplify the spelling of the English language in America (Teddy Roosevelt was one of its proponents). Smith was a member of this group, and the April issue contained, as examples, the following spellings: "publisht" for published, "Workt" for worked, "Obtain'd" for obtained. Smith came under heavy criticism for this and was forced to return to the regular "school spelling" in the next issue.

Smith did a very fine job of editing *The Aquarium*, and contributed from time to time (mostly native fish topics) as did William Innes (mostly goldfish topics). Tropical fish input was provided by Heede, Bird and others. It is difficult to select one article as typical but the following is of some historical interest as it marked the beginning of the use of formaldehyde in the aquarium hobby, a usage that is experiencing a resurgence in popularity today. The article appeared in the October 1912 (Vol. 1, No. 5) issue.

continued on page 50

The water sprite, *Ceratopteris thalictroides*, an excellent aquarium plant (one of the standbys) found in the Old World



POINTERS ON PLANTS PART II

by JERRY CURRIER AND MARTY SMITH

Let's examine the next group, the swordplants or *Echinodorus* species. These vary from the smallest to some of the largest of aquatic plants. There are many species but we will discuss only those more common to the home aquarist.

Echinodorus grisebachii, called the dwarf swordplant, does well in small aquaria and is comparatively easy to grow. It likes bright lighting and reproduces very rapidly.

Echinodorus paniculatus var. *gracilis*, the Amazon sword, has long been considered the "Queen" of aquatic plants. In prime condition this plant makes a beautiful center piece. The leaf stems are much shorter than those of the larger varieties. Because of this, *E. paniculatus* has a very striking appearance of a fountain of leaves rising from the bottom of the tank. Reproduction is by runners, and moderate light is preferred.

Echinodorus paniculatus var. *rangeri*, the "broad-leaved sword," is

continued on page 72

Talking about it later, we realized that if a Society's bowl show produced such close decisions, imagine what judges are faced with in intra-club shows and international competitions! The difference between a blue ribbon, or the first place trophy and just being an "also showed" is nearly always some fine line, sometimes only noticeable to the judge who is straining to find something on which to base his choice.

So, we resolved to concentrate on the fine points. As we outline them for you, please keep in mind that we are presuming that you are working with good stock and that you know how to keep your fish in the best of health. No judge is going to risk making a fool of himself by awarding a prize to a fish that shows any sign of injury or illness, or which is not up to the accepted standards of the species or class in which it is entered. Although we are speaking specifically of guppies, most of our techniques apply to other species as well.

We begin preparing for a show about a month before the actual entry date. Our fish are raised in large tanks, 30 and 50 gallon size. Since we work together raising them, it is also possible for us to feed them eight times a day. We use the so-called force-feeding method of frequent small feedings. Now this is a far cry from the conditions the fish will have to contend with in a show. There they will occupy much smaller tanks, and the usual practice is for the club that is sponsoring the show to feed the exhibits once a day.

We begin, therefore, by adapting the fish to show conditions. All the fish we consider as possible entries are gradually accustomed to smaller tanks by moving them first into 20's, then to 10's and finally into 2½ gallon tanks. This gradual conditioning is important, not only to insure that the fish will be comfortable and display well in a small tank, but also to prevent injuries caused when a fish from a large tank dashes into the side of a much smaller one in which he suddenly finds himself.

Our second conditioning step, taken during this month of preparation, is to gradually reduce the number of feedings from our customary eight to only two a day. As we cut down the number of feedings, we also gradually shift these fish onto a light diet of exclusively live foods to prevent their being weighted down with dry foods during show time.

Here we might also mention that we never use any hormones or stimulants of any kind, either in raising our fish or preparing them to show. Aside from the fact that we have a degree of "purist" leaning in our makeup, there is also a hard practical reason for this. The use of drugs requires great skill and special training which we just don't possess. Improper use of drugs is just as dangerous to fish as it is to people. While we don't deny that they can be beneficial in skilled hands, we just don't feel the risks are justified without that degree of knowledge necessary for successful administration of these substances.

The final conditioning step, simple but effective, is to keep the males



The female guppy shown in this photograph is of the "superba" type (i.e., heterocyclic tail).

separated from the females during this month. The males do not see the females until they are placed together in the tank at the show; this, of course, results in the male's display being at his best when he is judged.

Next is the final selection of our entries, but before we get to that let us consider a little more about the business of judging and the judges themselves. Judges are human. Like all humans they have preferences and prejudices. No matter how hard any judge tries, it is really impossible to be completely impartial. This is not meant as a criticism. It is simply a fact. We never met a judge who claimed to be perfect. All those we have talked to, seem to do a very fine job at what we realize is an extremely difficult task. Still, some judges develop reputations as "color judges"; some become known for other preferences, either real or imagined. This is the reason why many clubs that sponsor shows, keep the names of the judges secret until after entries close. Selecting an entry based on a judge's past record can also backfire. The judge may suddenly become aware of his leaning toward some particular feature, and get a little rougher in that department!

But all these factors do play a part in the selection of entries. We try to make our final selection just as close to show time as possible. We know that show chairmen everywhere may hate us for saying this, but we do make a practice of bringing in our entries as close to the show deadline as possible. The less time the fish is in strange surroundings under the care of other aquarists (however skilled they may be), the better we feel our chances are for our fish to look their best.

It is now hours before deadline, and we come to the most critical part—the selection of our entries. Here we play our little guessing game with the judge, and we believe that our method of selection



Much time and effort was invested in the development of this very pretty strain of white guppy. The edges of the caudal fin are somewhat transparent, resulting in a ragged appearance but for the most part, the edges are fairly uniform.



A brilliant orange half-black guppy. Half-blacks such as this one are very popular today.

is the most vital key to our success in showing our fish. We try to select three entries for each class in which we are going to compete. Although we might feel that one fish definitely outclasses the other two, we still enter all three.

One is selected for color. We look for the fish with the most vivid color, and if the class calls for it, the most complete coverage of a solid color. The second fish is selected for size and configuration. Here we examine the prospective entries for symmetry, especially in the fins, and for overall good proportion as well as being large.

The third fish is selected for vigor. This is a characteristic which we admit to being somewhat prejudiced toward ourselves. Even with all the conditioning and tender loving care that we have described here, we still have had experiences where our "color" entry and our "size" entry disliked the rigors of being carried to a show, and sulked on the bottom, but where our "vigorous" entry was up and prancing when the judge came by and subsequently figured in the prizes.

Also in connection with the selection of entries, we make a practice of entering females that are comparable in quality to the males, even though here in the east the female only figures in the judging of guppies in case of ties. We still feel that the judge will be influenced by the female and that the overall impression of the pair is important. Frankly, we think that guppies should be judged in pairs just like most other fishes.

When entering a week-long show, we also select a female that is just ready to drop fry. This is to provide the pair with live food during the long exhibition. We have heard many hobbyists decry the long show on the grounds that their fish are never the same after that long a time away from their customary care. Well, we think an occasional long show



A somewhat recent improvement in female guppies has produced specimens such as the one shown in which the dorsal and caudal fins almost approach the ventral stage.

is all right. While we wouldn't want to continually subject our fish to them, they do test the vigor of the fish. We even like an occasional show where judging is not done until several days after the entries close. This really separates the men from the boys!

Our fish conditioned, our entries selected, now it's off to the show! The fish are carefully packed in insulated containers and cushioned against any possible jolt or shock. Just one more thing to remember. Bring plenty of water from your established tanks! This last may seem like a needless precaution since the societies that sponsor shows always provide aged water to any entrants that request it. But again, we are dealing with fine points. Why subject your fish to even the slightest need to adjust, if you can avoid it? If you carry enough water to a show 80 miles from home to exhibit your entries in one-gallon bowls, and you find the sponsoring club is furnishing 2½-gallon tanks instead, you risk being left out on the prizes. (We learned this one the hard way!)

So there it is. Conditioning and Selection, coupled with just a little "psyching" of both the fish and the judges, is our whole approach to showing fish. Well, not quite the whole approach—there is one more thing. A show may be the culmination of a year's work in raising the entries, or it may be the climax of several years of a breeding program. The strain of this keen competition can be pretty severe on the hobbyist and we are no exception. After our fish are in their tanks at a show, we tell ourselves that the competition from there on is among the fish and not among us and the other hobbyists or the judges. In other words we condition ourselves to accept the judges' decision, win or lose, as gracefully as we possibly can. ●



The redstriped snakehead, *Channa micropeltes*, one of the Asian snakeheads.

WALKER: continued from page 7

The snakeheads are designed for function and survival. Their large, burning eyes can detect the slightest movement and the creature investigates immediately. The cavernous mouth of a snakehead can be opened at least to begin accommodating a fish nearly as large around as the snakehead himself, although the captured victim may be too large to make it through the gullet. Even should the prey be found too large to swallow, by the time it has been dropped the wicked teeth have left it without life.

There is a cruel grace about these creatures which is perhaps exposed best by not only the largest but also very likely the most handsome, *Channa micropeltes*. Reaching a length of more than a meter, this striking fish when young has a scarlet lateral stripe extending the entire length of the fish to the end of the tail. The red stripe is bordered above and below by a distinct black band which is just wide enough to separate the three basic areas of color. The belly is white and the dorsal surface a brownish-olive which, as the fish ages, shows mottling and may be more or less distinct depending upon the mood and condition of the fish. Pectoral and pelvic (ventral) fins are clear in young, turning pink and later more red with age. The anal is long-based and the dorsal extremely long and is used in propulsion. In general appearance the entire snakehead clan is rather reminiscent of our own North American bowfin, *Amia calva*, although there is no relationship whatever.

The snakeheads are primarily piscivores or fish-eaters, but the predatory instinct is so strong that they will often strike violently at



Channa obscura, another early importation into the hobby (circa 1908, as with *Channa africanus*).

anything moving in the water which might possibly fit into the gaping mouth. I have had *C. micropeltes* repeatedly strike at a pilot light which flickered on and off until he finally succeeded in shattering the test tube which housed the heater and pilot light. Luckily all he suffered was a scorched nose and a temporary lack of enthusiasm for food!

Beside the serpentine coldness of the piercing eyes and the snake-like shape of the head, the lightning speed of a snakehead's strike cannot help but bring to mind the blurred lunge of a rattlesnake or one of our other North American pit vipers. Aside from fishes they have been found to contain in their stomachs lizards, frogs, snakes, tadpoles, crabs and even small rodents in addition to the more ordinary piscatorial groceries. Even those loaches possessing protective erectile spines located in slots beneath the eyes to be used switch-blade fashion in order to cut the throats of predators which might swallow them are eaten with apparently the same relish as other fishes although there is perhaps a greater risk involved.

Channa micropeltes, the redstriped snakehead, is one of the few fishes I have observed which will not only overtake and capture a victim from behind, but once caught the fish will often be swallowed tail-first rather than rearranging it to a head-first position. Most predatory fishes simply will not do this because of the "one-way" action of not only fins but scales as well on some fishes.

Because of the size and power of the redstriped snakehead and its



An African snakehead, *Channa africana*. This species was one of the earliest snakeheads imported, i.e., circa 1908.

good table qualities, it is not surprising that this is among the most respected of game fishes in Thailand according to Hugh M. Smith. Its great strength makes the fish hard to land and it will sometimes jump after being hooked. There are few greater thrills in angling than to hook a heavy fish and have him take to the air in an effort to throw the hook. This is one of the major reasons for the tremendous popularity of the largemouth bass among our own followers of Isaac Walton.

Although this is not what could be considered a commonly available fish, it is an excellent show fish because of its beauty, rapid growth and individuality. It is difficult, however, to imagine under what circumstances an aquarist would wish to keep more than one of these feeding machines for any length of time if it is intended to keep the fish from feeling the pangs of hunger. In my experience, the redstriped snakehead spends most of the day "pointing" the customary feeding spot like a bird dog points quail. If a routine feeding hour is normal, should it be delayed for an hour you may incur the wrath of the creature which will then proceed to bang his unhappy head against the aquarium cover or even the side of the aquarium glass until his tantrum accomplishes the desired results and he is finally fed.

This is a fish which must be treated with respect when handling is necessary or when working in the aquarium, since the large and extremely sharp teeth are capable of inflicting a severe bite. Although attacks upon humans by *C. micropeltes* in nature are not infrequent, this usually



The large and very powerful head of *Channa obscura*, another African snakehead.

occurs when the male parent is guarding the nest. In the aquarium the fish will usually attempt to stay away from the hand of the aquarist, but it is conceivable that one might be bitten if the fish felt he was cornered. Feeding is a different matter, for a careless finger can be mistaken for a piece of beef heart, resulting in a rather nasty wound if the fish is of good size. Since the excitement of feeding will at times make the snakehead jump for the food before it hits the water, the best solution for not only saving fingers but also keeping him off the floor is a complete cover with a feeding hole.

Minnows are a good food for *C. micropeltes* at first, but gluttony and eventual wanton killing soon make it undesirable to try and keep a supply of these in the aquarium. Chunks of beef heart are probably the best solution, although some snakeheads reportedly will accept only living food. Ground beef heart only creates a mess. This is a true predator which will ordinarily strike only at moving food, and the first strike will scatter ground meat. Scraps will simply not be picked up. Even a fish freshly killed by the snakehead himself may be toyed with but probably not eaten. Chunks of beef heart which are not caught before they settle will probably not be eaten even if the fish is hungry.

For those of us who take great pleasure in seeing a large and ravenous fish stuff himself and especially enjoy the almost unbelievable rate of growth such a fish is capable of, there is a danger present which is not apparent. In the confines of the aquarium a healthy fish whose nature



Channa obscura is very beautifully mottled, and the nasal flaps are quite prominent.

it is to gorge himself at every opportunity will probably do so just as he would under natural conditions. Obesity is less obvious in fishes than in many other creatures, and the excessive food intake may eventually result in a fat deposit in the body cavity of the fish which may interfere with vital functions. Ultimately, death may result although the fish may be growing rapidly and have the appearance of perfect health. To avoid this: (1) allow show fishes which must be kept separately as much room as possible (2) do not continually allow them to eat to the point of discomfort (3) after the fish is perhaps a year old, it is not necessary to feed large species every day, especially very predaceous species such as snakeheads. It may be hard to ignore the hungry stare of a fish as you pass him by on "fast" day, but it is better than eventually losing a prized fish. Five days out of seven should be sufficient.

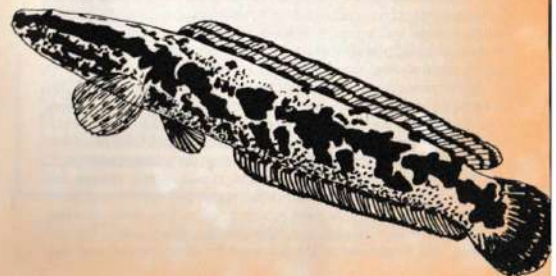
For those who dislike the violence of predation, their judgement should be tempered with some understanding of the very workings involved. In the plan of nature, even ruthless predation seems to have its place and purpose. Although the meddling fingers of mankind manage from time to time to upset the plan with "better" methods, cons of trial and error had gone into the planning and development of a natural system of checks and balances long before the two-legged predator ever came on the scene. There are in this plan those who seem to kill for pleasure, far in excess of their needs. It is significant that their prey often

consists of some prolific type which could, without control, overpopulate and ultimately lead to the detriment or destruction of all the aquatic life of the area. The opportunity to keep creatures of such import is one of the great pleasures of aquarium keeping. ●

EDITOR'S NOTE: This species (and other snakeheads as well) is sometimes placed in the genus *Ophicephalus* (occasionally incorrectly spelled "*Ophiocephalus*", but in 1933 ichthyologists Myers and Shapovalov determined that the two generic names were synonyms and, on the basis of priority, that *Channa* was the valid name. The two genera were originally separated on the basis that species of *Channa* were observed to lack ventral fins, but it was found that there were some species of *Ophicephalus* which commonly lacked at least one ventral fin. (Reference: Jayaraman, K. C. "The proper generic names for some common Indian fishes of commercial importance," *Journal of the Zoological Society of India*, Vol. 12, No. 2, pg. 240, September 1960.)

Although the family name, Ophicephalidae, has been used by some ichthyologists, the correct name is Channidae, both by reason of the rules governing nomenclature and by the nomenclature adopted by ichthyologists Greenwood, Rosen, Weitzman and Myers in their significant revision of the classification of fishes (Reference: "Phyletic studies of teleostean fishes, with a provisional classification of living forms," *Bulletin of the American Museum of Natural History*, Vol. 131, Art. 4, pg. 398, 1966).

Finally, we observe *Channa micropeltes* (under the name "*Ophicephalus micropeltes*") is one of the species of aquarium fishes restricted by the Texas Parks and Wildlife Department. In India, this fish is of considerable economic importance.



KLEE: continued from page 35

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In many cases, aquarium supplies were sold by stores specializing in birds. Note the use of the term "Aquria", rather than "Aquarium".

Advertisement of Jacob C. Cassel, one of the early dealers in aquarium supplies in the country.

"FORMALDEHYDE—A REMEDY FOR FISH INFECTED WITH PARASITES

by H. A. ROGERS

Pagosa Junction, Colorado

"About two months ago we received 25 goldfish from a reliable breeder who is also a personal friend. On arrival they seemed a little weak, but we attributed this to the long journey. Later indications showed an improper assimilation of food, which we thought no more than natural, considering the change of diet from the natural food of a pond to the concentrated, prepared dry food. In time we thought they would become accustomed to the change.

"After giving them frequent salt baths and keeping them isolated for ten days, we added a choice one to a colony of Japanese goldfish, every member of which had been in perfect condition for three years. Their aquarium was provided with an aerator which even at low speed, had always kept the water thoroughly aerated even in the warmest weather.

"In a week's time a beautiful, white, tripod nymph showed unfavorable symptoms, and, in spite of salt baths and special care, soon died. The symptoms, which were as new to us as they were alarming, spread to the entire colony, one after another dying until only two remained. The respiration of the fish went far above normal and they

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THE AQUARIUM

ISSUED IN THE INTERESTS OF THE STUDY, CARE AND BREEDING OF AQUATIC LIFE

CHANG-HITO
Hiss-haku Amis
No. 1

APRIL 1912

PUBLISHED AT PHILADELPHIA, PA.
BY THE AQUARIUM SOCIETIES
OF THE CITIES OF
NEW YORK : BROOKLYN
CHICAGO : PHILADELPHIA

Vol. I No. 1

The front cover of the first issue of *The Aquarium*, published by the aquarium societies of New York, Philadelphia, Brooklyn and Chicago.



This was the only air pump available commercially in 1912. It worked via water power and was attached to an ordinary faucet fixture.

hung at the surface, gasping, as if suffering for air. Speeding up the aerator brought no relief. The fish became listless, carrying their fins close to their body, occasionally violently twitching the fins, or darting recklessly about among the rocks as if in great agony. Later, they would lie around the bottom in a comparatively exhausted condition for a day or two, when death would ensue. No discoloration or dissolution of scales, fins or tails having taken place; in other words, no outward signs of disease was visible, excepting a marked thinness of body just before death. In the meantime, the same condition had developed among the new fish, one at a time dying until only ten remained.

"After testing and finding untenable every possible cause of the trouble which suggested itself to us, we came to the conclusion that the disease must have been imported with the new fish, and that, inasmuch as changing the water always gave temporary relief, it must be in the shape of a parasite whose numbers were greatly reduced for a time by a change of water.

"A microscope of 250 diameters was next brought into service in the hope of discovering the cause and, lo! there it was, an active, vicious-looking, leech-like worm, which, by sudden violent contraction and expansion of the body, struck out in all directions. The villain was quickly identified in a scientific volume on aquarium fishes as the *Gyrodactylus elegans*. (Editor's Note: The 'scientific volume' was undoubtedly Herman T. Wolf's book.) He belongs to the group of flukes, having prehensile hooks at one end and a sucker at the other. They burrow under the scales and infest the gills, feeding upon the juices of their host.

"We were made heartsick by learning that among the uncertain remedies mentioned the most promising was to destroy the fish, disinfect everything, and start over again. By careful experiments my wife demonstrated that when the flukes were put into a solution of four drops of formaldehyde to a quart of water, death ensued in a few minutes. Here, then, was a hint of a remedy, worse, possible, than the disease. I suggested that, as a desperate experiment, she place a patient in the solution. She

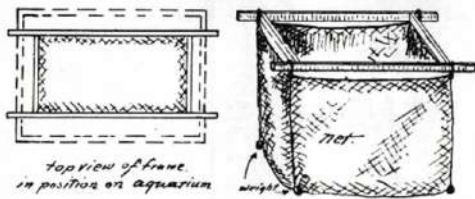


Plants available to the aquarist of 1912. From left to right: *Sagittaria*, *anacharis* and quillwort.

received the suggestion as a joke, having one prominent characteristic of the true scientist, she was always just as ready to explode a theory of her own as that of another. She said, therefore, 'Well, here goes. You arrange for the funeral and I will provide the corpse'.

"She began, however, with a much weaker solution than that mentioned above. Much to our surprise, the fish swam around in it as though nothing unusual had happened. Even after half an hour there was not the least sign of any ill effects. The strength of the solution was gradually increased until 10 drops of formaldehyde to a quart of water produced an unnatural quietness in another fish after 15 minutes. When it was removed to fresh water we thought it was all up with the little fellow, no respiration, no movements of the fins; but, presently, a gasp, a wriggle, and he was a live fish once more. The same result occurred with another fish in 20 drops to a quart for one minute. Our hint of a remedy had thus become a hope.

"We subjected all of our remaining fish, eight in number, to a bath in a solution of 5 drops of formaldehyde to a quart of water for 15 minutes on two consecutive days, disinfecting the aquarium and everything about it each time with a solution of a teaspoonful of formaldehyde in a quart of water. Microscopic examination revealed live flukes still. We increased the strength to 10 drops the third day. No more flukes could be found. To make sure that any adults lurking under the scales might be destroyed and to kill a possible new crop, we repeated this bath twice more, three days apart, disinfecting everything each time. Since then frequent and thorough searches have failed to show the parasite. It was of interest to observe that the weaker fish were affected more seriously by the formaldehyde than the stronger ones and that, as they recovered, they



Some aquarists think that the suspended net in the tank idea for spawning egglayers is relatively new. Hobbyists were using this arrangement at the turn of the century.

were affected less and less by the drug.

"Three of the eight fish to receive the first treatment died before the treatment was completed, but the five survivors are now all bright and happy, with fins wide-spread, respiration normal, and appetites and digestion of the best; and it has been three weeks since they had their last treatment. One of the old ones, which we have had four years, has lost patches of scales, but this is the only remaining sign of the dreadful ordeal through which they have passed. We firmly believe had we used the formaldehyde solution at the beginning of the trouble, the majority, if not all, of our pets would have been saved.

"Having no more patients for further experiments, we are unable to determine the proper strength of the solution and length of time for the bath to obtain the best results, and would suggest that the aquarist meeting with this, or any other parasitic horror, try a weaker solution and greater length of time for the bath. It may be that such treatment would be as effective in destroying the parasites and less injurious to the fish. The individual could never know what the rest of the world is, or has been doing. Others may have used the same remedy, which has been original with us, but, as we have not found this treatment or any other practical one mentioned in any of our literature on the subject, we are prompted to give the readers of this magazine the benefit of our experience in the hope that, if the facts given are not generally known, others with better facilities for experimenting than we have at hand may carry the test to a more definite end and give the results to others of aquatic life.

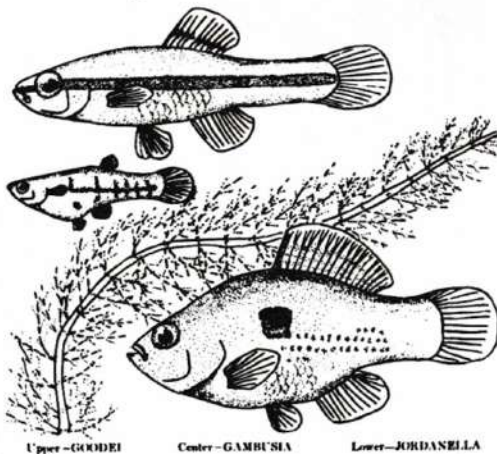
"While formaldehyde is extremely fatal to lower orders of life, it is

not excessively poisonous to the higher forms. It is, however, an irritant to the mucous membranes and should, therefore, be used with great caution. The aquarist will find that little instrument, the microscope (without which surgery would still be butchery and the Panama Canal merely a hope of the nations), a valuable addition to his paraphernalia. It need not be an expensive one; even 100 or 150 diameters will reveal the existence of dangerous parasites, and afford many pleasant hours studying the many forms of harmless animaculæ which inhabit all aquariums."

The aquarium hobby of 1912 was somewhat spartan in nature. In hard goods, the fish stores of the day sold mainly tanks and foods, supplemented by ornaments, gravel, nets, etc. There were no such things as filters; heaters were rudimentary and pumps were not commonly employed. One pump that was available at most large stores, however, was a German import, the "K.D.A. Aquarium Aerating Pump". This was a double-piston reciprocating water pump, made to fit onto an ordinary sink faucet. Water pressure forced the pistons back and forth, providing a more or less steady stream of air. An interesting aside about this pump concerns a then-famous court case in Germany. It seems that a landlord objected to the water consumption of such a pump employed by one of his tenants who happened to be an aquarist. (The typical pump would use about a bathtubful of water a day.) The judge, however, ruled that every person had a right to one bath a day, and that if an aquarist elected to use his bathtubful of water on his fish rather than himself, then the aquarist was perfectly within his rights. Case dismissed!

The importations of Dorn, Rabenau, Bade, Brind and others began to produce results, and a partial list of the fishes available to the hobbyist of 1912 included: the climbing perch, rosy barb, halfbanded barb, *Bodis badis*, betta, *Callichthys callichthys*, *Cichlasoma octofasciatum*, zebra danio, spotted danio, giant danio, *Gambusia affinis*, *Gambusia nicaraguensis*, *Geophagus gymnogenis*, guppy, *Epiplatys dageti*, *Aplocheilichthys panchax*, *Epiplatys sexfasciatus*, chanchito, paradise fish, *Channa striata* (snakehead), *Mollisias latipinna*, Egyptian mouthbrooder, *Pantodon buchholzi* (butterfly fish), *Xiphophorus maculatus*, leaffish, *Rasbora heteromorpha*, *Macropodus cupanus dayi*, African lungfish, *Pseudoxiphophorus bimaculatus*, *Rivulus tenuis*, dwarf gourami, striped gourami, swordtail, *Moenkhausia oligolepis*, *Hemibrycon suppyi*, bloodfin, *Myxus tengera*, and *Hemigrammus ulreyi*.

In October 1912, a spectacular exhibit of aquarium fishes was put on display at the annual show of the New York Aquarium Society. It seems strange to read of the enthusiasm caused by fishes that scarcely merit passing mention at the shows of today—the danios, gouramis, and barbs—but in 1912, these were stellar attractions indeed. However, the hits of this show were the betta and the butterfly fish (*Pantodon*). Most of the



Upper-GOODEI Center-GAMBUSIA Lower-JORDANELLA

An illustration from *The Aquarium* circa 1913. In addition to line drawings, the magazine also featured half-tones as well. One issue even had a color plate tip-in (but of snails, not fish).

killies were shy and did not show well, and the guppy was only one species among a host of other brilliantly colored livebearers.

In 1912, Hugo Mulertt ended his active participation in the hobby—some 43 years of service—by retiring to Wiesbaden, Germany. On June 3, 1912, the Milwaukee Aquarium Society was founded with 19 members, C. G. B. Schenk being named as its President. By the end of 1912, aquarium societies had been formed in Boston (President: Tennant Lee), Minneapolis (President: F. L. Tappan), and San Francisco (President: F. S. Curtis). Counting the New York Club as number one, the last three represented the 6th, 7th and 8th societies in America, respectively. (It should be mentioned, however, that except for the New York Aquarium Society, none of these societies exist today, although those that have come later have used the same or similar names.) Dues typically were \$1 a year (New York, however, had dues of \$2) with an initiation fee of \$1. Most clubs met monthly with the exception of the summer months, New York being the exception once again as it convened twice a month.



Another *The Aquarium* illustration circa 1913. The "Polycanthus" species referred to was *Macropodus cupanus dayi*.

POLYCANTHUS SPECIES—Male and Female

Just prior to Christmas of 1912, tragedy struck with the unexpected death of Eugene Smith. Thus passed away one of the pioneer aquarists in America, and its first organizer. To fill the editing gap temporarily, William T. Innes was appointed Acting Editor, and a general reorganization followed with the burden of publication falling upon new shoulders in the Midwest. The new editor was William A. Poyser of Hammond, Indiana (Librarian of the Chicago club, a former active member of the Philadelphia society, an expert on goldfish and frequent contributor to *THE AQUARIUM*). The task of business manager went to C. G. B. Schenk, President of the Milwaukee Aquarium Society, as it was thought that the business manager should be one in closer contact with the editor. William T. Innes, who had put much effort, time and skill into the publishing of the magazine for its first 7 issues, now had a welcome "breather" as the printing was now done in the Chicago area. Milwaukee, however, proved too far away, and I. J. Ackerman of Chicago replaced Schenk as business manager within a short while. In September of 1913, Poyser resigned because of the press of personal business matters, and Willis S. Hilpert of Chicago was forced to edit the September issue. In October 1913, J. W. Gage became editor-in-chief. At this point, the entire burden of the operation of *THE AQUARIUM* fell upon Chicago aquarists. But prior to this, however, the magazine was in financial difficulty. Advertisements and subscriptions were not sufficient to pay its publication costs, and the business of gathering material from societies in widely separated parts of the country proved formidable. Consequently, in February 1914, *THE AQUARIUM* published its last issue and passed from the scene. During its short life it was of superb quality, ably edited and creatively illustrated. It was an ambitious undertaking that was not to be repeated until after World War II. It was never, however, to be equaled.

To be continued.

MIGHELLS: continued from page 32

acid water. During the drought which runs from December to March in the highlands, they lose over half their depth, dropping from 4 ft. to about 1½-2 ft. deep.

The catfish are a slimmer version of the American bullhead and have very smooth scaleless skins. They also have a blue-gray color and I saw enough albinos to believe it is fairly common with them. These little fellows also have the reputation of migrating from one pond to another over land! These also might be of interest to American aquarists. There are also lake and river varieties of catfishes and their relatives that rival our big river cats. In the market at Pleiku one can find catfish-like fish up to 30 lbs. and the old women will tell you that there are bigger ones they couldn't carry. Apparently the fishermen's tale isn't limited to American fishermen! The streams and rivers are mostly of spring origin but increase their water many times over during the monsoon season. The fish then experience a great variation in both pH and hardness in one year's time. In the small streams I found several small rasboras that I knew from my pet shop days, and a number of characin-like fish that were new to me. Another fish which deserves mention I, at first sight, mistook for an Australian rainbow fish, but after much splashing around with the village children and finally catching it, I found myself looking at a much prettier fish. It had roughly the same body shape but the scales

were very small with coloration like a miniature American Rainbow Trout! This was only found occasionally in streams of at least six inches depth or more. I really didn't get to make much more than a passing acquaintance with it. The fisheries office in Pleiku began to think I was some sort of nut for when I would bring in a requisition for fish, I also had a million questions about those I'd encountered since the last visit. As I spoke no Vietnamese, the fisheries chief no English (and my French was as fractured as his), my usual answer was a smile, an arching of the eyebrows and a slight rise and fall of the shoulders. C'est la vie!

The terrain around Pleiku is generally rolling hills, separated by steep jungle-filled ravines. These ravines are invariably filled with streams which are of spring origin and which flow year around. They are quite clear and fairly swift with little sediment during the drought or beginning of the monsoon. Stone is almost nonexistent except as geological erratics, and the soil is a homogeneous silt of fine grain.

As the military units achieve more and more secure areas, the hill people of the highlands began to find ways to bridge the gap between themselves and the "outside" world. I found the tribespeople to be a cheerful, hardworking group who enjoyed life when they weren't dodging war and disease. Perhaps when peace comes to the highlands they will show us new aquarium varieties as we show them new things also. ●

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SOCIETIES: continued from page 31

their praise. George Pinter goes further than this in his *Algae on Purpose*, appearing in the May issue of *The Tropical Breeze* (published by the San Diego Tropical Fish Society). True, he addresses cichlid lovers only when he could have included live-bearer buffs, too, and he refers to the type of algae that clings to rocks and stones in streams in a moss-like fashion when he could have included algae that collect on surfaces within the aquarium. Nevertheless, all algae, whether they cling to rocks or collect on the walls of the aquarium, or whether they are the voyaging type that suspend in water, turning it green, are held in ill repute by aquarists generally. Author Pinter points out that cichlid owners often have a problem decorating their tanks in that their chosen fish are prone to abusing plants to a fare-thee-well. He has remedied this problem by collecting stones and rocks on which algae have anchored and finds them both decorative for his tanks, and tempting as food for his fish. He rinses his moss covered stones in cold tap water and soaks them for short time in a salt solution to rid the algae of leeches, the only fish enemy he has found on them. His fish enjoy foraging the algae and he arranges the rocks in a pleasing way to give accents of color to an otherwise drab aquarium interior. He is not afraid of the rocks he finds in streams in his

area as they do not add hardness to the water. This would be overcome anyway, he says, because he siphons off and replaces portions of the water in all his tanks periodically. An abundance of light will promote luxurious growth of this type of alga but it has never presented a problem of spreading throughout the aquarium. Certainly this type of alga would be beneficial to live-bearers, too, who delight in foraging. It has always seemed to this writer that algal growth on the sides and rear glass of the aquarium should be allowed to remain if it is green and healthy in that fishes seem to enjoy it so much. Certainly the moss-covered rocks and stones found in streams would add a natural touch to any home aquarium. *The Tropical Breeze* is published by the San Diego Aquarium Society and information regarding the society and bulletin may be obtained by writing the society at P.O. Box 4156 North Park Station, San Diego, California 92104.

Mike Walker, a junior member of the Milwaukee Aquarium Society, tells us about the blind cave fish (*Anoptichthys jordani*) in the May issue of *The Splash* (published by the Milwaukee Aquarium Society). He bases his article on research he conducted after becoming fascinated with the species that is found in subterranean streams near San Luis Potosi in Mexico. He briefs us on studies that were made of the fish by the New York Aquarium sparked by the question—which came first; the blindness or the cave dwelling? The evidence the team of scientists developed from their field trip to the subterranean streams in the San Luis Potosi area of Mexico indicates the fish were sighted before they swam into their world of darkness. The loss of sight apparently is a result of deterioration from generations of the species living in the absence of light. Some specimens were found without eyes, or eyes covered with skin, others with spots where eyes normally would be, while others possessed normal eyes. *Astyanax mexicanus* is a closely related sighted species. Mike has titled his piece *Evolution in Darkness* and provides us with a well-documented history of a well-known aquarium fish which is both good reference and reading material. Write to the Milwaukee Aquarium Society, Inc., P. O. Box 1416, Milwaukee, Wisconsin 53201 for information regarding the club and its publication. Exchange correspondence should be directed to Robert Watkins, 3416 South Kansas Avenue, Milwaukee, Wis. 53207.

An editorial appearing in the April issue of *The Wet Pet Gazette* (published by the Norwalk Aquarium Society) tells us what the exchange of bulletins, ideas, and methods is all about. Here it is pointed out that the technological advancement we know today would have been impossible if scientists had been reluctant to publish their findings and exchange information and ideas. Andrew Roth, the Photography Editor of *THE AQUARIUM*, was given a plaudit here for his willingness to address

62

local societies on the techniques that can be used by the non-professional hobbyist-photographer to portray his specimens with an Instamatic camera. Mr. Roth's efforts to share his knowledge with others was mentioned as an example of how the spirit of exchange of information can benefit the hobby as a whole as well as the individual aquarist. The thoughts in this editorial are far-reaching for it touches on all human relationship. Editor Jean Lucas, in this same issue, offers a behavior sketch of a species of *Synodontis* (not further identified) and suggests that a more complete listing of these interesting catfishes is in order. She describes her subject as being brown with lighter brown "almost yellowish, pectoral and dorsal fin spines." Black dots are sprinkled all over the body. The fish has grown rapidly from its original two-and-a-half inches to seven. His aquarium manners are above reproach and small fish are safe in his company. He likes a hiding place and is firm about keeping it despite the fact that he leaves it long enough to explore the aquarium thoroughly. Those who are charmed by the appearance of the juveniles should remember, however, that these fish become quite large rather rapidly and unless they have good-sized aquariums, they are best left in the dealer's tank. We hope this pleasing account of Jean's yet unidentified *Synodontis* will inspire someone adept in the field of classification and nomenclature to focus attention on this genus for those aquarists who

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63

like to know the correct designation of the creatures for whom they have developed an interest and an affection. *The Wet Pet Gazette* is a well-produced bulletin that in the years of its existence has never failed its readers in the way of provocative reading, good humor, and editorial excellence. Corresponding memberships to the Norwalk Aquarium Society are available at \$2 per year and such a membership includes a subscription to its publication *The Wet Pet Gazette*. Write to the society in care of Editor Mrs. Jean Lucas, 361 Sylvan Knoll Road, Stamford, Connecticut 06902 for information.

As a result of a Breeder's Award Program, *Tropic Tank Talk* (published by the Greater Detroit Aquarium Society) is falling heir to some excellent first-hand breeding experiences in the form of short articles. The March issue of this bulletin carries Janet Greenleaf's *Breeder's Award Report on Spawning Kribensis*, and James K. Langhammer's Reports on *Aphyosemion gardneri* and *Orange Chromides*. Mrs. Greenleaf's report treats on *Pelmatochromis kribensis* and she describes the species as being a "hearty, peaceful little fish, easy to feed and breed." The only fault she finds with this colorful dwarf cichlid is that as a community fish, it earns a demerit by being a recalcitrant "gravel digger." She hasn't found them choosy about mates and she set her pair up in a 5-gallon, all-glass aquarium with an undergravel filter, silica sand, and furnished with a flower pot on its side. In that she doesn't mention pH, hardness, or temperature, we assume that she didn't worry too much about any of these matters and dealt with them in the normal manner. The eggs were laid in a depression under the flower pot, and later the female carried them into the flower pot. First food for the young consisted of newly hatched brine shrimp and liver paste. The parents were allowed to remain with the young and they made a very closely knit family, a pleasant sight for any aquarist to see. Mr. James K. Langhammer warns us that *Aphyosemion gardneri* is water sensitive and that this fish should never be moved into fresh water for even a complete change with aged water can be dangerous. The exquisite beauty of the species apparently warrants the care it requires and although it is subject to the parasite known as velvet, this can be controlled with copper. A fine silica sand or grated peat should cover the floor of the aquarium for this bottom-spawner, and the eggs should be stored in peat in a "well-drained" condition from three to six weeks. Brine shrimp is the diet for the young who will be ready to spawn at three months. The author surprises us in his treatment of orange chromides (*Etroplus maculatus*) by telling us that this is a brackish-water fish and is subject to fungus. He controls this by using Sulfa-Quinine, two to three teaspoons per gallon of water. He also advises one tablespoon of aquarium salt to a gallon of water. The fish spawn according to cichlid fashion and he leaves the

64

young with the parents as both participate in the care of the fry. The babies are ready for newly-hatched brine shrimp and microworms when they are free-swimming which occurs usually 10 days after hatching. All three of these short but precise articles are reference material and we are sure that the Breeder's Award Program has proved to be a blessing to Editor Jim Langhammer insofar as material is concerned for *Tropic Tank Talk*, even though he is one of the leading participants in the program himself. Information regarding the society and its bulletin should be addressed to Greater Detroit Aquarium Society, Box C, Royal Oak, Michigan 48068. ●

PROBLEMS continued from page 28

butter" species, e.g. angelfish, tiger barbs, black tetras, etc.

From: Michael J. Stein, Wheeling, Illinois.

I have a 6-compartment betta tank. I only have 3 bettas (2 males and a female). Right now I have them in their own 2-quart glass jars. The reason I don't have them in the betta tank is that I do not have a filter for

all compartments or one that I can switch around. I know that plants would take care of wastes but most of them are too tall for my eight-inch high tank. Could you recommend about 6 or 7 different ornamental plants with roots that would take care of a 6-inch by 3-inch area, under a dollar a piece?

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the dividing glasses, you might make your tank into a 3-compartment tank, in that you only have 3 fish with which to work. This would give each fish more room. Plants that might be used for these compartments are as follows: (1) Hair grass—can be purchased in a clump and divided. This plant propagates from runners and, of course, has a root system. (2) Water sprite (*Ceratopteris thalictroides*)—lends itself to slipping. Small pieces can be cut and rooted. As it grows, of course, it should be trimmed down to accommodate the small area you have in mind. (3) Pigmy chain sword-plant (*Echinodorus tenellus*)—reproduces from runners, never grows taller than 4 inches (*hirsuta*)—gives the pleasant appearance of being clover, reproduces by sending out runners, and should be kept back by pruning. Too much light will send the leaves to the surface of the water. (5) *Acorus gramineus* var. *pusillus*—seldom grows taller than 3 inches and sometimes produces a smaller plant from the stout roots that can be clipped and planted elsewhere. (6) *Bacopa caroliniana* has small bright green leaves and although it will grow taller than you desire, pruning will keep it down.

From: R. F. Jamerson, Lexington, North Carolina.

I have 3 Oscars (*Astronotus ocellatus*) at present in a 30-gallon tank with slightly acid water and good filtration. Two of them seem to stay together at times. They are about 7 inches long and seem quite healthy. I am not sure that they are paired. What can I do to induce them to spawn if I have a pair? I have been told to raise the temperature above 80°F. They are almost 3 years old or better. Are they too young?

Answer: Your *Astronotus ocellatus* are not too young to spawn. They are, however, a bit undersized for their age. You did not say what you are feeding them but they should be

getting some fresh food such as chunks of lean beef, chunks of raw fish, snails (which they love—about the size of a marble), earthworms, canned shrimp (washed), and they will take pieces of scallop or green shrimp (shelled). A 30-gallon tank is not large enough for 3 specimens. I would remove the "outsider" and set him (or her) up in a tank of his own. The 30-gallon tank is rather small for a spawning pair of Oscars. We used a 50- or a 75-gallon tank. However, they may make out in the 30-gallon tank although it should be considered a temporary home. A partial change of water (about a fifth of the amount in their aquarium) may induce spawning and in that two are staying together you may have a pair. There is usually no external way of determining sexes but occasionally males will have several prominent ocelli (blotches) at the base of the dorsal fin. You will not know which is the female until the spawning takes place.

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There is some jaw-locking in the preliminary stages although sometimes two males or two females will exhibit this behaviorism. They are usually very good parents and the youngsters can remain with the parents until they put on size (somewhat under that of a dime). The parents will be unhappy when you remove the fry and we always left them a dozen or so until they lost interest in them.

From: Dianne Garver, Fanwood, New Jersey.

On occasion I feed my fish bits of raw liver. Is this advisable?

Answer: This is a good food for fish but unless used carefully, it may cloud the aquarium water.

Question: Is it possible to prepare dried liver at home?

Answer: It is possible, but more trouble than it is worth.

AUTHORS: continued from page 26

eral of the tetras. At one time or another he has bred many of the old aquarium standbys including rams, *kribensis* and angels, and a few unusual ones such as *Badis badis*, the leaffish and halfbeaks. He has had several articles published, primarily on killies.

A reservist, he served in Korea with the 2nd Infantry Division, and the 4th Infantry Division in the Republic of Vietnam. Other interests include reading, hunting, fishing, canning, gardening and, of course, cattle.

ADVERSARIA: continued from page 24 of coincidence. I can, if called upon to do so, gather and submit the substantiating "points of view" of many experienced and highly reputable importers, wholesalers, breeders, dealers and hobbyists who will agree, although perhaps more reservedly than I, that *tubifex* is one of the major blights in the entire tropical fish

industry, primarily because the public is not properly informed as to the possible dangers involved.

It must be added, at this point, that were the tubifex properly prepared (whatever that means!) before feeding, there exists the possibility that no ill-effects would ensue. I have no idea what rule-of-thumb for preparation or feeding or cleaning of tubifex might truly be effective, or, for that matter, how long the worms might stay in their "cleansed" state before they needed processing all over again. Just the same, exactly how is the buyer supposed to determine, by examination, in what state of cleanliness this prospective fishfood might be?

With so many foods, natural and prepared, on the market today, a goodly number of which are really of exceptional quality, what logic is there in taking the tubifex gamble? I fully realize that, since the packagers of tubifex, live and otherwise, would

not exactly be enthralled at the publication of this letter, my private "war" on tubifex may not reach the public through this message. I, and those I know who uphold my viewpoint, will look forward to the possibility of a "calling-out" on this question now, or in the future.

Robert G. Madden, Dedham, Mass. EDITOR'S COMMENTS: Mr. Madden has raised a vital issue and we certainly invite appropriate support or rebuttal from interested parties.

To place the issue on a more substantial basis, the following technical input should be noted. The first is a matter of nomenclature. The "tubifex" of the aquarium hobby includes certain aquatic worms known as oligochaetes. In particular, these worms generally belong to the family Tubificidae, although certain members of the families Naididae and Lumbricidae have been used as food for aquarium fishes and erroneously termed "tubifex" by hobbyists. Within

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the Tubificidae, the most common species used to feed fishes have been *Tubifex tubifex* and *Limnodrilus hoffmeisteri*, but a host of other species (and genera) have been used as well. Accordingly, we prefer to refer to these worms as "tubificids" in the interests of accuracy.

Tubificids have long been suspect in the aquarium hobby as carriers of fish diseases. In 1957, Dr. Reichenbach-Klinke (in his "Krankheiten der Aquarienfische") wrote with regard to *Ichthyophthirius*: "Above all, the various forms of tubifex are under suspicion as carriers; all experiments to date in this direction, however, have been inconclusive". In 1958, the pathologist, Dr. John Lake of Chicago, Illinois, made a microscopic examination of numerous tubificid worms, bloodworms, daphnia and other crustacea of the Chicago area, and found them to be infected with many kinds of disease-producing bacteria. In 1961, Amlacher wrote

(in his "Taschenbuch der Fische Krankheiten") re a dropsy-like disease: "An especially dangerous disease, it occurs as a consequence of feeding bloodworms or tubifex taken from polluted waters". In 1962, the late Sol Kessler of Irvington, New Jersey, reported on the results of experiments he conducted with tubificids and other live foods. Two identical 30-gallon tank setups were prepared, each with 5 white clouds, 5 small angels, 4 small discus, 12 large neon tetras, 6 red platies, and 6 fancy guppies. Tank "A" was fed with live tubificids, dry food and live daphnia. Tank "B" was fed with frozen beef heart, dry food and live adult brine shrimp. Disease (including "shimmies", velvet, darkening of the skin, and a white film coating of the skin) soon hit Tank A. After twenty-nine days, all the fish in Tank B still were in excellent condition, but the only fish alive in Tank A consisted of 3 angels, 5 white clouds and 8 neon

tetras. The white clouds, however, were infected with velvet.

Since tubificids are not the only live foods that may be obtained from polluted waters, Mr. Madden's indictment must be extended to all live foods with the single exception of brine shrimp. It is reasonable, however, to assume that daphnia and its relatives are safer than tubificids, and mosquito larvae safer than the daphnia types. Since many aquarists do use live foods successfully, we cannot conclude that feeding them will always cause disease. All tubificids, for example, do not come from polluted waters. It is a fact that *Tubifex tubifex* and *Limnodrilus hoffmeisteri* are found in anything from the most grossly polluted waters to waters of but slight pollution; *Limnodrilus udekemianus*, *Eulodrilus hammoniensis* and *Psammoryctes barbata*, however, although found in slightly to badly polluted waters, are not found in the extreme states of water

pollution of the two species just mentioned; on the other hand, *Tubifex ignola*, *Aulodrilus pleuriseti*, *Eulodrilus moldaviensis*, *Rhyacodrilus cocineus*, *Eulodrilus bavaricus* and *Psammoryctes velutinus* are found only in slightly polluted waters.

The last consideration pertains to preparation. There is some evidence that the mere freezing of live foods (shrimp excepted again) does not eliminate the dangers of disease, although it does decrease it. A similar statement may be made for the process of washing (in running water) the live foods before using them. The efficacy of freeze-drying would appear to be superior to the other methods, but bacterial spores can and do withstand freeze-drying, however. What we really need now is more of the type of experimentation illustrated by the Sol Kessler data, the type that any aquarist can perform. In any event, we will let our readers take the discussion from here. A. J. K.

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CURRIER & SMITH: continued from page 37

very similar. However, this variety is larger and the leaves and stems in a mature specimen may reach 24 inches in length.

The members of *Aponogeton* genus require a bit more care than do any of the previously mentioned plants. These plants have a large central bulb-like structure called a "rhizome". Reproduction is by seeding from the blooms although on occasion, division of the rhizome is used.

Aponogeton crispus X *undulatus* hybrids are most commonly available to the aquarist today. Water chemistry is not critical but they need moderate light. This species is a heavy feeder. The plants tend to produce long, narrow, ruffled leaves and all have a resting period during which they lie down. Some varieties remain small while others may reach up to 18 inches in length. The color will vary from light to bright green although some are reddish.

Aponogeton ulvaceus is a broad-leaved species whose full grown leaves reach a length of 12 inches or more and up to 3 inches across. The leaves are translucent and slightly wavy.

Aponogeton fenestralis is the most striking and considered the most difficult to grow. This species is popularly known as the Madagascar lace plant and its leaves may reach a length of 12 inches on 4-inch stems. The veins of the leaf have no tissue between them, giving rise to a lace-like appearance and hence the name. The rhizome of this species is highly susceptible to rot and because of this, the sand surrounding the rhizome should be kept clean. This plant prefers soft, slightly acid water with the temperature in the low 70's. Regular changes of water may be beneficial.

The *Cryptocoryne* species are the last of the plants in this group. Most of the species in this group reproduce by short runners or budding along the "corm". This is the central, bulb-like structure at the base of the plant. Some varieties will bloom under water. The species are variable as to appearance, coloration and requirements. Generally speaking, they prefer temperatures of 75°F. and up, soft water, moderate light, fertile sand, and water which is relatively motionless.

Cryptocoryne nevillei is the smallest species of the genus and has been mistakenly known as *C. beckettii*. This plant will vary in length from over 1 inch to approximately 4 inches high. The leaves are bright green on the top, paler underneath, and spear-shaped. Too much light is harmful, causing the plant to pale and die. It will form a dense carpet on the bottom of your aquarium if given a little time.



One of the newer crypts on the market today, *Cryptocoryne lutea*.



A closeup of the leaves of *Cryptocoryne lutea*. This plant comes from Ceylon.

The true *Cryptocoryne beckettii* is a larger plant growing to 6 inches in height. The leaves are narrow, lance-shaped with reddish to pinkish undersides.

Cryptocoryne griffithii will grow much larger reaching a height of over a foot. The leaves are broad and heart-shaped and are carried on long, upright stems. This species has a tendency to be sensitive to excess light. The leaves are dark, shiny green above and lighter below. This species produces a submerged flower.

Cryptocoryne cordata is similar to, and hard to distinguish from, *C. griffithii*. However, it is slightly taller and the leaves tend to have more color. This species also blooms underwater.

Cryptocoryne ciliata comes in two varieties: *major*, which may grow to 18 inches; and *minor* which is generally not more than 8 inches. The apple-green leaves are spear-shaped in appearance with undersides a lighter green. One of the easiest *Cryptocoryne* to raise, it is a slow grower.

Cryptocoryne blausii is one of the newer species and not often seen. The general structure of this plant is very similar to *C. griffithii*. It grows a bit taller and its leaves are somewhat smaller and narrower. The upper leaf may shade through a purple-red to bronze. The



A very young specimen of the Amazon sword plant, *Echinodorus paniculatus* var. *gracilis*.

underside is generally pink. This species also blooms under water. *C. blussii* is also susceptible to rot, especially in alkaline water.

The bunch plants are constructed differently and require a different approach from those already described.

These plants have long stems on which the leaves are borne. Wherever a leaf emerges there is a node, which is similar to the crown of the rooted plant. Leaves, new shoots, roots or flowers can emerge from these nodes. The nodes of the bunch plants can be compared to the crown of the single root plants. The bunch plants, as a group, do better with bright light, and some natural sunlight is a necessity if they are to prosper. These plants vary greatly as to shape, color and requirements. They are fairly easy to maintain and are usually reproduced from cuttings. To take cuttings, simply cut or pinch through the stem. Be sure to take a piece long enough so that 1 or 2 nodes (with leaves removed) can be put below the surface of the sand; at least 4 nodes with leaves attached should be above the sand surface. These plants can be planted in close quarters, i.e., 1/4 inch or so apart. They look better when planted in bunches and will grow well under conditions of crowding.

74



An old favorite with aquarists, *Cabomba aquatica*. The plant does best in soft water.

Elodea, or "Anacharis", is one of the oldest bunch plants used in aquaria.

Elodea canadensis is a species which can take the lower temperatures common to goldfish, 50° to 60° F. When kept at higher temperatures it becomes pale and stringy, and is likely to fall apart.

Elodea densa, a South American species, is more adaptable to the usual home aquarium conditions. Both species can be rooted or left to float.

Limnophila heterophylla and *L. sessiflora* are some of the most beautiful bunch plants. These plants carry light green rosettes of finely divided leaves on tall stems. However, they usually do poorly in hard water.

Cabomba resembles the aforementioned genus in general appearance, but has a darker green color and the rosettes are somewhat larger. It is said that this plant is more tolerant of hard water than *Limnophila*. *C. aquatica* is the best species for aquarium cultivation as it will tolerate the warmth more readily. *C. pulcherrima*, a reddish species, is suitable for cooler aquaria. Very bright lighting is required to

75



A very young specimen of the wideleaf Amazon swordplant, *Echinodorus paniculatus* var. *rangeri*.

maintain the red color of this species.

Hygrophilla polysperma has long been considered one of the best bunch plants available. The leaves are light green above, lighter green underneath. Water conditions are not too important. However, it does not tolerate excessive amounts of nitrogenous substances. This genus likes moderate-to-bright light. With pruning you can produce a pleasing bush effect. The cuttings are rapid growers and easy to establish.

Synnema triflorum is usually called "water wisteria". The leaf structure will vary from finely serrated, small oval shapes to many-lobed, irregular leaves. Reproduction is by runners which are produced at the base and along the central stem. Young plants will grow from the leaves when the leaves are separated from the parent plant. Cuttings are also easily established. Soft water is best for consistent growth. However, wisteria adapts quite readily to hard water and growth is still satisfactory.

Myriophyllum is a genus represented by several species, none of which are very good as tropical aquatic plants. However, *M. pinnatum* is a bush plant that can adjust to the temperatures found in the home

76



One of the most beautiful center plants of them all, *Aponogeton undulatus*.

aquarium. This species is not particular as to its water requirements. At high (70° to 80° F.) temperatures, the other species of this genus will fall apart quite rapidly. For cold water aquaria, under 70° F., *M. elatinoideis*, *M. hippuroideis* and *M. verticillatum* can be used and results are generally good.

The last group of plants we will consider are the floating plants. These either float on the surface with roots hanging down in the water, float under the surface with roots free in the water, or — like the various dwarf lilies — are rooted in the sand with the leaves floating on the surface or out of the water entirely.

The genus *Lemma*, "duckweed", is represented by three species: *L. minor* and *L. gibba* float at the water surface, and *L. trisulca* floats just below the water surface. All three species are prolific when given plenty of light. They can cover the top of a tank in no time. We consider them more of a nuisance than anything. However, they are useful where plant-eating fishes are present.

Ceratophyllum submersum and *C. demersum*, known as "fox-tail" or "hornwort", lack roots and tend to float just below the surface. New branches are formed from the nodes along the central stem. Growth

77



The water wisteria, *Synnema triflorum*. The plant reproduces very well from simple cuttings.

is rapid if bright light is provided. The color of *C. submersum* is a light green. The leaves are longer and spread out. *C. demersum*, is darker green and the leaves are more densely grouped. This genus prefers hard water but will tolerate almost any water condition.

Ceratopteris thalictroides has been around for some time. Called "water sprite", it is an aquatic fern. Basic requirements are simply bright light and warm temperatures. This plant can be rooted in the sand. It will form a tall plant reaching heights of as much as 18 inches.

Water sprite is viviparous and young plants are formed on the edges of the leaves. It is best to allow them to float until the roots are well developed and the plant fully formed. Narrow and broad-leaved varieties exist but the broad-leaved type is most usually encountered and is a better grower.

Riccia fluitans, is a form of aquatic moss. The small individual plants stay together and cause dense, floating carpets on the water's surface.

Nitella flexilis is the last of the plants to be discussed. A floating plant, this species is actually a complex alga, and not a true plant. That is to say it has no roots, stems or leaves. This plant will grow at all levels in the aquarium. Although requiring less light than most of the "floaters", it should have at least moderate lighting for best results. ●



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