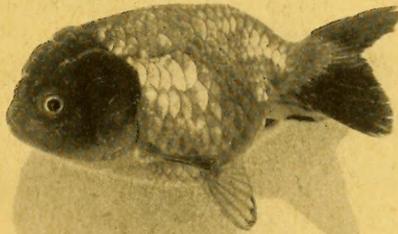


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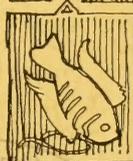
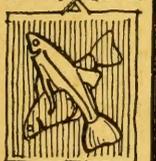
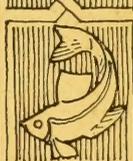
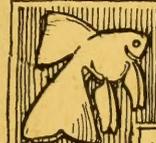
THE AQUARIUM

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



JAPANESE LION-HEAD GOLDFISH

Photograph by Wm. T. Innes, Jr.



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Frank

Smithsonian
OCT 23
National Museum

OCTOBER 1912

Vol. I

PUBLISHED AT PHILADELPHIA, PA.
BY THE AQUARIUM SOCIETIES
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No. 5

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Callichthys marmoratus	Mollienesia latipinna	Trichogaster lalius
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Danio rerio	Paratilapia multicolor	Tetragonopterus guppyi
Danio malabaricus	Paratilapia species	Tetragonopterus rubilus
Gambusia affinis	Pantodon buchholzi	Tetragonopterus ulreyi
Gambusia caudimaculata	Platypoecilia maculata	Xiphophorus brevis
Gambusia holbrooki	Platypoecilia niger	Xiphophorus helleri
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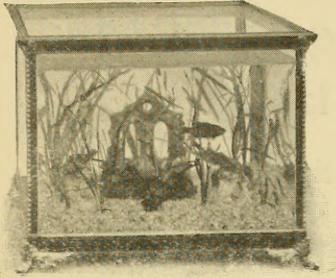
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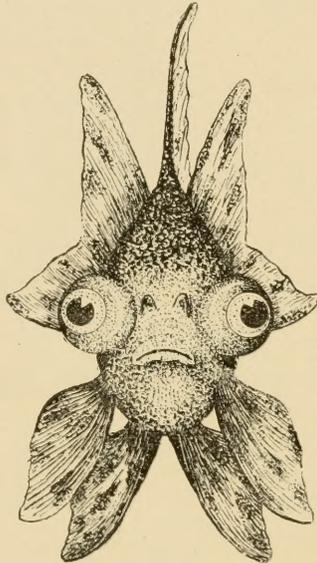
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THE AQUARIUM

VOLUME I

OCTOBER, 1912

NUMBER 5

Practical Aquarium Management

WM. T. INNES, Jr., Philadelphia, Pa.

THERE is one question which the beginner always asks of the experienced aquarist—"How often should I change the water?"

As the Fall is the time of the year when a great many institutions and individuals start an aquarium, we shall take up very simply and plainly at this time those things the beginner should know, and we cannot do better than start with the question already referred to. *The answer:* Except under unusual circumstances, *not at all.* This answer is sure to bring forth expressions of surprise and wonderment and a demand to know how in this way one may avoid having the water become stagnant and ill-smelling. As a matter of fact, a properly-conditioned aquarium only needs water added to make up for evaporation, while a general house-cleaning and re-planting may be desirable (but not necessary) from one to three years apart.

The principles governing this are so simple that it is surprising to find the general public ignorant of them. The big fact is that what the fish exhale (carbon dioxide) is what plants need and that what plants exhale (oxygen) is what fish need. The answer in a general way, then, is to have enough plants to consume the products of the breathing of the fish. This arrangement produces what is known as a "balanced aquarium" and is capable of remaining undisturbed for years at a time. The writer has an aquarium which has not been drained for five years, while the editor of this magazine has one which has remained un-

disturbed for nineteen years. Both aquaria are in excellent condition.

The proper conditions for an aquarium naturally group themselves into five considerations as follows:

- Plants
- Light
- Number of fish
- Feeding
- Temperature.

The general principle regarding the benefits exchanged between plants and fish has already been stated, but the plants in order to do their part of the work must have *light*—not too little nor too much. They only give off the oxygen under the influence of light, but most aquarium plants will be "burned" if exposed to too much direct sunlight. A strong north or other diffused light is generally successful. An hour or two a day of direct sunlight is beneficial, but more than this is not recommended, particularly as it is apt to turn the water green by the rapid growth of minute algae.

Some plants are better oxygenators than others. Three of the best are giant *Anacharis*, *Vallisneria spiralis*, the Italian or diminutive variety and *Sagittaria* (see illustrations). The latter two are probably the most satisfactory of all aquarium plants. The Washington Grass (*Cabomba caroliniana*) frequently sold by dealers is not recommended. It breaks up easily and unless the conditions are just right it soon looks shabby. Readers desiring fuller information regarding other varieties of aquarium plants may obtain it by writing to our letter-box department.

There cannot be too many plants as long as the fish have room to swim. The surplus oxygen they form goes off in bubbles.

Plant in washed coarse sand or sand and gravel. Do not use fine ocean sand. If plants have roots, spread them well. From one to two inches is deep enough for the sand.

The next important subject is the number of fish which may be placed in the aquarium. In spite of advice to the contrary, the beginner insists on overcrowding and only learns by repeated failures. As a large fish consumes more oxygen than a small one, there can be no satisfactory rule as to the number of fish used, but there is a very good rule which it will be well to remember — *one inch of fish to the gallon of water*. This is not counting the tail. That is to say, a five-gallon aquarium will properly maintain either one 5-inch or five 1-inch or ten ½-inch fish.

To calculate the gallon capacity of an aquarium, multiply the depth, length and width of the water measurement in inches and divide the total by 231.

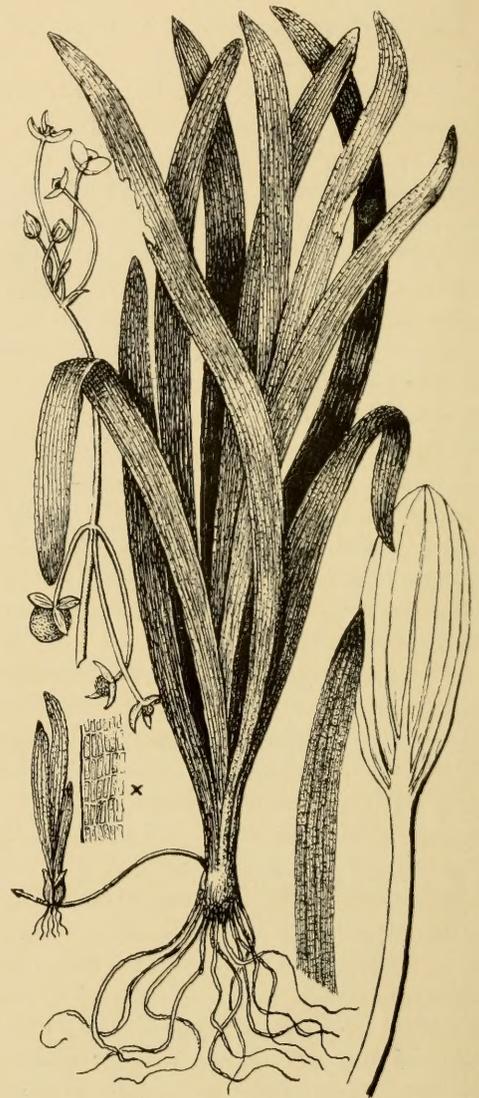
Avoid globes where possible. The curved sides act as lenses to focus the light in the eyes of the fish. If globes must be used, do not fill more than two thirds full. This gives more air surface to the water than when they are filled to the top. The larger the air surface, the better. This applies to any aquarium. Therefore a broad, flat shape is better than a deep, narrow one. Fish undoubtedly do better in rectangular-shaped aquaria than in globes and they can be seen to much better advantage.

For goldfish an aquarium of less than five gallons capacity is not very satisfactory. A 10-gallon size is a good one to start with. With many of the tropical fish now being introduced it is possible to use very small aquaria, even down to quart jars.

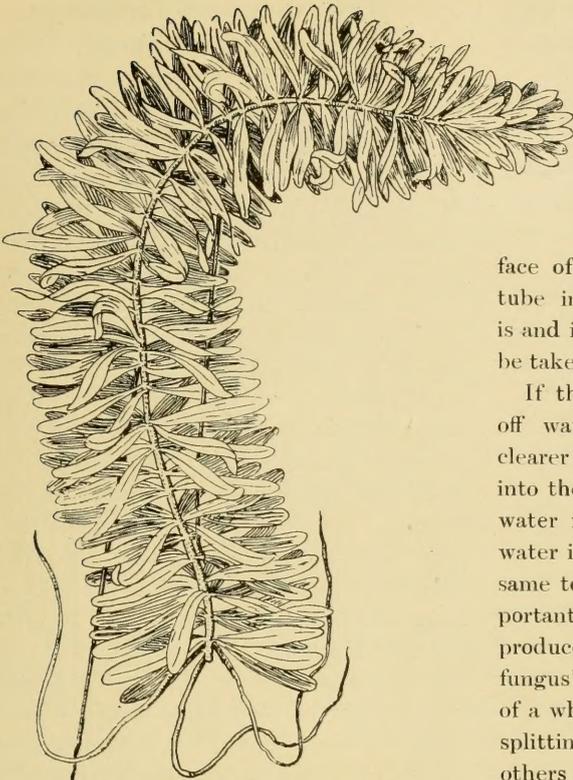
Many persons kill their fish by kindness. That is to say, they over-feed them. Fish in the confinement of an aquarium should not be fed more than will be *entirely consumed in a few minutes*. In moderate and warm weather they may be fed once daily. If the water is cool (50° to 60°F), every

other day is sufficient. If below this, once a week. The most generally used food is the least desirable. This is the white wafer. Nearly all dealers sell a better food in granular form, composed of dried insects, egg, and farinaceous substances.

The best temperature for goldfish is from 65° to 70°. They can maintain life down to the freezing point, but under artificial conditions necessary in an aquarium this is to be avoided. Higher than 80° is also dangerous.



SAGITTARIA—From Wolf's "Goldfish Breeds"



ANACHARIS—From Wolf's "Goldfish Breeds"

A 10-gallon aquarium should be provided with about half a dozen water snails such as dealers sell. They will keep down the green growth on the glass and also consume particles of food which the fish may have overlooked. For the latter purpose, some aquarists use tadpoles. The writer does not care for them, as they keep the water and sand stirred up too much. The snails should be watched and any dead ones promptly taken out. A mussel helps to keep the water clear and is a desirable aquarium inhabitant, but should not be used unless one is willing to frequently observe whether it is alive. Their decomposition is rapid and very offensive.

Once in a while, when the sediment in an aquarium becomes unsightly, siphon it off with a rubber tube of from one-quarter to one-half inch diameter and about three to four feet long. Fill the tube with water, tightly pinch one end; put the other end

quickly into the aquarium, hold the pinched end down as far as possible below the aquarium and then open the tube into a suitable receptacle. The water will run out as long as the lowest point of the discharging end of the tube is lower than the surface of the water. Move the end of the tube in the water around where the dirt is and it will rapidly suck it up. Care must be taken not to draw in small fish and snails.

If the time can be taken, let the drawn-off water settle somewhat and filter the clearer portion through fine muslin back into the aquarium. This is better than new water if the aquarium is right. If new water is used, see that it is of nearly the same temperature as the old. This is important. Violent changes in temperature produce contagious diseases known as "white fungus" and "tail rot." At the first sign of a whitish coating on the fish or a general splitting of the fins, separate it from the others and place in salt water until improvement is distinct. This may take from one day to a week. The water should be salt enough to be just noticeable to the taste. Salt water should be changed daily. Feed very sparingly. Sometimes this treatment is beneficial to fish which are generally run down but show no external signs of disease. It is believed that sea water, properly diluted, is more effective than common cooking salt. Do not use advertised brands of non-caking table salt. Some of them contain chemicals injurious to fish.

On cloudy days fish even in a properly conditioned aquarium will come to the surface of the water to breathe, but if they do this in clear weather it is a sure sign that something is wrong. It may be from too high a temperature, too few plants, decomposition of snails, mussels or unconsumed food, but in all cases it is from overcrowding. Whatever the cause, it must be found and remedied quickly. To neglect to do so is to invite disaster.

THE AQUARIUM

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VOL. I OCTOBER, 1912 No. 5

CREDIT for the issue of last month belongs entirely to Mr. Innes, the Philadelphia Society local editor, upon whom devolved the whole work of getting out the magazine, owing to the editor's disability.

IN the last number the names of the fishes illustrating Mr. Nichols' article were somewhat misplaced. They should have been as follows: Upper, *Fundulus goodei*; center, *Girardinus formosus*; lower, *Jordanella floridae*.

MR. FRANCIS S. CURTIS, a member of the New York Society and once its secretary, is working diligently to form a society in San Francisco, where he now resides. All who are interested are invited to get in touch with Mr. Curtis, whose address is 760 Church Street, San Francisco, Cal. A society at this gateway to Asia would mean much to us, in view of the fact that the finest goldfish come to us from Japan via that city.

AN account of the third annual exhibit of the New York Society will be found on this page. There were altogether 327 entries, divided into eight classes. Mention of the awards will be made in next month's issue.

The Aquarium Exhibit

JOHN TREADWELL NICHOLS

THE annual exhibit of the New York Aquarium Society took place in the American Museum of Natural History, New York, October 6th to 13th, inclusive. It constituted what is doubtless the finest collection of living fresh-water fishes which has ever been on public view in America.

The different breeds of goldfish formed a comparatively small part of the collection, yet some fine goldfish were shown and much admired by the visitors. The fan tails and grotesque telescope eyes of some of them, a monument to the breeders' art, never lose their interest, familiar as they become. To devotees of the goldfish it may have caused regret that the space allotted to these was limited by other forms, many of which are less adapted to aquarium culture, but most of us were glad to see the new things. Some of these less familiar fishes doubtless find favor simply because they are new; others are veritable living jewels whose popularity must increase with familiarity. The paradise fish with gaudy, streaming fins have now become so plentiful in aquaria as to scarce merit mention. The beautiful Indian fishes of the genus *Trichogaster* with iridescent yellow, red, and blue colors, and long threadlike ventral fins which they wave so gracefully, call up visions of the mysterious, luxuriant tropical waters of that faraway land. The many species of iridescent silver and pearl *Barbus* compel our admiration as they float in the still water of the aquarium. But no more attractive fish comes from the continent of Asia than the trim, active, boldly-marked *Danio rerio*. Some beautiful specimens of *Danio malabaricus* were very attractive, but this species will scarcely find as much favor as the smaller, more brightly-colored *rerio*, while *Danio analipunctatus* is a veritable living gem.

The fighting-fish *Betta* were among the most interesting shown. These fishes are kept for fighting by the Siamese, pitted

against one another like game-cocks. They build a nest, a mass of floating bubbles under which the eggs are laid and zealously guarded until hatching by the male fish. Such a nest was started during the exhibition.

One of the tanks contained a pair of mouth breeders, *Paratilapia multicolor*, which carry the eggs in the mouth, and there were two allied species seldom seen in aquaria, but the African specimens which attracted the most attention were of the curious and beautiful butterfly fish, *Pantodon*. Several of this rare and interesting fish were exhibited, and it was a treat to the zoologists who visited the exhibit to see living specimens of it. They were generally lying inactive near the surface of the water and did not show off well. The species is more of a curiosity than one especially adapted to aquarium culture.

There were many small fish of the family *Pociliidae* shown from Southern America, which bear their young alive instead of laying eggs, none other so beautiful as *Xiphophorus helleri*. Some splendid males of this species, their elongated swordlike tails flashing iridescent colors, attracted much admiration. Elegantly spotted *Girardinus reticulatus* was one of the most beautiful of the live-bearers, and a splendid male *Gambusia holbrooki*, almost jet black with gleaming white eye, was much admired. The males of most of these species are brighter and often quite different from the females.

Several species of *Rivulus*, not distantly allied to the live-bearers, were interesting, but *Rivulus ruber* stayed too near the surface and the others were too sluggish to be aquarium fish of the first rank. Some very beautiful green *Fundulus chrysotus* from the southern United States were perhaps too large and clumsy to find general favor. The species of the Indian genus *Haplochilus* showed to better advantage in a small aquarium. A number of species were shown.

On one aisle *Haplochilus senegalensis*, *rubrostigma*, *chaperi* and *panchar* occupied adjacent tanks, beautiful all of them, but

less beautiful than a tank of *elegans* across the aisle.

Numerous species of chanchito, small fresh-water fishes from southern America resembling our sunfishes, were very interesting. These fish are hardy, but less attractive than some of the more delicate kinds. On the other hand, the genus *Tetragonopterus* from the same regions are as beautiful and graceful as they are rare and interesting. They are quite unlike any fish from northern regions, resembling somewhat both minnows and catfish, with superficial resemblances in form and in the minute adipose fin in front of the tail on the back to the salmon. *Tetragonopterus rubropictus*, marked with red, and *paragoniatus*, with a black lengthwise stripe, were very attractive. An armored catfish (*Callichthys*), of which there were two or three specimens shown, had especial interest for the naturalist, and two gobies (*Eleotris*) were interesting because so seldom seen in aquaria.

A single specimen of *Rasbora heteromorpha* was shown. Its interesting black marking, activity and beauty make it a very attractive aquarium fish.

In a large tank at the end of the exhibition room was an African lungfish, an eel-like form with two pairs of feelers like fins. The marshes where they live dry up at certain times of year, and it then becomes encased in the hard, dried mud and breathes air. The specimen was shipped to the American Museum of Natural History, dry, in a lump of hard mud. When it arrived the mud was carefully softened and broken, and the fish readily took up aquatic life again in the tank and at once developed an appetite for fish worms.

The exhibition, being arranged especially for the tropical fishes which made up so large a part of it, did not contain many of the colder-water forms from Europe. It is only necessary to mention that the bitterling was on view. It was disappointing to some that more of our native fishes were not shown, but they had for consolation a

splendid tank of red-bellied dace and some lively specimens of banded sunfish.

A special feature was made of young fishes, and a great assortment shown. The rapidity of growth of some of those raised this season, especially where they had been kept in outside tanks, was remarkable.

One striking thing about the exhibition was the variety of people it appealed to. It was of course of particular interest to the naturalist and to persons interested in aquaria, while the fishes, amid their water-plant surroundings, made a strong appeal to all lovers of beauty; and there were always children in the room admiring the pretty colors, interested by the whiskers of the striped Indian catfish, getting an insight into an unknown life below the surface of their ponds and streams, their imagination stirred by seeing the climbing perch and hearing of its exploits out of water.

The largest daily attendance at the exhibition was on Sunday, October 6, when 1317 persons visited it.

On the Amœba

W. A. POYSER, Hammond, Indiana

SCIENTISTS in classifying the animal life upon the earth have given the name Protozoa to the sub-kingdom containing the lowest forms. The name means "first animal". In this class belong Amœba, Infusoria and the like. The Protozoa are all one-celled animals and are among the organisms called animalcules. This term is popularly used to designate microscopic animals, particularly such as are found in water. The term, however, has no scientific standing.

The Amœba, one of the lowest protozoans, inhabits fresh water or occasionally moist earth. Usually it is most abundant in water containing decayed vegetation. It appears when examined under the microscope as a clear, translucent drop of jelly, varying in size from 1/100 to 1/40 of an inch in diameter. The viscid, jelly-like matter

is protoplasm, the fundamental living substance, present substantially the same in all plants and animals. The word protoplasm means "first creation." Chemically, it is a particle of albumen in a firmly adhesive condition like a speck of white-of-egg. Nothing could be less animal-like than this shapeless mass of matter. The creature possesses but little structure or differentiation of parts. Certain water-filled spaces, a nucleus and a pulsating vacuole may be detected. The nucleus seems the controlling center and the vacuole to be connected with the excretory or respiratory functions. Thus at the very bottom of the scale of animal life we find the process of respiration. Granular particles of partially or wholly undigested food are always present.

The name Amœba signifies change, alteration, and is well applied. To move, a "finger" of the body-substance is protruded and the rest flows after it; to feed, the Amœba literally flows around and envelops the desired particle. These projections are termed pseudopoda (false feet). When a particle of food has been received into the body, the aperture closes, and the discharge of excreta is effected in a similar but reverse manner. These operations may take place at any portion of the body.

Reproduction is effected by division. When an Amœba attains the maximum size it divides by constriction, each part goes its way as a complete individual. Thus they may be said to be immortal in the scientific sense in which the term is used to denote a continuance of physical life on earth. They resolve themselves into their own offspring, and nothing perishes. Under adverse conditions they may become encysted and form resting bodies. This stage may be caused by drought, lack of food, or approach of winter. Thus protected they may be blown about by the wind, remaining suspended in the air for long periods. When proper conditions for a continuance of activity develop, the organism again revives. This is characteristic of other organisms and

accounts for their presence in all exposed bodies of water, even temporary rain puddles.

The Amœba, together with other microscopic life, undoubtedly forms the essential food of the newly-hatched fry. Composed, as it is, of protoplasm the living matter, it should be the substance nutritious par excellence. It is always present in the humus on the bottoms of aquaria.

Daphnia

C. J. HEEDE, Brooklyn

A species of Entomostraca, order Cladocera. The common water-flea. The head is large, rounded above and possesses large antennæ which extend upward therefrom. The forward portion of the head culminates in a more or less prominent beak. The eyes are spherical with about 20 lenses. Jaws possess a strong submaxillary ending in four horny spines three of which curve inward.

The antennæ are used like oars, projecting the animals in a series of spasmodic jerky motions through the water. Daphnia are frequently found in ponds and ditches, in such numbers as to color the water a blood-red especially where the water is stagnant. While daphnia are a favorite with the microscopist, they are unexcelled as a food for all varieties of aquarium fishes, either alive or dried and powdered. They are easy to keep alive and breed, when placed in a tank with 6 to 8 inches of water and a layer of sand about 2 inches deep on the bottom. They must be fed sparingly with chicken manure. They are also good scavengers as they destroy algae and will clear the water of all impurities. The female daphnia carries the eggs on her back, and these when laid hatch instantly. Late in the Fall they produce eggs which are hardier and can stand a much lower temperature. Daphnia can be collected all year round, even when ice covers the ponds. In places where they

are plentiful a cut in the ice will be the signal for them to appear in the opening, especially if any artificial light is used. They invariably seek light and sunshine but in cold weather keep near the bottom.

The "Lion-head" Goldfish

WM. T. INNES, JR., Philadelphia

THE "Lion-head" has for the past several years been the most highly prized and costly fish among Japanese fanciers. The two peculiarities distinguishing this breed are the absence of dorsal fin and a growth over the head somewhat resembling in form the protuberances of a raspberry. The latter development only appears in pronounced form in the mature fish, and in a large percentage of instances not at all. It has been claimed that the dorsal fins are extracted by the Japanese



JAPANESE LION-HEAD GOLDFISH

Photograph by Wm. T. Innes, Jr.

breeders, but this is manifestly impossible, for the scales are perfectly formed where the fin should have been and furthermore a number of these fish have been bred, showing no dorsals, in Philadelphia under the observation of the writer.

The body is short and thick and most specimens scaled. Tails double and short in all thus far observed in this country. We are indebted to Mr. Barrett for the loan of fish from which illustration was made.

Formaldehyde

A Remedy for Fish Infested with Parasites

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 fish 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 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 the 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 completely 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 were 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 and 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*. It 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, possibly, than the disease. I suggested that, as a desperate experiment, she place a patient in the solution. She received the suggestion as a joke, but, having one prominent characteristic of the true scientist, she is 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 fellows, 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 five 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 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 widespread, 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 that, 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 can 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 tests to a more definite end and give the results to lovers 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 animalculæ which inhabit all aquariums.

THE distribution of freshwater fishes offers some of the most perplexing problems of animal distribution known to zoologists. This is true, not only of families, but even of species, whose peculiar range is often unaccountable.

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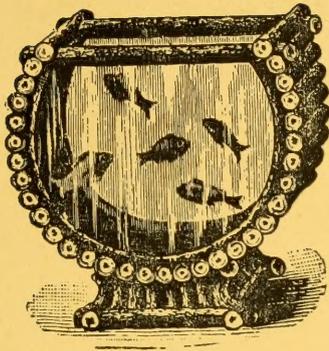
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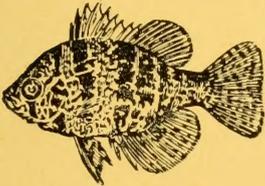
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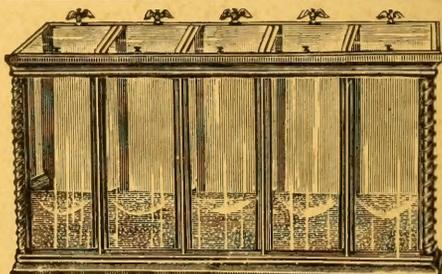
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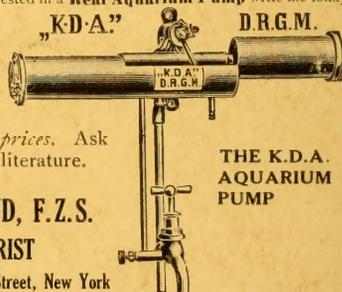
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