

# The AQUARIST AND PONDKEEPER

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## QUERIES

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## Editorial

A CONTRIBUTOR to this issue discusses the matter of obtaining financial profit as well as pleasure from the pursuit of fish keeping. Mr. V. L. Trew demonstrates in his article, with the support of some hard facts on costs, that to set out with the intention of making money from breeding fishes is likely to be a disappointing venture.

That it is a venture which attracts many aquarists who have enjoyed some initial success in multiplying their stocks of fishes is well known to us, for letters are received from them often enough asking us to verify that it would be possible for them to make a living by full-time fish keeping. To such enquirers we always emphasise the very great risks involved. Initial outlay and running costs are not small and profits are not large enough to ensure rapid development of a favourable balance. Losses amongst the stock through accident or disease can easily occur and may be disastrous financially. This is something that has been learnt the hard way in the past by many people who have lost their life's savings in trying to make businesses of their hobbies, in dog breeding, aviculture, poultry farming and vegetable growing, etc., as well as in fish keeping.

However, to be more encouraging, there is quite a good possibility of making your hobby help to pay for itself, and we know of several aquarists who although primarily are interested in studying the habits of fishes in aquaria as a hobby can keep their costs down or even meet them fully by disposing of their surplus stocks. There is, of course, some "know-how" involved, and in this matter our contributor has some useful suggestions to make for readers who would like to cut their costs rather than their fish keeping in 1958.

The Editor and staff of The *Aquarist*  
wish all our readers a Merry Christmas  
and a peaceful and Happy New Year



## Microscopy for the Aquarist—36 by C. E. C. COLE

**I**N my last article I mentioned the usefulness of dark-ground illumination, as compared and contrasted with transmitted illumination.

Some of you may wonder why I did not mention overhead illumination. This method is extremely useful for making out details of opaque specimens, and was discussed quite early on in this series for use with low-power objectives. It is unlikely that we shall use it for high-power work, for the creatures we examine by high power are very small and thin and, as explained previously, in such cases light descending upon the objects will almost all pass straight through, revealing nothing at all.

In my last article, too, I mentioned the use of turpentine and clove oil as "clearing" agents, and promised to tell you more concerning "clearing" and the other processes employed in the making of microscope slides.

I shall be indeed surprised if most of you will not feel the urge to make a few slides. Apart from any other consideration, you will discover upon writing to suppliers of manufactured slides that their lists contain only very few aquatic subjects. You will further discover, as I did years enough ago, that after perusing the lists and making a careful selection of aquatic creatures, quite a number of the listed slides are not available. One orders six, perhaps, and gets four and a promise—not always, I regret to say, subsequently fulfilled. There is nothing more frustrating.

Perhaps I have been unfortunate in finding slides wrongly labelled, heads twisted, legs short or broken or obscuring some other interesting detail, but there it is—that quite definitely has been my experience.

It is possible that many of your first efforts at making slides will be failures but do not allow this to deter you; it is only by practice that you develop skill. The most encouraging feature is that one has no need to spend a fortune! Failure to make a slide does not mean the loss of anything except a specimen, and not always this! Old slides can be cleaned and used again and again.

It is easier to prepare larger specimens for mounting than it is to deal with small creatures, if only because we can see what we are doing without using a lens at all.

But large creatures are bulky—too thick to mount even in a cavity slip—and very, very opaque. Take water beetles as an example. Even the smallest have appreciable thickness, and without overhead lighting no great detail can be made out. How can we deal with them?

If only they were transparent and thin, and also soft, no doubt we could tackle them. That is precisely what we do to them, in the following manner.

Of paramount importance is a small quantity of "caustic potash solution" (potassium hydroxide solution). This can easily be obtained for a few coppers from your local chemist. Ask for 5 per cent. or (more rapid in action) 10 per cent. solution. Corks should not be used to seal the container; a bakelite cap is better. Care should be observed whenever you are using the solution not to drop it on clothes or polished tables, and do not wash your hands in it.

Whilst at the chemist's, also obtain some methylated spirit and some undiluted acetic acid. Two or 3 fluid ounces of each will last a considerable time. A quart or so of distilled water is a good investment; we should use this instead of tap water. Apart from these, all we need at the moment is one or two small specimen tubes and, of course, some beetles.

It is a little late in the year to go beetle hunting, but a visit to one or two local ponds with screw-topped jars and a small net might yield one or two, particularly if the weather is mild. The most likely places are among sub-

merged vegetation at the edge of the ponds. Sweep your net along, through and under clumps of weeds. If the net is placed fairly low in the water, and brought into and under grass growing partially submerged from the bank, any creatures moving among the grass will dive down and into the net as it is brought up to the surface. If you do not get beetles you are almost certain to find other interesting and worthwhile catches—freshwater shrimps, *Asellus*, May-fly larvae, etc.

However, let us assume that you are lucky and catch some specimens of active beetles. How to kill them? This is always a problem, about which I have doubts. There are various ways, and it is up to us to choose the most merciful. My own opinion is that the best way is to drop them into hot (not boiling) water. Boiling water cooks them, and they are likely to fall to pieces when moved. Hot water renders them lifeless almost immediately, although some species are more resistant than others to this treatment.

Once dead they can be placed immediately into a few millilitres of potassium hydroxide solution. No action is apparent to the eye, but a softening up starts immediately. After a day or two a noticeable browning of the water is apparent, and this intensifies each succeeding day until frequently the beetle is invisible in the solution. Do not worry—this is the normal action of the caustic solution—the beetle is still there; it will never dissolve completely in the strength we have obtained.

By the way, it will help considerably if a note is made (in writing, not just in your head) of each stage and the result of each examination you make. Dates are extremely useful and you will soon be able to estimate the time it will take to prepare a large, a medium or a small specimen for slide making.

Leave the insects a week before examining them for the first time. Carefully tip them out, in the solution, into a flat vessel; a staining pot is ideal, or a Petrie dish or even an unwanted saucer.

Gently test their softness by pressing the elytra with a matchstick or something similar. After only a week there may still be considerable resistance to pressure, but in some cases a general sponginess will be felt. Pop them back into the softening tube again and leave them. Remember to throw the matchstick into the fire—do not leave it on the tablecloth or polished top.

If you intend to do a lot of this sort of work it is better to invest in a piece of stout plywood which can be used as a temporary table top upon which to stand whatever bottles and specimen tubes, staining pots, etc., you have, to save considerable domestic strife.

Continue, at intervals of a day or two, to test the condition of your specimens. By the time my next article appears they should be ready for further processing.

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### An Inexpensive Christmas Gift

**T**OO little attention is paid to the nutritional requirements of fishes, and a new "AQUARIST Booklet" by Dr. Feroze N. Ghadially, entitled *Fish Foods and Feeding*, provides in practical detail what the aquarist needs to know about this. Live and dried foods are described, with special attention to foods for rearing young fishes. The book's 88 pages are profusely illustrated, and it is obtainable for 4s. 11d. post free from *The Aquarist*, Brentford, Middlesex.



# THE PEREGRINATING TILAPIA

by JAMES W. ATZ (*Associate Curator, New York Aquarium*)

IN his long, hard fight for a place in the sun, man has had the help of other animals almost from the beginning. Long before he learned to write, to make things out of metal or even to plant and harvest crops, ancient man had discovered ways of keeping dogs and hoofed stock to make life easier for him. The domestication of animals, like the use of fire and the cultivation of plants, is one of the really basic human discoveries upon which all subsequent civilisation has depended.

But the incalculable benefits derived from domestic animals were not obtained without effort. The creatures had to be fed, watered and protected from both their enemies and the elements; in fact, the more productive and useful they became, the greater became their dependence on man for food and shelter. No one can say just when man first started to dream about an ideal domestic animal—one that would be marvellously helpful without requiring any care on his part—but it was surely long ago because the idea of getting something for nothing seems to be a fallacy that has plagued men from the earliest times.

Moreover, the fact that animals multiply lends credence to the belief that here, indeed, is the miraculous creation of wealth out of nothingness. Such ideas are embodied in old fables like *The Goose that Laid the Golden Eggs* and in a fanciful creation as recent as cartoonist Al Capp's *Shmoo*. They are also behind the get-rich-quick schemes, involving the raising of everything from earthworms and bullfrogs to chinchillas and skunks, that at one time or another have been passed off on an all too willing public—not that many of these enterprises cannot be made to yield legitimate profits, but that they require time, energy and know-how. Such misplaced faith in the powers of nature has made well-meaning but over-optimistic people proclaim that the economic salvation of whole regions could be accomplished merely by introducing the right

species of animal into them; an example is the proposal made a few years ago to bring musk oxen into rural New England.

The latest of these "miracle animals" is a fish whose prolificity and adaptability have given it the reputation of economic rehabilitator and social saviour of many of the world's underprivileged peoples. In this exalted role it has been transplanted into waters two-thirds of the distance around the earth.

This fish has no generally recognised popular name. In parts of its native Africa it is called the large-mouth kurper, bream and mudfish, among others, but none of these has been applied to it anywhere else. The fish has become widely known by its generic scientific name, *Tilapia*. This appellation is not entirely satisfactory, however, since there are several score of fishes belonging to that genus. Although it would be more exact to use the full scientific name, *Tilapia mossambica*, when anyone, unless he is a fish fancier, mentions *Tilapia* today it is pretty safe to assume that *Tilapia mossambica* is the species in question.

The large-mouth kurper, or *Tilapia*, was originally confined to eastern Africa where it inhabits both fresh and brackish waters. It is regularly found in estuaries as well as rivers entering the Indian Ocean, from Ethiopia south to Algoa Bay, which is near the southernmost tip of the continent. It also occurs in landlocked waters. Because it is a desirable food and game fish, South Africans have planted the fish in numerous natural and artificial bodies of water within their Union. For example, the species has now become established in at least one river near Cape Town, several hundred miles from its nearest natural habitat.<sup>1</sup> Although they frequently recognised the large-mouth kurper as a good angler's fish with high table quality, Africans did little or nothing about culturing it intensively—undoubtedly for the simple reason that the



Photo:

Although these *Tilapia mossambica* were only 4 in. long when this picture was taken, they had already produced four broods of 25-50 young each

N.Y. Zoological Society

The end of the war thus found *Tilapia* settled throughout Java and also on Sumatra, Bali, Lombok, the Celebes and other East Indian islands and on the mainland of Asia in Malaya. The fish had become established in the wild state in Java and Malaya, having been accidentally or deliberately allowed to escape into streams, lakes or swamps. It is only a matter of time before *Tilapia* will become part of the native fish-life of all of the islands where it is being kept in captivity. This introduced species bids fair to become a prominent element in the aquatic fauna of much of south-eastern Asia.

*Tilapia mossambica* is not an unusual-looking fish. It has occasionally been imported alive into Europe and America as an aquarium fish, but it grows too large and is not colourful enough ever to have achieved the popularity that some other cichlids have attained. Much of what we know about the peculiar reproductive behaviour of *Tilapia* has been learned by observing specimens in glass-sided aquaria.<sup>4</sup> As the time for spawning approaches, the male *Tilapia* behaves more and more hostilely toward other fishes, especially members of his own species. Eventually he appropriates a small area on the bottom which he vigorously defends against all comers. Within it he soon digs

a shallow, circular pit perhaps a foot or more in diameter. This is done by scooping up the mud or sand in the mouth, carrying it out of the area and then ejecting it. Now the male is ready to attract a mate into his nest. Sooner or later some ripe female follows him there and, after a courtship that may be either stormy or tranquil, the eggs are laid and fertilised.<sup>5</sup>

*Tilapia* eggs are laid in small batches of a dozen or so, and after depositing each batch, the female turns about almost immediately and takes them up in her mouth. The total number of eggs produced at any one spawning frequently runs into the hundreds, so that the female has quite a mouthful when she finally leaves the nest—more than likely being chased away by the male, since she no longer reacts positively to his efforts to spawn. Carrying her eggs, the female seeks some sheltered spot where she rests quietly. Her principal activity seems to consist of chewing movements with her swollen mouth and throat, by means of which she churns the developing eggs and fry, thereby undoubtedly keeping them well supplied with fresh water. The young hatch within 5 days, but they do not leave their oral incubator for another few days. Before they are released, the mother fish becomes restive; she

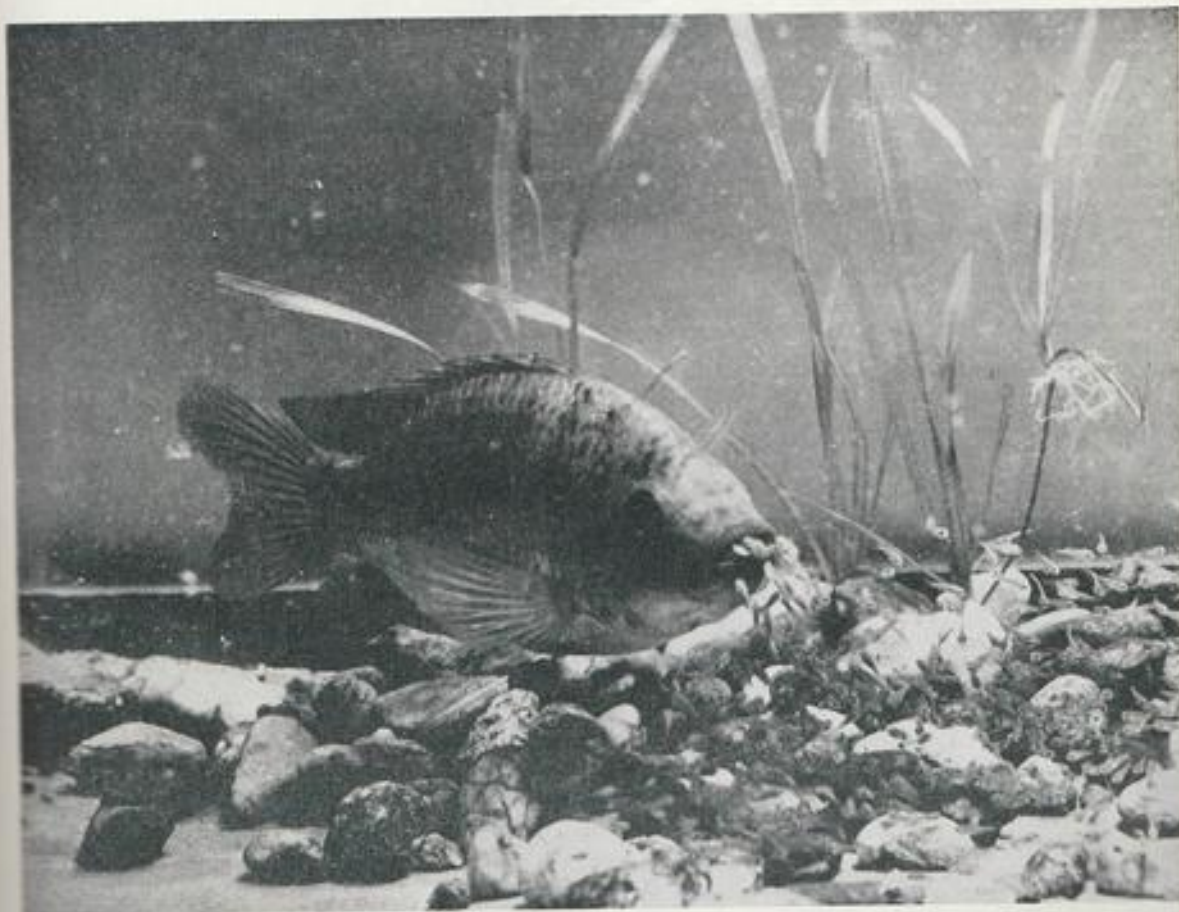


Photo:

A female *Tilapia mossambica* taking her brood into her mouth. Some of the young are streaming toward her, while others appear as yet indifferent

F.A.O.



acts as if her offspring were irritating her by trying to escape, but even if one or two manage to get out of her mouth, she snaps them up again. Finally, however, the whole brood of youngsters, not quite one-quarter of an inch long, is liberated.

But the close bond between parent and offspring—seemingly so incongruous in a creature as lowly as a fish—is not yet broken. The baby fish hover in a group not far from their mother, and should a passing shadow or disturbance in the water alarm them, they immediately return to the parental mouth. Both parent and young co-operate to accomplish this remarkable feat; the female "calls" her brood with special movements and they in turn swarm toward her head. Quickly she gathers them in, even swimming about and snapping up any stragglers. If an intruding fish, or human hand for that matter, threatens the family group too suddenly to permit the young to be carried away from danger, the mother fish fearlessly attacks the interloper while the tiny fish scatter near the bottom.

With each passing day, however, parent and offspring become less attached to each other; the female does not catch up her young so readily, and they seem less eager to be taken. They begin to venture further and further away. Four or 5 days after making their first appearance, the young are no longer taken into their mother's mouth. Almost fully developed, with all fins formed and with only a remnant of the egg-yolk remaining, they are on their own.

The wonder is that the mother fish, deprived of all food for the 10 or more days it takes the young to hatch and develop sufficiently to be allowed out of her mouth, does not eat her brood. Sometimes she does, but usually only when harassed. Male *Tilapia* are not nearly as ideal parents as their mates. Although they will occasionally take up some eggs, they rarely, if ever, complete the task of incubating them, but swallow the eggs or the young before they are fully developed.

If the way that *Tilapia* multiplies is any criterion, the protection that it provides its eggs and young is most effective. For instance, a pond which was less than one-fiftieth of an acre in area yielded 3,500 offspring 6 months after 50 *Tilapia* were placed in it.<sup>9</sup> When put into a half-acre pond, 150 young *Tilapia* produced some 15,000 fish

in less than 4 months.<sup>10 11</sup> Such rates of increase are not large when compared with other fishes that may lay literally millions of eggs, but these species usually breed only once a year, and their eggs and young, which are at the mercy of the environment from the very start, must be given special care and feeding by the fish culturist if any reasonable proportion are to survive. Female *Tilapia*, on the other hand, breed all year round, perhaps as frequently as once a month, and the fry require no special attention at all.

Moreover, the *Tilapia* is extremely adaptable. It will breed in both fresh water and sea water, and in all brackish mixtures of the two.<sup>12</sup> If no mud or sand is present in which to dig a nest, the male will simply clean off a spot on the hard bottom to serve as a place for the eggs.<sup>2</sup> The fish spawns readily in dirt ponds or concrete tanks, in clear or muddy water, in outdoor pools or indoor aquaria. Although primarily a vegetarian, it will eat many different kinds of animal as well as vegetable substances. One of its favourite foods seems to be algae, but other types of aquatic plants are also consumed, including those nearly microscopic, floating ones called plankton.<sup>13</sup> As a substitute, *Tilapia* will accept rice bran, the residue from pressed coconut meat and chopped leaves from the tapioca plant.<sup>14</sup> Insects, crustaceans, worms and small fishes are devoured with apparent relish.<sup>15</sup> Specimens at the New York Aquarium feed willingly on raw chopped meat, fish and clam and on oatmeal boiled into a stiff paste. Where there is ample food, *Tilapia* grows rapidly and will attain a weight of 1 pound or more in 8 months or, under very favourable conditions, nearly 2 pounds in 1 year.<sup>14</sup> In heavily fertilised ponds, yields of as much as 2,300 or 3,700 pounds per acre per annum have been reported, and one fantastic figure of 13,600 pounds per acre in 1 year has been reported.<sup>16</sup> Of course, the average return is much less than this.<sup>17</sup>

The proclivity of *Tilapia* for eating algae of the long-thread kind, which often grows so luxuriantly that it becomes a nuisance, has made the fish doubly useful in some regions. In South Africa, *Tilapia* have been used to control excessive algal growths, and in Indonesia and Malaya to combat the malarial mosquito.<sup>17</sup> The *Anopheles* that is principally responsible for the spread of malaria in

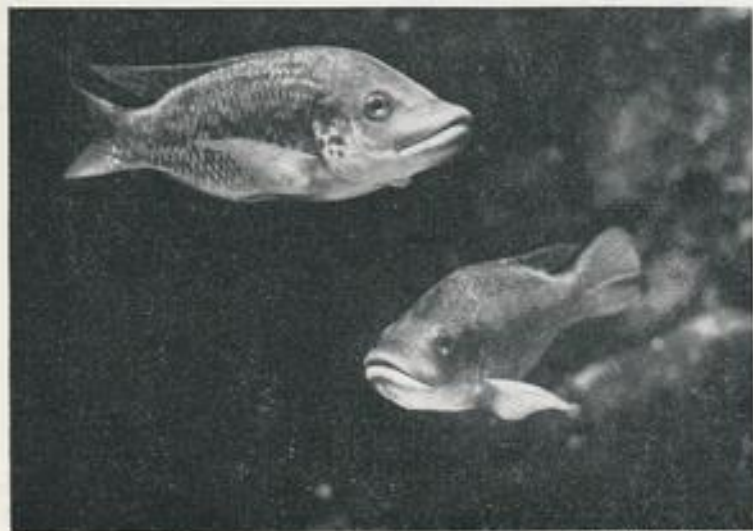


Photo :

N.Y. Zoological Society



These *Tilapia mossambica* (male above, female below) were living in sea water at the New York Aquarium when this picture was taken. They lived for more than 5 years in one of the salt-water tanks



Photo :

Foreign Operations Administration, U.S.A.



*Tilapia mossambica* netted from a fish pond in Thailand. This picture gives a good idea of the prolificity of this species

brackish-water areas thrives only in water covered with thread algae. Water with a clear surface contains very few or no larvae of this pest. All that is needed to assure such a state of affairs is to place some *Tilapia* in the water; in a few weeks the algae, and the mosquitos, disappear.<sup>4</sup>

The fame of this hardy, fast-growing, easy-to-breed and good-to-eat fish spread far and wide. In a world where each year there are 25 million more human beings to feed and where even at present more than half the people are undernourished, no source of food can be neglected. Pond fish furnish one of the cheapest sources of animal protein, which is the component of man's diet most critically in demand. Furthermore, many tropical and subtropical regions, where human dietary and population problems are especially acute, provide conditions suitable for extensive pond-fish culture. It is not surprising that the appearance of a new kind of pond fish, which was superior in some respects to the old ones, should excite keen interest among fishery experts. The introduction of *Tilapia* into Indonesia and Malaya had been somewhat haphazard, but since the war systematic, planned attempts have been made by the officials of several different countries.

One of the most spectacular successes of *Tilapia* has been won in Thailand. In that country fish culture is not at all as well developed as in Java. After 2½ years of testing at one of the governmental Fisheries Stations, the transplantation of *Tilapia* into thousands of widely distributed ponds, ditches, canals, swamps and rice fields was commenced.<sup>18</sup> The Food and Agriculture Organisation of the United Nations made the fish a vital part of its programme to expand Thailand's inland fisheries. More than 150,000 copies of a pamphlet on *How to Culture Tilapia* have been distributed. Because the raising of this species does not require the skilled techniques needed for carp and other pond fishes, it has proved an ideal beginner's fish. For this reason and because they like to eat it, the Thai have enthusiastically taken up *Tilapia* culture.<sup>19</sup> Unlike the situation in Java, the new fish has not yet become established in any sizeable natural bodies of water, apparently because it is unable to cope with the Thai predatory fish.

From Thailand, the *Tilapia* was brought to the

Philippines. Here it has been introduced successfully into ponds, reservoirs, canals and rice paddies and into certain lakes and other natural waters. The fish gives promise of providing the Philippine people with an excellent source of cheap but tasty animal-protein food.<sup>20</sup> It has been made an integral part of the SAMAKA plan of the Philippine Rural Reconstruction Movement.<sup>21</sup>

After some discussion *pro* and *con*, *Tilapia* was brought to India, first to Mandapam from Thailand, then to Madras from Ceylon and finally to Travancore-Cochin from Malaya.<sup>22</sup> One of the most troublesome problems of Indian pond-fish culture is a recurring shortage of fry. Because most of the fishes that are raised in ponds refuse to reproduce in captivity, it is necessary to collect their fry in the wild. But when natural reproduction is more or less unsuccessful—as, for example, when the monsoons fail—the lack of fry can temporarily cripple the industry in whole areas. Rarely, if ever, is there any shortage of young *Tilapia*, however.

Nature was bountiful with the islands of the West Indies, but she failed to provide any of them with suitable freshwater food fishes. In order to make up for this deficiency, Dr. C. F. Hickling, Fisheries Adviser in Her Majesty's Colonial Office, suggested that *Tilapia* be introduced. This suggestion was promptly followed by Mr. Swithin Schouten, Agricultural Superintendent of St. Lucia, and Mr. Derek W. le Mare of the Fisheries Department of Malaya. Through the good offices of Paramount Aquarium Inc., a large fish-importing concern in the United States, 450 young *Tilapia* were transported by boat from Malaya to New York and from there by plane to the island of St. Lucia in the British West Indies. Only two fish died during the whole long journey.<sup>23 24</sup>

In their new home, two-thirds of the way around the earth from their native waters, the *Tilapia* multiplied prodigiously. Soon there were enough to be transplanted to five other West Indian islands and to Trinidad. In St. Lucia and Granada, specimens were deliberately allowed to take up existence in the wild; but in Jamaica, the fish accidentally got into one of the rivers and established themselves. In 1951, *Tilapia* from Jamaica were introduced into Haiti as part of an extensive fisheries-



development programme of the FAO. Within 2 years they had become a favourite of the people and had been successfully planted in several rivers as well as a brackish-water lake.<sup>22, 24</sup> Before the coming of *Tilapia*, Haiti had no freshwater fisheries to speak of, and this lack was keenly felt because the density of population per acre of arable land in that country is one of the highest in the world. To make matters worse, Haitians have little or no experience in either fishing or fish culturing. Once again the superiority of *Tilapia*, which require so little care, has been established.

Because of its success in Haiti, the fish has been introduced by the FAO into the neighbouring Dominican Republic.<sup>25</sup> Fishery Biologist William T. Miller carried *Tilapia* from Trinidad to St. Thomas in the Virgin Islands, where he has found that it gives promise of making a first-rate forage fish for large-mouth black bass.<sup>26</sup> In 1954, *Tilapia* reached South America, when specimens from three different shipments were successfully established in ponds along the coast of British Guiana. As in Thailand, however, it so far does not appear that the fish will become established in the wild because of its inability to withstand the onslaughts of native predators.<sup>26</sup>

The reason for bringing *Tilapia* to the Hawaiian Islands was quite different from those that had previously brought about its widespread transplantation. What was wanted in Hawaii was a cheap yet hardy bait fish for tuna, which is one of the most lucrative of all U.S. fisheries. Because they live well in sea water as well as in the bait tanks aboard tuna-fishing boats and because they are so cheap to produce, small *Tilapia* show excellent possibilities as bait fish, and they have been used successfully to catch tuna.<sup>27</sup> In the meantime, however, it soon became apparent that *Tilapia* might prove to be a popular food fish, and so specimens have recently been planted in various Hawaiian waters, especially with an eye to rehabilitating the brackish-water fishery, which has been on the decline for many years.<sup>28</sup>

Still another use for *Tilapia* brought about its introduction into the Fijis. In those far-away islands, pigs are the principal source of meat, but more animal-protein food for them was needed. Acting on the advice of Malayan-fisheries experts, an economical reciprocal arrangement was

made in which the effluent from the piggery was used to fertilise the *Tilapia* pond, keeping the water saturated with tiny floating plants that are ideal food for *Tilapia*.<sup>29</sup> The pigs thus feed the fish, as well as the fish the pigs—and man steps in and helps himself to some *Tilapia* stew, as well as roast pork.

From all that has gone before, it might seem that *Tilapia* is, indeed, the perfect pond fish and that it alone could provide food for the world's undernourished millions. By the very nature of things this is manifestly untrue. Nevertheless, some people have been so carried away by what has already been achieved with the fish that they have proposed some extravagant schemes quite beyond the creature's capabilities. For one thing, *Tilapia* is a strictly tropical fish and is definitely sensitive to cold. Temperatures of 50° F. or less are fatal. For this reason, if no other, the schemes to introduce this species into the Everglades of Florida as a food fish or into ditches in Oregon to control algae are impractical. Sensitivity to cold has even limited its usefulness in such warm temperate countries as Taiwan and South Africa.<sup>28</sup>

Another of the gravest shortcomings of *Tilapia* is, strangely enough, associated with one of its most desirable attributes. The fish will spawn almost anywhere at any time, but under the conditions usually prevailing in ponds, it also commences to reproduce at a very young age and therefore small size. It is an unfortunate fact that the fish grows very slowly from the time it begins to raise young—all its energies being diverted to reproduction, as it were. The result of this sexual precociousness is a pond containing a tremendous number of fish but with the great majority of them less than 6 inches long, a size considerably less than the 14-inch maximum attained in nature. There is no great disadvantage to this if you, like many Orientals, prefer to fry your fish whole, scales, fins and all, or to cut them up into chunks for stewing or to make fish paste out of them. But if you are bothered by the bones and want to fillet your fish or if you want to gut them, scale them and cook them in one piece, *Tilapia* nearly 10 inches long are needed.

The tendency of *Tilapia* to become stunted when cul-



Pondfish culture in Thailand. Here technicians are feeding the fish in ponds specially prepared for *Tilapia* and carp



Photo :

F.O.A.

tured in ponds seems to be the principal reason why this fish does not yet appear regularly in West Indian markets, even though it has contributed significantly to the diet of the poor. West Indians, as a rule, want sizeable fish for their table, although in this regard the Haitians are a notable exception.

Experiments are at present under way in St. Lucia, Trinidad and Jamaica to determine the best method of overcoming the "runting" of *Tilapia*, as it is called. One method is to rear the sexes separately. Although young males and females look very much alike, one or two simple ways of telling them apart have been discovered.<sup>21</sup> It has also been found that males grow faster and get larger than females, even when the latter are relieved of the trying task of incubating their eggs and young. Perhaps the answer to the problem of "runting" will be to rear male *Tilapia* of genetic strains specially selected for fast growth by themselves in ponds that have been properly fertilised to provide plenty of food for them.<sup>22</sup> Perhaps by raising fish in deep ponds sexual maturity can be delayed, since there is evidence that the greater illumination in shallow water stimulates the fish's pituitary gland and brings about early maturation.<sup>23</sup>

Experiments with *Tilapia* to explore its potentialities and to improve methods of culturing it are also being carried out in Malaya, Thailand, the Philippines, Ceylon, Hawaii, Taiwan, the Fijis and South Africa. In the latter country, it has been found that *Tilapia* thrive in the effluent from a Cape Town sewage plant, yielding well over 1,000 pounds of fish per acre each year—which is phenomenal for this latitude. Previously, the highly fertile but bacteriologically safe water was simply wasted.<sup>24</sup> At the Alabama Polytechnic Institute in the U.S.A. the possibility of employing *Tilapia* in ponds in the warmer parts of the United States is being studied.<sup>25</sup>

Despite all the propaganda to the contrary, not everyone views the spread of *Tilapia* with pleasure or equanimity. It has been called an aquatic locust and "one of the most formidable wreckers of the international waters to-day."<sup>26</sup> It is hard to imagine that so prolific a fish would not have some adverse effects on native aquatic fauna, but as yet evidence of such results has not been reported. So far, the good *Tilapia* has done far outweighs the bad. Nevertheless, no one with any knowledge of the pernicious effects of the introduction of such exotics as carp and goldfish, for example, can approve of the casual way that *Tilapia* has often been transplanted from one place to another. Heed should be taken to experts like Dr. George S. Myers, who have warned that *Tilapia* could prove disastrous to the native fishes of South and Central America.<sup>27</sup> Under no circumstances should any fish be introduced into a new place without first carefully considering all the possible repercussions that it might set off in its new environment. One cannot help feeling that some of the introductions of *Tilapia* have turned out much better than could rightly have been expected and that those responsible for them have exercised more luck than brains.

In Java, where *Tilapia* first came into its own, it no longer occupies first place among pond fishes. Once again the milkfish, whose light colour makes it more marketable, is the most important species. Nevertheless, *Tilapia* ranks second or third in total number of pounds produced, and it has been estimated that the introduction of this species into Java has added some 40,000 tons to the annual production of fish and has contributed substantially to the alleviation of the shortage of fish on that island.<sup>28</sup>

Pak Mudjair, whose discovery of *Tilapia* started the fish on its Odyssey, has had a street in the western Javanese town of Bandung named after him, but his greatest satisfaction must come from the knowledge that his fish now thrives in tens or perhaps hundreds of thousands of ponds

and other bodies of water and that it provides an enormous number of people with food. It is true that *Tilapia* has not lived up to all expectations, but no real creature could have done all that the publicity agents and incorrigible optimists claimed for it. Suffice it to point out that man seems to have acquired another domestic animal to help him on his way.

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## Cacti in the Fish House

GO over the roof of your fish house to make sure that there are no leaks which might allow a drip of water to fall on any cactus plant. Such drips can be fatal, as they cause rot to set in. See that some fresh air is available on all suitable occasions. Open windows or ventilators as long as there is some sunshine or if the air is not too cold. Do not do this during foggy weather or when there is an actual frost. Most cacti will want a good rest during the winter and unless they can get this they are not likely to flower so well in the coming spring.



# A Novel Fish- Observation Chamber

by C. A. SPINAGE

(Photographs by  
the author)



Photographer with camera set up in the observation chamber

**T**UCKED away in one of the most desolate and rugged spots of Kenya Colony, East Africa, lies a small, crystal-clear pool, surrounded by palm trees and lying like an oasis amidst the forbidding hills of a recently volcanic area.

This is Mzima springs, or "fine water" as the natives call it owing to its extreme clarity, caused by a spring flowing over a sandy bottom. Desolate and remote as it may sound (it is over a hundred miles to the nearest town), it has been made easily accessible for the tourist and is now a point of great attraction.

The National Parks of Kenya have erected a small tower at one side of the pool, where the visitor may watch in safety the antics of the hippopotamus and other creatures of the pool. Owing to the water's clarity the animals can be seen, when they have submerged, executing their

grotesque half-walking, half-floating movement across the bottom; whilst shoals of fishes can be seen sporting near the surface, their backs flashing green and silver in the sun.

Because of the enormous numbers of fishes which the pool holds, a novel fish-observation chamber has also been constructed at one side of the pool, where the spectator can descend a few steps and, by looking through its glass sides, study the fish denizens in their natural habitat. Perhaps if one is lucky, a hippo, or even a crocodile may swim by!

The fishes flock around the glass windows in incredible numbers, attracted by the bait that the wardens throw them. They consist mainly of a species of *Barbus*, of which there are over a hundred different types in Kenya, many of which differ only in some minor respect, visible only at the closest inspection.



Mzima springs, Kenya



Fish photographed from the observation chamber. They are crowding close together just below the water's surface in anticipation of food

## Fancy Goldfish Breeding—II by A. BOARDER

**L**IONHEAD goldfish are not very popular at the present time, but the reason why so few are seen at shows may be because it has been rather difficult to obtain good specimens since the war. Few aquarists seem to be breeding this variety now, but in the hope that more may take up the rearing of this peculiar fish the following advice is offered.

The easiest way to describe the lionhead would be to say that it is a fish similar to a fantail in shape but without a dorsal fin. Also it must have the hood, as is required for the oranda. Whereas the oranda was shaped as for the veiltail, that is with a body almost spherical, the body of the lionhead should resemble an oval. The tail of the oranda is full and flowing, falling in graceful folds like the veiltail, but that of the lionhead is shorter and held out behind the body in a horizontal line with that of the body.

### 11. The Lionhead

The lionhead may be scaled, or metallic as it is called, or nacreous, or matt. The scaled types are the ones usually seen. The fish cannot be called handsome, as the lack of the dorsal fin immediately puts the fish in the class of absurdities, and the bison-like head adds to its strangeness.

The breeding conditions for the lionhead follow the same pattern as that for the fantail, but it is only when the fish are almost mature that the hood will develop. This waiting period is one of the reasons why this fish is not very popular. One never knows whether specimens will be of any use or

not, as if the hood fails to develop properly the fish is quite valueless. Some lionheads can show the start of the hood when they are not much more than a year old but so much depends on the rate of growth. If the fish have been well fed and have had plenty of room they may have grown to a fair size in 12 months and so have the hood developing. If their growth had been retarded by poor feeding and cramped conditions then the hood may not form for 2 or 3 years.

Only those fish which have the true characteristics should be used for breeding purposes. That is, the parents should have well-developed hoods, the general shape of a fantail and show no sign of a dorsal fin. If the tail is not quite divided or is not sufficiently forked there is no need to worry, as if the fish are from a good strain they are likely to provide plenty of youngsters from which one can choose a few good ones. There is no special feeding problem with these fish and they do not appear to be delicate in any way.

When sorting the youngsters it will be found that the usual method for all twin-tailed varieties can be used. First place them in a white bowl and examine them from above; then use the clear-sided tank for a further examination. Discard all those which show a dorsal fin. Also you must look out for those which have one or two small humps where the fin would have been. These types make particularly ugly fish and are of no value. The back should be as clear as possible from all signs of irregularities. The scaled types will take some time to change colour and so this feature cannot be determined early in the life of the fish.

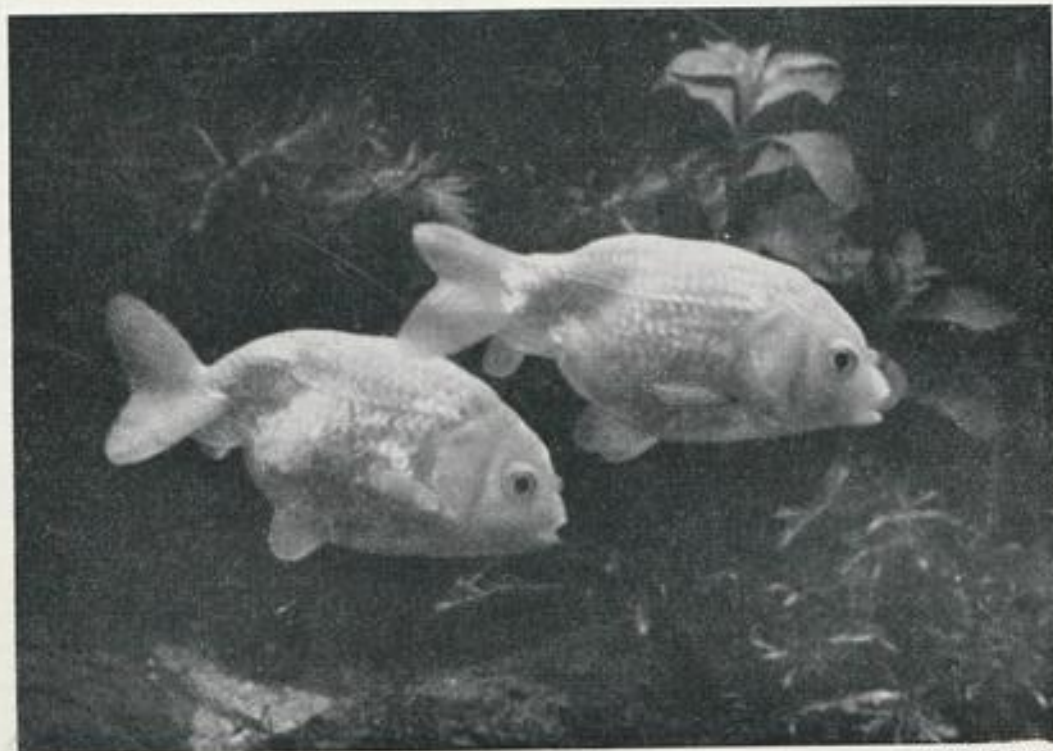


Photo:

Lawrence E. Perkins

Lionhead goldfish



All metallic types should change colour by the end of the twelfth month after being hatched. The nacreous and matt types will, of course, change quite early like the shubunkins.

Once the badly shaped fish have been discarded the rest should have plenty of space and a good variety of food including plenty of starchy kinds. A little warmth until the fish are 3 months old will help them to develop and also to change colour. After this age it is as well to let the water remain at ordinary air temperatures, according to the weather. Where any late-hatched varieties of fancy goldfish are concerned it may be necessary to keep some form of artificial heating going so that the fish can continue to feed and grow on well into the winter. Remember that as the temperature of the water decreases so do the appetites of fishes.

For show purposes the lionhead should conform to the following standards: body should be oval in shape with a depth of just over half the length. The caudal peduncle should be set rather high to hold the tail well up and to prevent any tendency of it to droop. The fish should have a raspberry-like growth on the top of the head and gill covers and this growth should be as near round as possible. There must be no dorsal fin and the caudal fin should be completely divided and well forked, like that of the fantail. The pectoral and pelvic fins should be in depth half the depth of the body. The anal fins should be paired and held horizontally. The metallic type should be completely scaled, except the head, with a good metallic sheen. No scales should be visible in the nacreous and matt types. The self-coloured metallic should be a deep red, the variegated should have two or more colours "in pleasing pattern" (I assume this to mean near-matching). The nacreous should have the colour of the shubunkin: blue, violet, red, yellow and brown with scattered black markings. The minimum length of the fish for show purposes is 2 inches excluding the tail. Why the Federation of British Aquatic Societies' Standards allow 20 points for size after making this stipulation I do not pretend to know; the 20 points could have been more usefully allotted to the hood.

The lionhead is quite hardy in any well-conditioned pond and it will be found to withstand quite a cold winter out of doors. It is hardier than the oranda and veiltail because of the lack of flowing finnage, which is always more prone to get damaged by congestion and fungus in very cold periods.

When breeding lionheads it will be found that various shapes will appear at times among the spawnings. Some fish will have the dorsal fairly well developed whilst others do not have the divided tail. For showing, such fish would not be recognised in this country. However, in China such fishes are kept and bred from and so there are very many varieties bred in China which are almost unknown over here. The Chinese have been breeding fancy goldfish for centuries and have evolved scores of types; some have oranda shapes without a dorsal fin, some have joined or webbed tails which are fringed at the ends, some are evenly marked bright red on silver, some have silver bodies with red heads, others are all cream in colour. Some silver-bodied fish have chocolate markings, others are yellow with black spots, some kinds have pearl scales, others large bubble eyes. There are types with huge nasal appendages. In fact, they have so many different and distinct varieties which breed fairly true that our efforts in this country must seem ridiculous to the Chinese.

When one considers that the Goldfish Society of Great Britain decided to recognise four varieties only when they were first formed it is not hard to realise why there are so few novelties among goldfish varieties seen in this country to-day. There is no encouragement to show them and even the F.B.A.S. recognises only a few varieties. One would have thought that the Goldfish Society would have recognised and encouraged the breeding of as many varieties

as possible instead of restricting breeders to four. Just fancy what an uproar there would be in the dog world if a new dog society were formed and only four main varieties of dogs were to be bred! The F.B.A.S. issued their last standards in loose-leaf form, which will enable them I hope to add standards for all the new varieties which are sure to appear in this country from time to time. The pearl-scaled types could be recognised in any of the recognised groups as well as the pom-pom (goldfish with large nasal flaps).

In the next article of this series the nymph will be dealt with, together with advice for wintering youngsters of all varieties.

## FRIENDS & FOES

No. 62

### Water Beetles (*continued*)



*Gyrinus larva*

#### COLEOPTERA

FAMILY:—Gyrinidae, from Greek *gyros*—a circle.

**H**ARDLY a living person can have failed to see one or more species of this beetle during the spring and late summer months. Even the most unobservant persons have their attention drawn by ripples on the surface of the water caused by the swift gyrations of the "whirligig" beetle. Round and round they go until, quite suddenly, they disappear beneath the surface. Whether they dive because danger, real or imagined, threatens, or because they see a meal below them, is hard to state definitely. They are extremely difficult to catch; a sudden swift movement beneath them carries the best chance of trapping them in a net, if it anticipates the direction of their dive. On the surface a net is hopeless.

Examination reveals the fact that the eyes of this beetle are divided into two portions: one for observation below water, the other for vision in air. The legs are flattened and furnished with swimming hairs, and the abdomen extends beyond the elytra. Antennae are short and clubbed.

Eggs are laid in spring, and from these hatch strange-looking larvae bearing hairy filaments on either side of each abdominal segment; these are the gills. The last segment bears two pairs of gills, and the tip of the segment bears a couple of pairs of hooks used for climbing.

The larvae are carnivorous but fairly inactive, and are fully grown by the end of July, at which time they climb out of the water and pupate within a cleverly hidden silken cocoon. Pupation takes about a month. About the beginning of September the beetles swarm, and it is then that they are so obvious and active on the water surface. If they do not fly off to another stretch of water they will hibernate as soon as the temperature drops, passing the winter in the mud at the bottom of the pond.

*C. E. C. Cole*



# AQUARIST'S Notebook



by

RAYMOND YATES

WRITING in the Portsmouth Club magazine, Mr. Phil. Knight of the Singapore Aquarium Society gives some interesting information on the Van Kleef Aquarium, which is situated in the King George V park in the heart of Singapore. Built at a cost of £60,000 as a result of a bequest from a former resident, Mr. K. B. van Kleef, it was opened in September, 1955 and has already established itself as the most modern and finest in Asia. The design of the modern building is most impressive. At present there are 48 exhibition tanks holding from 50 gallons (for freshwater fishes) to 1,300 gallons, marine and freshwater exhibits being roughly equal in number. Constant filtration is used and a pipe line brings water from the sea, a mile or so away. Altogether about 50,000 gallons of fresh and 75,000 of sea water are in circulation. Difficulty with the marine stocks at first was due to the poor quality of the sea water, which is diluted by the very heavy rainfall inshore. This trouble was got over by the addition of large quantities of salt to the water and strict quarantine before adding new fishes to display tanks. Local freshwater species are much in evidence, including fine specimens of *Rasbora elegans* and *R. trilineata* fully 8 inches in length. A local catfish is already 4 feet in length and still growing. A laboratory is situated in the basement but this is rather small and by no means up to the ambitions of the curator, Mr. Alec Fraser-Brunner, who is so well known to readers of *The Aquarist*. Tank accommodation there is limited to nine 36 in. tanks which are used for a moderate amount of breeding and conversion of marine specimens such as archers, scats and *Monodactylus* into freshwater. Some ambitious plans are afoot for an extension of the Aquarium to include a really large tank for displaying the larger sharks from the locality. Attendance averages about 30,000 monthly. Admission charges are cheap, being only 9d. for adults and 5d. for children, and the Aquarium is a popular resort at week-ends. Mr. Knight was a member of the Portsmouth club before leaving for Singapore.

In southern England, aquarists visiting Chessington Zoo should not fail to visit the Aquarium there. It is not very large but is big enough to house quite a representative collection of tropical and coldwater fishes, both rare and common species. Perhaps the best of the tropical tanks are those reserved for angels and for clown barbs. There is also a reptile section which has been recently reconstructed. A variety of snakes, lizards, terrapins, frogs and an alligator are very much at home, in fact conditions are so natural that even green lizards have been breeding, which is quite something. The zoo proper contains all the expected animals, lions, tigers, bears, elephant, penguins, sea lions, monkeys, etc., and there is also an adequate amusement park. Chessington Manor was built in 1340 but was destroyed by Cromwell in 1646. To this day it is known as "Burnt Stub." The grounds cover 65 acres. The Zoo is in the centre of a ring formed by Wimbledon, Leatherhead, Esher, East Molesey and Surbiton and hobbyists visiting these areas are within easy reach of the Zoo.

It is true that industrialisation spoils large tracts of Britain but there is still plenty of natural beauty left. One thing I notice is the fact the minnow is so rare in many localities, so much so that many people just don't know a minnow when they see one. Many people imagine that a minnow and a stickleback are one and the same thing. The stickleback is found everywhere, even in salt water. I well remember my surprise many years ago when I found the

Zuider Zee teeming with this fish. Aquarists could help by introducing fishes such as the minnow into waters where none now exist, as this fish carries well in cool weather and breeds readily in suitable conditions. True it has many enemies, but nature sees that there are always enough to carry on the race. Anglers have no use for it because it is too small to be of interest (except as bait), and for this reason no stocking takes place. At places like Windermere there are many, many millions of these fish and you can catch dozens merely by lowering a tin with a bright object inside into the water, which lures the inquisitive fish. I have introduced fishes into suitable waters where none existed (particularly rudd and tench) and wish more fish enthusiasts would take this little trouble. The same can be said of water plants. A great many waters have very little vegetation or little variety. Suitable plants brought from overcrowded streams elsewhere (in polythene bags) will soon establish themselves. Give nature a helping hand if you can.

It is very annoying to find the peace of a community tank ruined by the attentions of a bully to one or more of the previously happy occupants. Just why do fish bully others? Well, there are many reasons. Sex is one. Male fish of one species will often bully all the other males of that species and make their lives unbearable (e.g. swordtails). Female fish can prove bullies with related species, e.g. a blue gourami with all other gouramies. Fish with no partner often pester totally unrelated species but cease once one of their own kind is put in to join them. Size is also a reason. Large fishes and small fishes just don't mix. Small specimens flee and some individuals seem to get quite a kick out of chasing others, (e.g. black shark and liberty mollie). Others are predaceous and are just naturally inclined that way. Worst of all are those mean specimens who enjoy sly fin-nipping or endless non-stop chasing, such as black-line tetras, tiger barbs, penguins, wasp gobies and the like. Fighters and paradise fish can be great trouble makers but perhaps worst of all are those fishes which consider a certain portion of the tank to be theirs and theirs alone. There is no cure for bullies except moving them. Even when removed for several days or weeks, once returned they soon commence their bullying tactics. Newly purchased fishes which prove to be trouble-makers should be returned to the dealer, who will normally exchange them for something more pacific.

Scene . . . a diesel train near Buxton, crammed with schoolboys homeward bound. Conversation overheard went as follows. "How's your goldfish?" "Dead." "How long did you have it?" "Only a day." "Well, I told you." "Told me what?" "Not to overfeed it . . . anyone knows goldfish mustn't have more than two ant eggs a day . . ." ". . . how many did you give it?" "Five, worse luck." "Well, next time you'll listen to me." Here the tiniest member of the party chimed in . . . "My grandma had a goldfish for 20 years . . . she looked after it though . . . it went down the drain hundreds of times but she went after it and always got it back." Here the conversation

(Please turn to page 204)



# Profit as well as Pleasure

by V. L. TREW

THE hobby of fish keeping ranks high to-day, but I wonder how many of us realise the number of supporters it loses each year through misunderstanding of the difference between making the hobby pay for itself and making money out of fish breeding? Only recently I have read a publication which deals with ways of increasing finance at home, in which quite a large space was taken up with the idea of breeding tropical fishes for profit. Let me say at once that this is possible, but there are many snags to overcome.

To be fair I should state that I was employed for some years before the war by one of the best-known aquarists in the West End of London—part of this time was spent solely in the breeding rooms—and therefore I feel qualified to give my views on this subject. Further, I have been secretary of my local society, and have bred and sold many fishes during the past 15 years.

The main object of this article is to help not only the newcomers to the hobby but also those who wish to make their enjoyment as inexpensive as possible. By achieving this many potential enthusiasts would not be lost to aquarists' clubs throughout the country. A hobby on a sound footing will always encourage people to go on, and this in turn leads to a keener interest in general.

First let us consider the space available. At least four aquaria of say 24 in. by 12 in. by 12 in. would be needed to keep up a supply of one particular variety of fish. This is most important, because unless you can guarantee a reasonable number most established dealers are just not interested. Next, cost of running must be borne in mind. The formula for costing electricity is:

$$\text{Cost} = \frac{\text{wattage} \times \text{no. of hours} \times \text{rate/unit (kw. hour)}}{1000}$$

Therefore four aquaria with 100 w. heaters using, say, 10 hours of electricity per day (at 1d./unit) would give a figure of

$$\frac{400 \times 10 \times 1d.}{1000} = \frac{4000}{1000} = 4d. \text{ per day}$$

Top lighting is almost unnecessary for breeding tanks; in fact most of the unsuccessful attempts can be attributed to too much light. Feeding costs have also to be taken into account and here the most important thing is quantity. Make sure you have a good supply of micro worms, white worm, *Daphnia*, Infusoria, etc., on hand, as by giving this point some consideration your losses will be cut to a minimum.

Having fixed the amount of equipment in the mind's eye we can pass on to the actual fishes which are to be bred. Assuming that one has a community aquarium in the living-room this can now be made to form a dual role. Not only will it give the pleasure for which it was intended but it will be a storage place for the breeding pairs.

The choice of fish does not entirely rest with the breeder. Obviously there is little point in producing some species, no matter how difficult they are to breed, if a ready market is not available. The types to aim at are the "bread-and-butter" ones. Any of the community type that a dealer sells in batches of say three to six at a time are the best proposition.



Photo: Laurence E. Perkins

The platy is a species always in popular demand, but only specimens of good shape and size can be disposed of profitably.

To give an example of this: I remember one aquarist who went in for breeding fighting fish, and after the first batch were sold was at a loss to understand why the demand suddenly fell off; but a little forethought would have told him that most people buy only one or two fish, and if you sell 50 the dealer has to find that number of customers also. No, leave this type of fish to the professional breeder; he has much more scope and room to spare for the number that are required.

Of the many fishes which should give a reasonable return the following are perhaps among the best to concentrate on:

Egglayers: white-cloud-mountain minnows, zebra, X-ray, flame, tiger barb, beacon, dwarf gourami, catfish (*Corydoras aeneus*, *C. paleatus*).

Livebearers: mollies (perma-black, sail-fin, liberty), platys (moon, black, wagtail, spangled), swordtail (Berlin, black, red, Wiesbaden).

At first glance the above species may seem simple enough to produce (with the exception of catfish) but really first-class fishes are not so easily turned out. How often do we see a perma-black mollie which is up to exhibition standard, or well-developed platys?

Naturally, the above paragraphs must be viewed in their proper context; we are discussing fishes which have a high sales potential.

As aquarists we must always strive to breed the rare species, not only for the knowledge and sense of satisfaction this creates, but to enable us to pass on to others something new, but these must be bred primarily for our own collection. At the same time I see no reason why one should not try to make certain fishes pay for the electricity, etc., we use.

Many excellent articles have been written in this journal on the subject of breeding the above varieties, and it would be pointless to take up space to cover the same ground.



It must be assumed that before proceeding with the object of "making ends meet" the reader has acquired the necessary knowledge. Without this the effort will almost certainly fail.

Now let us take a look at the actual marketing of the fishes bred. Two main channels are open: (1) selling through the sales columns of this magazine; (2) selling in bulk to a dealer. If you choose the first method your success will be achieved only by sending fishes of the highest quality, well packed and dispatched as arranged. Should you prefer selling to a dealer then quite a different approach must be made. Often what would turn out as a good sale meets with non-acceptance because you get to the shop at an inconvenient time, or the type of fishes you have to offer are not wanted at that particular moment.

Just give this matter a few minutes' thought and you will

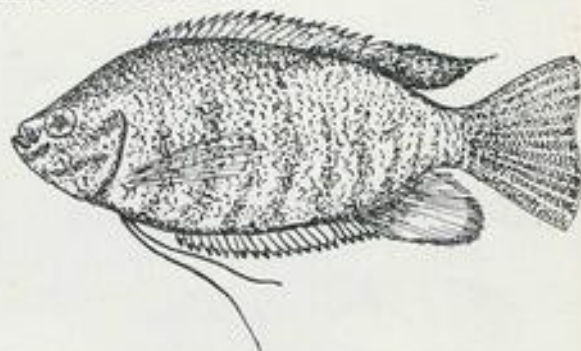
see that had you written a letter first, things may have been very different. Select one of the larger dealers or, if possible, a wholesaler, write and tell him what fishes you intend to breed and ask if he is interested. His price may seem very low but I can assure you that more often than not it will be a fair one—between 25 and 40 per cent. of the selling price is about average. Remember, importations of fishes are cheaper, and the overhead costs of this type of trade are quite high; also fishes make up only part of the sales.

Consider all the aspects. Don't reach for your cheque book in the hope that you will buy a new car or house in one year's breeding! But if at the end of a year you can say, "Well, I have had all the enjoyment of my hobby and it has paid for itself," then you can give yourself a pat on the back.

## TROPICAL FISHKEEPERS' REFRESHER COURSE:

by Pisces

### Thick-lipped Gourami (*Colisa labiosa*)



*Colisa labiosa*

**ORDER:**—Labyrinthi, from Greek *labyrinthos*—a tortuous passage, and Latin *icius*—suffix indicating possession of a character.

**FAMILY:**—Anabantidae, from Greek *anabantos* or *anabaino*—to go up, plus Latin *idae*—a suffix added to stems of generic names to form family names.

**SPECIES:**—*Colisa*, from a native name, and *labiosa*, from Latin *labeo*—having large lips, and Latin *osus*—prone to.

**S**MALLER than the three-spot, larger than the dwarf, the thick-lipped gourami seldom exceeds 3½ inches in length. It is a native of Burma. When the thickness of its lips is compared with those of other gouramies it is easy to see why it was given its specific name.

Fully grown males are easily distinguished from the females; they have more colour, longer dorsal fins and slightly concave head. The female's head appears blunter, her body with more rounded fins. A series of dark blotches along the side divides the body into two almost equal halves, the upper a brownish hue and the lower paling rapidly towards the anal. There is a hint of orange along the outer margin of the anal and dorsal fins of the females. The sides of the males, on the other hand, are traversed by many dark vertical bars, with blue and orange lighter patches between. The caudal, dorsal and anal fins show blue and orange. Pelvic fins of both sexes are hair-like and reddish orange.

Like all the *Colisa* the adults supplement the oxygen derived from the water with pure atmospheric air taken in gulps at the water surface and stored in the labyrinth organ—the auxiliary breathing chamber. This presupposes an ability to withstand overcrowding and foul conditions. This is true enough of adult fishes, but many newcomers when breeding gouramies assume that if the adult fishes can be crowded so can the youngsters. This is a fatal error. More deaths of fry are caused in this way than by any disease. They die by suffocation. For the first 3 weeks of life they are without the fully developed labyrinth, and are as dependent upon oxygen from the water as any other kind of fish. Foul conditions rob the water of much oxygen, and the balance is rapidly used up

by hundreds of little gouramies fighting for existence, fighting a losing battle far too often.

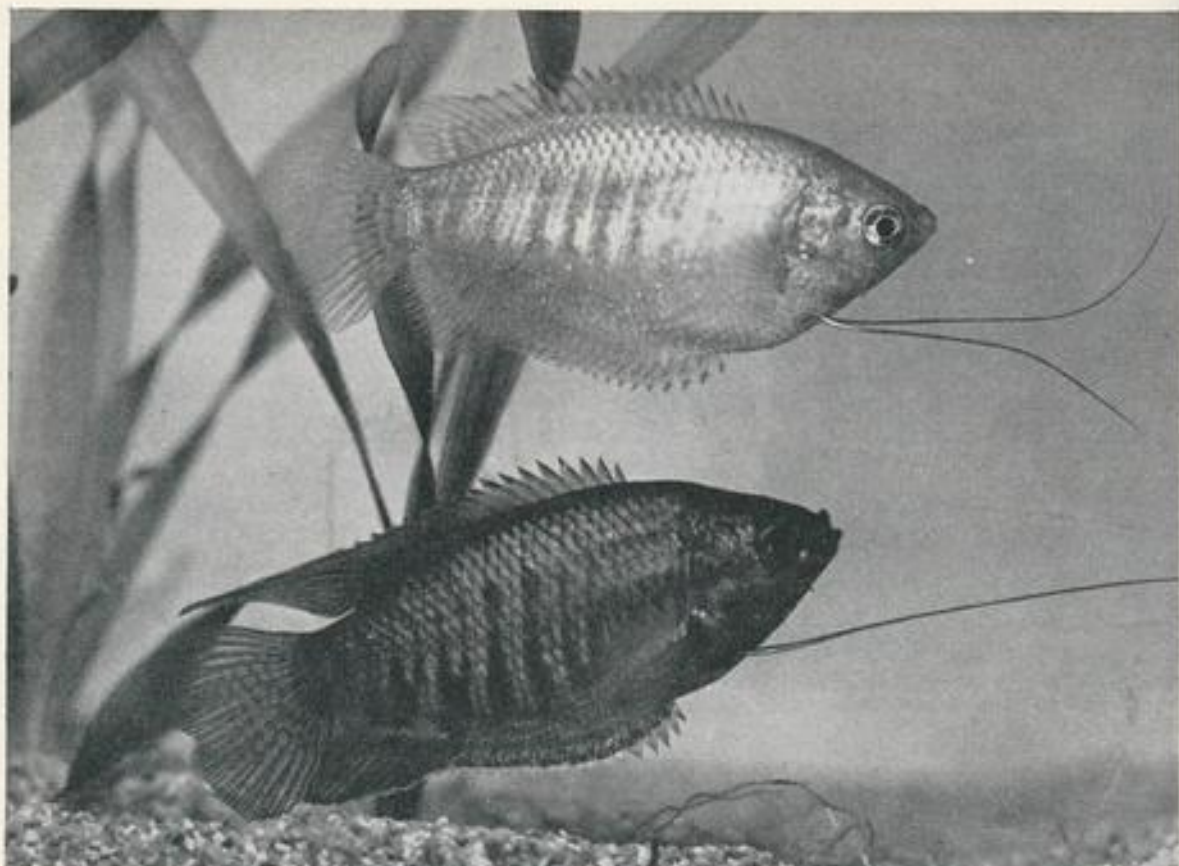
Normally content at an average temperature of 73° F., with this fish, breeding is stimulated by increasing it to between 77° and 80° F. Additional live food should also be fed to bring the prospective breeders into tip-top condition, this being indicated by a greatly enhanced beauty in the male and increased liveliness in the female, who will soon develop a swelling just behind the pelvic fins. Believe it or not, this is where the eggs are. The shortness of the body cavity of anabantids is a constant source of surprise to the tyro. Why have such a waste of bulk in solid flesh and muscle? Yes, it's solid enough, but also very supple. Nature intended it to be so, to enable the bodies of the fishes to entwine during spawning without rupturing their essentials.

Mr. Thicklips, as soon as he feels the urge to mate, begins to build a nest of weeds and bubbles at the surface of the water. Mrs. Thicklips takes a sly look at the nest whenever permitted, but does nothing to help its construction.

When satisfied that it is serviceable, the male seeks out the female, gently urging her to a position underneath it. If she approves, they embrace and, in the squeeze that follows, a number of clear eggs are pressed from her body and float upwards into and around the nest. This continues at intervals until the female is spent. Eggs which drift too far away are collected and blown into position in the nest.

Now the male assumes guard duties, hovering below the nest in an apparently feverish anxiety, turning this way and that, making very short journeys of inspection, seeking suspected enemies and usually, in home aquaria, finding





none. One source of annoyance and danger to his eggs consists of the presence of cyprids, who show a marked liking for gourami eggs. Without tearing or knocking his nest to pieces the male can only float and glare at the little pests running all over the nest and just doing what they like with the eggs.

It is better, if these creatures are known or seen to be in the aquarium, to float the nest into a saucer, and leave this in the aquarium. Alternatively it can be removed to a freshly set-up tank and floated carefully on the top until the eggs hatch—a matter of 48 hours or so after spawning.

Fry are small, like a multitude of animated commas. As soon as they are free-swimming the tiniest of infusorians should be fed, together with water thick with floating algae. Temperature of culture and water should be the same as that of the aquarium. This avoids death of the fry, infusorians and algae, through too sudden a change.

After a week on these small foods, new-hatched brine shrimps, *Cyclops* nauplii and tiniest of *Daphnia* can be fed. A little and often should be the maxim. Follow up with gnat larvae, micro worms, etc.

During these young days, while the fry are almost completely transparent, it is worth risking sacrificing one or two to see what happens to the food they eat. Examination under a microscope will reveal its presence in their intestines, with quite surprising results occasionally. It is by no means certain that all they eat will be digested. I have actually seen live foods pass unchanged through a fish's intestines, to emerge and swim away, none the worse, apparently, for its temporary incarceration inside the fish.

Whether the fish experienced any discomfort with the passage of the food I cannot say.

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## Aquarist's Notebook

(continued from page 201)

changed to talk about "prep" so I was denied further enlightenment.

Far too few aquarists ever look inside the light hood and yet this is often a fruitful source of blue-green algae, which is carried into the tank by condensation water. The algae forms on the lower grooves of the hood and can often be overlooked. This unsightly growth gets a hold above the water level above the front glass, and this is easy to miss because what the eye doesn't see the heart doesn't grieve over. Run over all these top inside surfaces with a razor blade and later a cotton-wool pad. I can never quite understand why steel wool is advised when cotton wool does the job so much better, with less risk.

Pumps are useful for aeration but need not be on all the time unless a tank is shockingly overcrowded. The real advantage of a pump is to freshen up the tank first thing in the morning (when it has a larger content of carbon dioxide), and last thing at night before leaving the tank in the dark. There is also a layer of "bad" water which the pump circulation helps to dispel.



## READERS' QUERIES ANSWERED

I have not been keeping tropical fish very long, but a week or two ago I spawned some two-spot gouramies. After the fry hatched out, I removed the parent fish and introduced dried food for the babies. In a few days, however, all but a few of the fry died. Please can you tell me where I went wrong?

Newly hatched fry need careful attention. In the first place they need microscopic live food (Infusoria) or powder-fine dried food to eat. Secondly, the temperature of the water should be kept fairly constant—no sudden rises or drops in temperature. Thirdly, the fry of labyrinth fishes can be killed quite easily if the surface of the water is cooled by a cold stream of air passing between the cover glass and the top of the aquarium. We suggest that you try and spawn your gouramies again during the next month or so, and make sure that the fry get plenty of the right sort of food and are protected from cold draughts across the surface of the water.

Please can you tell me the life span of zebra fish?

The zebra fish (*Brachydanio rerio*) has a life span of about 2 years. Sometimes an individual fish will reach the age of 3 years, but only in good conditions, and when its companions in the tank are small, peaceful fishes. Bullying fishes soon weaken and hasten the death of zebra fish past their prime.

A dwarf gourami in my aquarium has suddenly become very bloated in the body and its scales stand out as though they have been rubbed the wrong way. Has this fish contracted some disease?

Your fish shows all the symptoms of dropsy. Although much has been written about dropsy affecting fishes in the aquarium, there does not appear to be any certain cure for it. It has been found, however, that laxative live food such as *Daphnia* and chopped earthworms helps to retard the disease's progress: dried food accelerates it.

## The Garden Pond in December

by Astilbes

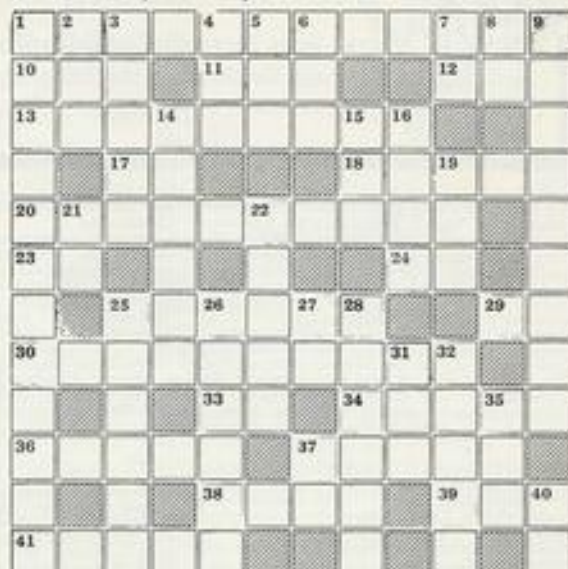
ONE of winter's risks for the garden pond is cracking from the pressure of ice formation. If the pond should form a crack there is the possibility of the rest of the water draining away and leaving the fishes in a layer of mud. Fishes should be caught and placed in a safe place until the pond can be made whole again. It will not be possible to mend the leak whilst the frosts still continue, but once a thaw sets in the cracks can be dealt with. Treatment depends on the extent of the cracks. If fairly large ones they should be well raked out and any loose pieces of concrete removed. Then force in a mixture of cement and fine sharp sand, one part of each. See that it is pushed well into the crack and make sure that all the crack is treated. There is no need to extend the cement mix beyond the crack for if this is done it is almost certain to peel away in time.

Very fine cracks can be treated with a plastic substance such as Seclastic. This compound keeps rather soft and is quite waterproof. It is necessary to see that it is well forced into the crack. It is so sticky that it will cling to the fingers unless they are dipped into a little paraffin. A very good way of forcing the plastic into a crack is to have some strips of grease-proof paper handy. Once some of the plastic is laid over the crack the paper applied on top can be pressed to force the material home. The paper can be left over the plastic and it will come away in time.

No planting should be done in or around the pond at this time of the year, but catalogues can be examined for seeds to be ordered in readiness for the spring sowing.

## The AQUARIST Crossword

Compiled by J. LAUGHLAND



### CLUES ACROSS

- Milfoil suitable for the tropical aquarium (12)
- Hard water in a way (3)
- S. American river. Home of tetra from— (3)
- pra nobis*. Tail of the Rainbow (3)
- Woodworker tells the fish to come in (9)
- Indian Army in short (1, 1)
- Pertaining to the wind (5)
- Dwarf sucking catfish (10)
- The paper's "producer" (2)
- Hemirhamnus ocellifer* (6)
- Mixed type (2)
- Pearl-oyster beds in other woods (5, 5)
- It be a gift (2)
- To eat or wear away, 'e is before and behind the rod (5)
- To moisten (5)
- Graven images or fancy gold-fish (5)
- Dance or part of the angler's tackle (4)
- Uncle (3)
- Is not twisted? (5)

### CLUES DOWN

- The order of toothed carps (12)
- Young Conservatives' Association (1, 1, 1)
- One of the danios (5)
- Addled roe (3)
- A bent one is usually a boy's first hook (3)
- This is the kind of water the sloppy aquarist gets into (3)
- A short glance gives the answer (2)
- of the Chaldees (2)
- Gender (9)
- One who packs (6)
- The standard comparative term for slippery customers (3)
- Rake is nearly all roe (4)
- Cash (1, 1, 1)
- Not even a tot (2)
- Mother o'pearl (5)
- Cow-homin, perhaps, or *stireya* (5)
- Victoria's consort (6)
- Old English (1, 1)
- Name of a fish; egg-eyed sharp? (6)
- Although the tail has left the frog it is still from (3)
- Freshfish more likely to grace a frypan than a tank (5)
- Decoration for Other Ranks (1, 1, 1)
- This is that is (1, 1)
- The one who has the last word on this. See 24 (2)

### PICK YOUR ANSWER

- A barbel on the lower jaw of a fish is called: (a) labial; (b) mandibular; (c) maxillary; (d) rostral.
- Which is the smallest of the following species? (a) *Aequidens caryocarpus*; (b) *A. latifrons*; (c) *A. portuarensis*; (d) *A. tetramerus*.
- Rasbora nigrofasciata* is an earlier name of: (a) *Rasbora daniconius*; (b) *R. heteromorpha*; (c) *R. maculata*; (d) *R. trilunata*.
- The "wood" of a red tuxedo swordtail should be: (a) black, edged yellow; (b) red, edged yellow; (c) yellow, edged black; (d) yellow, edged red.
- Water pimpernel is the popular name of: (a) *Ansbias*; (b) *Cordamine*; (c) *Hydrilla*; (d) *Samolus*.
- Aequidens* belongs to the same family as: (a) *Ceratopteris*; (b) *Lemna*; (c) *Marilia*; (d) *Salvinia*.

G. F. H.

(Solutions on page 206)



# News

## from AQUARISTS' SOCIETIES

Monthly reports from Secretaries of aquarists' societies for inclusion on this page should reach the Editor by the 5th of the month preceding the month of publication.

AT the open shows at both Bath and Bristol, members of **Yeovil and District Aquarist Society** were successful in winning awards. The most outstanding was Mr. A. Dromy with his goldfish which was the "best fish" at both shows in its class, winning the Harper Cup at Bath, and the W. Butler Cup at Bristol. Other winners included Mr. R. Stone, winning the A. C. Gurney's Cup for his glowlights in the best tropical breeder's exhibit of egg-layers at Bath open show. At the last meeting of the society, Mr. L. G. Emery of Bath gave a talk on his experience in the keeping and breeding of shubunkins and how to bring them to show standard, with which he has had great success.

RECENT activities at **Bristol Aquarist Society** meetings have been a talk on guppies by vice-president Mr. H. C. B. Thomas, who is an F.G.B.S. Class B judge, the annual plant show, and a discussion with members of the M.A.A.S. on the new pointing system for exhibition fish.

Mr. L. E. J. Challenger won the tropical plant class and Mr. N. O. Grimston the cold-water section.

Mr. V. E. Capaldi therefore wins the table show trophy with 23 points, two more than Mr. S. J. Davis, who receives the runner-up goblet.

AT the October meeting of **Bath Aquarists Society** the members listened to a very interesting talk by Mr. Colin Roc of Birmingham, who dealt with personal experiences in his early days of fishkeeping during the war when serving abroad in India, etc. Both tropical and cold-water aspects of the hobby were covered and, of course, at question time many subjects were brought up including the inevitable "white spot." As a practical aquarist his advice about cleaning out tanks, including plants, after an infestation seems both practical and necessary, especially as it appears he has proved that this trouble can re-occur after a period of months when everything appears in order after treatment.

A **FILM** show presented by **Sunderland and District Aquarists Club** attracted over 100 aquarists recently. The societies represented were: Newcastle-on-Tyne and District Aquarist Society, Tyneside Aquatic and Biological Society, Wallsend and District Aquatic and Biological Society, the Newcastle Guppy Breeders Society and Middlesbrough and District Aquarist Society. The films shown were all of interest to the aquarist, the titles being "Coral Wonderland," "The Life of the Trout," and "Marvels in Miniature," and were kindly loaned by the following Governments: Australia, South Africa and India, and the programme lasted over two hours. Old friends were met and a pleasant evening was had by all. The number present was very gratifying to the organisers of this show; it seems to prove beyond all doubt that given good programmes there is no lack of enthusiasm among aquarists. Sunderland and District Aquarist Club hope to put on many more programmes such as this in the near future.

THE recent show held by **Chester and District Aquarist Society** in conjunction with the local branch of the National Cacti Society was again a success. Over 750 people attended the show with a financial gain once again showing as a result of the combined effort. The judge

was Mr. F. Williams, Aquarium Curator of Chester Zoo.

Twenty-four extra tanks and staging had been added to the show from last year's profits and another increase will be made for the next show. Plans of the staging designed and built by the members are available to any societies interested.

The results were:—Tropical Furnished Aquaria: 1st, J. Bowyer; 2nd, P. Shobbrook; 3rd, K. Parry and R. Sharp. Individual Fish: 1st, K. Parry (scarf); 2nd, J. Bowyer; 3rd, J. Bowyer. Matched Pairs: 1st, K. Parry (red fighters); 2nd, F. Oldbury; 3rd, L. Moulding. Breeders (Livebearers): 1st, J. Bowyer (cofer-tails); 2nd, A. Lee; 3rd, K. Parry and F. Oldbury. (Egg-layers): 1st, L. Moulding (white clouds).

THE annual general meeting of the **Bethnal Green Aquarists Society** was held on 29th October and the following officers were elected: Mr. H. Penton, chairman; Mr. W. Wiegold, show secretary; Mrs. F. Scott, treasurer; Mr. A. H. Scott, secretary; committee: Messrs. J. Hayes, J. Hurst and A. Wiegold. Meetings are held every Tuesday evening at 7.45 p.m. at the Bethnal Green Men's Institute, 229, Bethnal Green Road, E.2. Visitors and possible new members can be sure of an interesting evening.

THE **Dewsbury and District Aquarist Society** have arranged a meeting to take place in No. 1 room of the Textile Hall, Dewsbury on Saturday the 14th December at 3 p.m. The purpose of the meeting is to form a Yorkshire Federation, the headquarters to be decided by the societies entering the federation. All societies resident in Yorkshire are requested to send two delegates if possible.

ON Friday, the 1st November, the **East London Aquarists and Pondkeepers Association** celebrated their 25th anniversary as a fish club. Mr. C. W. G. Creed gave a very interesting illustrated talk on his travels in Holland, and after an interval the president, Mr. P. S. Campkin presented the medals, etc., won at the

recent show. To wind up the evening Mr. R. A. Taylor, the oldest member, cut the cake and everyone present drank the health of the club. Over 50 people were in attendance.

AN inter-club show between **Independent Aquarist Society** and **Clapham Aquarist Society** resulted in a win for Independent by 37 points against 23 points.

The results were:—A.V. Barbs: 1st, L. Dare (L.) rosy barb; 2nd, H. Dickenson (C.) tiger barb; 3rd, L. Parrior (C.) cherry barb. A.V. Livebearers: 1st, K. Hickford (L.) female red swordtail; 2nd, A. Hart (C.) albino swordtail; 3rd, H. Dickenson (C.) yellow wagtail. A.V. Cichlids: 1st, L. Dare (L.) *Apistogramma ramirezi*; 2nd, T. Pizzala (L.) Texas cichlid; 3rd, T. Pizzala (L.) *Cichlasoma fayerosii*. A.V. Characins: 1st, T. Pizzala (L.) *Metyms schreimulleri*; 2nd, F. Tompkins (L.) *Anisotoma anaromus*; 3rd, T. Feasey (C.) Buenos Aires Tetra. A.V. Anabantids: 1st, C. Desborough (L.) dwarf gourami; 2nd, F. Tompkins (L.) combtail; 3rd, E. Evans (C.) thick lip gourami. A.V. carps and minnows: 1st, E. Evans (C.) white cloud mountain minnow; 2nd, G. Feasey (C.) flying fox; 3rd, L. Dare (L.) zebra danio.

AN inter-club table show was the feature of the last meeting of **Middleton and District Aquarist Society**, the opposition coming from **Salford Aquarist Society**. There was a good attendance of members and judging was done by Mr. McDowell.

### Crossword Solution

M	Y	R	T	O	P	H	Y	L	L	U	M
I	C	E	R	I	O	R	A				
C	A	R	P	E	N	T	E	R		S	
R	I	A				E	O	L	I	C	
O	T	O	C	I	N	C	L	U	S	U	
C	O	K	A		E	D	L				
Y	B	E	A	C	O	N	P	I			
P	E	A	R	L	R	E	E	F	S	N	
R	R	B	E	E	R	O	D	E			
I	M	B	U	E		I	D	O	L	S	
N	U	R	E	E	L	E	M	E			
I	N	S	E	T		E	S	S	D		

PICK YOUR ANSWER (Solution)

1 (b). 2 (a). 3 (d). 4 (c). 5 (d). 6 (d).



Photos:

Personalities at the first annual conference of the British Aquarists' Study Society held at the London Zoo and reported in last month's issue. Left: Dr. F. N. Ghadially (technical adviser to the B.A.S.S.), Dr. H. Gwynne Ververs (curator, London Zoo Aquarium), Dr. A. Pearlman (chairman, B.A.S.S.). Right: Mr. John Edwards (organising secretary, B.A.S.S.) telling the assembly about the Society's aims and objects.



J. L. M. JUDGE



