The AQUARIST
AND PONDKEEPER

Founded in 1924 as "The Amateur Aquarist"

THE BUTTS, HALF ACRE, BRENTFORD, MIDDLESEX
Telephone: EALing 4703
PUBLISHED MONTHLY
SUBSCRIPTION RATES

The Aquarist will be sent post free for one year to any address for 19/6. Half-yearly 9/9. Canada and U.S.A. $3.00 yearly; $1.75 half-yearly.

QUERIES

Postal replies are made to all specialised queries accompanied by a stamped, addressed envelope. *This privilege is afforded only to registered readers and direct subscribers.* Subscription forms can be obtained on application. In all cases letters should be addressed to the Editor.

Correspondence with intending contributors is welcomed.

MSS. or prints unaccompanied by a stamped, addressed envelope cannot be returned, and no responsibility is accepted for contributions submitted.

The Editor accepts no responsibility for views expressed by contributors.

Contents

VOL. XXII No. 6 1957

Editorial

"SELF-convicted of having carried coals to Newcastle for over a quarter of a century," is how *The Irish Times* describes the Zoological Society of London. This is because the authorities have recently changed the point of collection of sea water for their marine aquaria from the Bay of Biscay (from whence it has been conveyed in ballast tanks of ships especially for the Zoo for more than 30 years) to Littlehampton, Sussex. It does seem, from what we have been hearing in recent weeks about the state of pollution of our coastal waters, that any change in the sea at Littlehampton would have been for the worse rather than for the better during the passage of all those years. However, we believe that the change of procedure is experimental in nature and that no final decision on the relative merits of French and English sea water for marine aquaria will be taken until observations have been made of the Littlehampton stock in use.

AQUARISTS who can do so are warmly recommended to visit the British Aquarists' Festival at the Belle Vue Gardens, Manchester on 5th and 6th October. This aquaria show, organised by the Federation of Northern Aquarium Societies for the seventh year, in terms of the number of societies and aquarists actively supporting it through their membership is now the major annual event of its kind in Britain. Not only that, it is the only show ever to have changed its approach from the conventional arrangement for the competitive exhibition so as to allow scope for the ingenuity of exhibitors in making a decorative display of their aquaria as society grouped entries. Visitors from all parts of the world have, in previous years, praised the B.A.F. highly. A visit to the show, which, as in the past, will include a comprehensive display of equipment by the aquarium dealers, can be made a day out for the aquarist and his family, since all the attractions of Belle Vue Gardens, including the Zoo and Aquarium, are available for the one price of admission. *The Aquarist* will be represented at the show and we hope to meet many of our readers there.

Fancy Goldfish Breeding—8

by A. BOARDER

IT is probable that the veiltail goldfish is the most popular of the fancy goldfish, and one would naturally expect that there would be plenty of good fish to be seen at shows or for sale. Unfortunately this is not the case at present. The quality of veiltails appears to go in cycles. Some years many good ones are seen whilst at other times few really good fish are to be found.

The main fault with the present-day veiltails is that they lack colour. The nacreous or shubunkin-coloured types should have a bright colouring composed of blue, violet, yellow, red and brown, with black markings fairly well scattered. Most of the veiltails seen at the shows have no blue, no red and appear either mostly brown or brownish yellow with some black, but this is usually too brownish and so the fish does not have that bright appearance it should have.

This lack of colour may be due to the fact that breeders are concentrating on finnage alone and are neglecting the beautiful colours the fish should have. In trying to establish a good coloured strain the breeder should use one or two fish which have the required colours, regardless whether they conform wholly to the standards in other points. I do not mean that fish should never be used for breeding purposes if their parents were not from a good strain. It is probable that in any spawning from good stock some of the youngsters will have the colour required. These fish should be paired to a good fish which lacks colour and then among the progeny it is almost certain that a few fish will be obtained which have the good colour together with the other good points necessary.

Before a start is made on sorting the veiltails it will be an advantage to know the main points required by the standards. The body should be short and almost round, approaching a sphere in shape. The back should be nicely rounded with no trace of flatness. There should be no sign

Photo: Laurence E. Perkins

Very good finnage is exhibited by this young specimen of a veiltail goldfish

8. Sorting Veiltails

of a snout or hump back. The dorsal fin should be high and full with rounded contours and well held. The caudal fin should be completely divided and be at least as long as the body. The bottom should be as straight as possible and show no signs of a forking. It should hang in graceful folds and be free from blemishes. The pectoral and pelvic fins are long and pointed and the anal fins must be double and completely divided. Fish with single anal fins would be disqualified at a show.

The main faults seen in many veiltails are: flat backs, forked tails, lack of colour, lack of deportment and condition. So many fish on the show bench have fin congestion apparent in the red streaks, especially in the tails. Lack of a good rise in the curve of the back is also often seen, and as most of the fish have a good deep belly this only accentuates the flat back.

To sort the veiltail youngsters the same procedure should be adopted as with the fantails described in the previous article on "Breeding Fancy Goldfish." First place the fish in a white bowl and examine for divided tails. The tail should be quite divided from the caudal peduncle, so that it appears that the fish has two complete tails. At this early stage in development it must not be expected that the tails will be of the required length; this length will come as the fish grows. At the moment it will be as well to keep all those fishes which show the complete division. The ends of the tails may not be quite straight and it is only at a later date that it will be possible to say for sure whether the shape will conform to the standards or not. Suffice it to say that any fishes which show a distinct forking to the ends of the tail are not likely to be of much use, as this fault may get worse.

Once the fish with the best tails have been sorted they must be placed in a clear-sided tank so that they can be examined for body shape. Even at a young age the fish will show up any tendencies for snouts and hump or flat backs, although it cannot be expected that the fish will show the complete shape of an adult fish. However, it is possible to discard many fish at this stage which fail in body shape. Now examine the anal fins. Some may be found which have no sign of a fin there whilst others may have one, and some with one well-developed fin and the other misshapen. It is no use wasting time on such fish. They will never grow another fin or have the badly shaped fin improve. Now look at the dorsal fins. Only those with good development should be chosen; thin or pointed fins are useless. The pectoral and pelvic fins do not give so much trouble as a rule and it is usual to expect to find that any fish with good caudal, anal and dorsal fins would have decent pectoral and pelvic fins.

As for colour it may not be possible to be certain at an early age whether a fish will develop the correct colours or not, and it may not be until the fish are 3 months old that a final sorting can be made as to colour. This applies only to nacreous or calico fish. The scaled ones may not get their proper colour for another year. A great deal will depend on the strain and also on the conditions under which the fish have been reared. I consider that it is a great pity that the Federation of British Aquatic Societies has recognised the scaled or metallic veiltail. I would like to see all veiltails nacreous as I do not consider that it is right to expect a scaled hard-finned type of fish to have the flowing soft finnage required of the veiltail. The fantails are

the type of fish which should always be scaled, but here the Federation also allow a variation as they recognise a nacreous fantail. This only encourages breeders to exhibit over-developed fantails as scaled veiltails or to show under-developed veiltails as fantails. If only the fantail had to be scaled and the veiltail had to be scaleless how much better it would be for everyone!

It will be seen then that it is necessary to keep all the fry which have the correct finnage and decent shapes for some time to see whether the colour is going to develop correctly. As far as the nacreous coloured ones are concerned it is possible to discard those fishes which are apparently colourless. These are not likely to get better colours, whereas the fish which appear to be very dark or almost black are the ones which will probably develop some of the required blue ground with the other colours mixed among it.

The scaled types will have to be kept until they have changed colour from the bronze to the red or chrome yellow as the case may be. Variegated fish are also recognised but as it is far more difficult to breed a fish with a self colour, whether it be red or chrome yellow, it is probable that the judge will favour the self-coloured fish to the one with some silver markings. Any black on a scaled fish may be the result of incomplete colour change.

Having made the preliminary sorting it may be surprising how few fish are left from a large spawning. Concentrate on the good ones by giving them as much space as possible. Each fish should now have at least 24 sq. in. of surface area in the tank. This is when the fish are about a month old, or a little older, according to their rate of development. This latter is decided mostly by the amount of food the fish have been able to obtain together with amount of space they have had. It would not be practicable to try to rear all the fish from one spawning in most establishments; you would need 84 standard tanks to rear 1,000 fry to an inch long overall.

The picked fry should now have as varied a diet as possible. It has often been written that to get good deep bodies on the fish it is necessary to feed on plenty of starchy foods. I do not agree with this entirely, as I consider that if a fish has not got a naturally deep body all the feeding in the world would not give it the deep body so sought after. Another point which has often been made is that to get deep bodies on the fish it is necessary to keep them in very deep water; in fact it has been stated that the deeper the water the deeper the bodies will become. I do not believe this. If a thin-bodied fish was placed in a tank 2 ft. deep and fed on all-starch diet I doubt very much if it would alter the thin body into a deep one. It is then apparent to me that it is necessary to breed for body shape, and then perhaps a good body may be improved by feeding, but I hold an open mind on this point. Feeding with starchy foods may increase the fat on a fish but it is not likely to alter the structural shape of the bone formation.

The ideal foods for young veiltails would be a standard packet food containing wheat germ (Bemax types), dried shrimp, dried liver or other meat and ground oats. Then each day the fish should have some form of live food such as chopped garden worm, white worms, *Daphnia*, *Tubifex* or mosquito larvae. From a month old the fish can eat quite a lot of food and it should be given in sufficient quantities so that if they require it the fish can feed almost all day long. The amount given at a time, however, should never be more than the fish can clear up in a few moments (unless the feed happens to be *Daphnia*, which will live in the water and not foul it as would happen if too much dried food was given).

The ideal temperature at which to keep these youngsters is about 70° F. The water can cool somewhat during the night and this will not harm the fish at all. Whether you use any artificial aeration will be up to you. If only the tank is kept under-stocked there is no need to use an aerator. If aerators are used it may be a problem to get the fish used to unaerated water when the showing season comes round. Many fish at shows are soon showing signs of distress in their tanks if they have been used to tanks which are artificially aerated. I recommend that when the fry are first taken from the hatching tank they should be placed in bare tanks, that is, no oxygenating water plants need be added.

A 2-years' old female veiltail goldfish

Now that the youngsters are about a month old it will be a good plan to introduce some water plants, such as hornwort, to give the fish something to browse over during the day. A little duckweed on the surface is a great help, especially if the tanks are in a fish house or where they are able to get plenty of sunshine. Many fish like to lie in the sun but they also like to be able to get away from it at times. I find that a little duckweed gives this shade and also tends to keep the water from over-heating during heat waves. The fish will also eat the roots, and when they get older, the leaves as well. If the plant grows too rampant it can always be netted off quite easily.

See that some of the water in the tank is changed each week. Do this on one special day of the week as then it is less likely to be forgotten. It is surprising how soon a tank can get foul when a number of young fish are constantly feeding and discharging their droppings in the water. Use your siphon and clear out all the waste matter at the base of the tank and top up with some fresh water. It is surprising how the fish will react to the partial change. As the fish grow on so will any faults become more apparent, and so the first sorting must not be thought to be the last. Every week one may find a fish with a fault which will necessitate its removal from the special rearing tank. From a thousand fry you will be lucky to obtain a dozen fish which conform exactly to the standards; but keep trying. "Softly walkie, catchee monkey."

CACTI IN THE FISH HOUSE

TAKE care that too much water is never given to cacti. The weather may turn cool and then the soil in the pot will take too long to dry out. Nothing will kill a cactus plant quicker than over-watering. The roots die and rot and then the whole plant will collapse. See that the pots are standing so that all surplus water can drain away quickly. Pans holding pots should have a layer of gravel to assist the drainage.

Some New Results in the

Treatment of Ponds to Control Some External Parasites of Fish

by RAY ALLISON

(Agriculture Experiment Station, Alabama Polytechnic Institute, Alabama, U.S.A.)

TO control external parasites of fish, fishery workers in the past have experimented with a large number of chemicals and methods of application. Although these experiments have met with varying degrees of success, very little quantitative work has been reported.

Tests in aquaria and ponds have been conducted to determine the efficacy of formalin and potassium permanganate in concentrations that could be tolerated by fish populations over long periods of exposure. Most of the previous work on this type of chemical control has been restricted to dips of short duration or to short exposures under circumstances in which a raceway or pond could be flushed to reduce the concentration after a prescribed period of exposure. No work has been reported on treatments wherein a body of water is treated with a given concentration of a chemical and the fish are exposed to this material until its natural dissipation occurs. Obviously, only very low concentrations of most chemicals could be used under such circumstances.

Materials and Methods

Parasitised fish were obtained from several local impoundments, including the ponds of the Agricultural Experiment Station of the Alabama Polytechnic Institute. Parasitised populations were usually discovered because of unusual mortality reported by Station personnel or local pond owners. In most of these instances, the epizootics were caused by a single parasitic species and rather uniform infestations suitable for experimentation could be obtained.

Parasitised fish were brought into the laboratory and stocked at the rate of 10 fish to each 40-litre aquarium. Three concentrations of formalin and three of potassium permanganate were tested. The formalin was used in concentrations of 5, 10 and 15 p.p.m. Potassium permanganate was used in concentrations of 2, 3 and 4 p.p.m. In each test, fish in untreated aquaria were maintained as controls.

The test fish were usually exposed to the treatment for 72 hours. At the end of the test period, the fish were removed and counts were made of the parasites on each group of fish.

Embody's technique (1942) was used in removing gyrodactylid trematodes. The test fish from each treatment were placed in 500 millilitre (ml.) beakers containing a 1 to 4,000 solution of cresol. The fish were removed after a 10-minute exposure. The parasites in the solution were first concentrated by pouring the solution through the detachable bucket of Wisconsin-type plankton net (Welch 1948: 240, fig. 66) equipped with bolting cloth that had a mesh of 48 by 64 microns. After the sides of the net were carefully washed down, the fluid was drained into a 6.5-ml. McNaught centrifuge tube. The fluid was then centrifuged for 20 minutes at slow speeds. The parasites were concentrated in the narrow end of the tube. They were removed from the tube with a thin pipette and transferred to a modified Sedgwick-Rafter counting cell. The counting cell used was made by sealing a 50 mm. by 20 mm. by 1mm. brass rectangle to an ordinary 1 in. by 3 in. glass slide. This cell had the capacity of exactly 1 ml. As total counts of all parasites in the cell were to be made, a grid within the bounds of the rectangle was scratched on the slide to facilitate counting. The total number of parasites removed from each group of test fish was counted and recorded.

This technique, with minor modifications, was used on other parasitic species tested. It was found that the cresol solution would not remove *Trichodina* from the host fish. For this parasite, 10 per cent. formalin was used. In experiments with *Ichthyophthirius*, no method was found that would remove all of the parasites for quantitative studies. For this parasite, the efficacy of the compounds tested was measured by gross observation of the parasitised animals. Tricaine methane sulphonate (M.S. 222) was used to narcotise the fish temporarily to facilitate observation with a stereoscopic microscope.

After the aquarium tests were completed, the impoundments from which the parasitised fish were taken, were treated. First, the volume in acre-feet of water was determined by multiplying the average depth in feet by the number of acres in the pond. As 1 acre-foot of water weighs 2.7 million pounds, 2.7 pounds of chemical per acre-foot would be necessary for a concentration of 1 p.p.m. In this manner, the number of pounds necessary for the desired p.p.m. was calculated. Formalin was applied to the pond from a container having a "gravity-flow" hose line into the water. The hose line was held over the side of the boat, in the propeller wash, as the boat was driven back and forth over the surface of the pond. Each volume of formalin in the container was diluted with five volumes of water before being applied to the pond. Potassium permanganate was applied from a coarsely woven bag held over the side of a boat. After the application of these materials, a boat powered by a 5 h.p. outboard motor was driven back and forth across the pond several times in an effort to agitate the entire surface.

Gyrodactylus

In June, 1955, a large number of fingerling speckled bullhead (*Ameiurus nebulosus marmoratus*) taken from a pond in central Alabama were examined for parasites. These fish were heavily infested with *Gyrodactylus*. In an effort to control this parasite, experiments with formalin and potassium permanganate were set up in 40-litre aquaria as previously described.

Formalin. The results in the aquarium tests with formalin are presented in Table 1. In the experiment where three concentrations of formalin were tested in five replications, all concentrations from 5 to 15 p.p.m. averaged between 92 and 99 per cent. reduction of infestation as compared with the untreated controls. Only two replications of the tests with 5 p.p.m. gave less than 90 per cent. control, and all replications with 10 and 15 p.p.m. gave better than 99 per cent. control.

After the aquarium tests were completed, the 2-acre pond from which the parasitised fish were taken was treated with 5.5 p.p.m. formalin as previously described. At the end of the first 72-hour period after treatment, a sample of 40 fish

Table 1. Effect of formalin on *Gyrodactylus* on speckled-bullhead fingerlings in aquaria
(Ten fish per replication)

Treatment	Replications										Average	
	1		2		3		4		5		Replication (number)	Control (per cent.)
	(N)	(P)	(N)	(P)	(N)	(P)	(N)	(P)	(N)	(P)		
Untreated controls	2,529	—	1,179	—	888	—	1,087	—	1,176	—	1,371.8	—
5 p.p.m. formalin	170	93.30	30	97.46	72	99.19	114	89.52	138	88.29	104.8	92.37
10 p.p.m. formalin	25	99.02	1	99.92	11	99.88	1	99.92	8	99.32	9.2	99.33
15 p.p.m. formalin	2	99.92	0	100.00	0	100.00	5	99.89	0	100.00	1.4	99.99

(N)—Number of parasites. (P)—Percentage of control.

Table 2. Effect of formalin on *Gyrodactylus* on speckled-bullhead fingerlings in a pond
(Ten fish per replication)

Period	Replications								Average	
	1		2		3		4		Replication (number)	Control (per cent.)
	(N)	(P)	(N)	(P)	(N)	(P)	(N)	(P)		
Before treatment	1,179	—	888	—	1,087	—	1,176	—	1,075	—
72 hours after treatment ...	22	98.14	69	92.23	99	91.90	94	92.01	71	93.45
4 weeks after treatment ...	0	100.00	0	100.00	0	100.00	0	100.00	0	100.00

(N)—Number of parasites. (P)—Percentage of control.

was removed and the parasites were counted (Table 2). In this instance, the average control obtained was 93.4 per cent. as compared to 92.3 per cent. in the aquarium tests. Four weeks after treatment, a second sample of 40 fish was removed from the pond and found to be completely free of *Gyrodactylus*. The data from the pond treatment suggest that had the fish in the aquarium tests been held longer, complete control might have been obtained with 5 p.p.m. formalin.

Potassium permanganate. The results of the aquarium tests with potassium permanganate are shown in Table 3. In a single unreplicated experiment, concentrations of 2, 3 and 4 p.p.m. each gave better than 95 per cent. control. The treatments with 2, 3 and 4 p.p.m. potassium permanganate were slightly more efficient than the treatments with 5, 10 and 15 p.p.m. formalin respectively. The potassium permanganate was not used in field tests because no more ponds containing fish infested with this parasite were available.

Table 3. Effect of potassium permanganate on *Gyrodactylus* on speckled-bullhead fingerlings in aquaria
(Ten fish per treatment)

Treatment	Total parasites (number)	Control (per cent.)
Untreated control	2,773	—
2 p.p.m. potassium permanganate	104	96.25
3 p.p.m. potassium permanganate	8	99.72
4 p.p.m. potassium permanganate	3	99.90

Trichodina

In March, 1956, speckled bullheads taken as a sample from one of the Agricultural Experiment Station ponds were examined and found to be heavily parasitised with

Table 4. Effect of formalin on *Trichodina* on speckled-bullhead fingerlings in aquaria
(Ten fish per replication)

Treatment	Replications								Average	
	1		2		3		4		Replication (number)	Control (per cent.)
	(N)	(P)	(N)	(P)	(N)	(P)	(N)	(P)		
Untreated controls ...	2,357	—	1,915	—	1,545	—	4,423	—	2,560	—
5 p.p.m. formalin ...	1,025	56.52	925	51.70	452	70.75	2,158	51.21	1,140	55.47
10 p.p.m. formalin ...	237	90.00	106	88.80	142	90.81	1,010	76.49	451	82.18
15 p.p.m. formalin ...	0	100.00	0	100.00	112	92.76	32	99.28	33	98.60

(N)—Number of parasites. (P)—Percentage of control.

Table 5. Effect of potassium permanganate on *Trichodina* on speckled-bullhead fingerlings in aquaria
(Ten fish per replication)

Treatment	Replications								Average	
	1		2		3		4		Replication (number)	Control (per cent.)
	(N)	(P)	(N)	(P)	(N)	(P)	(N)	(P)		
Untreated controls	1,150	—	1,430	—	1,080	—	1,205	—	1,213	—
2 p.p.m. potassium permanganate	225	80.27	400	62.05	175	83.80	305	74.69	276	77.24
3 p.p.m. potassium permanganate	150	86.85	91	93.50	103	90.00	87	92.79	109	90.98
4 p.p.m. potassium permanganate	0	100.00	5	99.76	12	98.89	9	99.26	6	99.47

(N)—Number of parasites. (P)—Percentage of control.

Table 6. Effect of 3 p.p.m. potassium permanganate on *Trichodina* on speckled-bullhead fingerlings in a pond (Ten fish per replication)

Period	Replications								Average	
	1		2		3		4		Replication (number)	Control (per cent.)
	(N)	(P)	(N)	(P)	(N)	(P)	(N)	(P)		
Before treatment	1,140	—	1,430	—	1,082	—	1,205	—	1,213	—
72 hours after treatment ...	185	83.78	105	92.66	130	87.99	92	92.37	128	89.46
4 weeks after treatment	0	100.00	0	100.00	0	100.00	0	100.00	0	100.00

(N)—Number of parasites. (P)—Percentage of control.

Trichodina. Aquarium tests with formalin and potassium permanganate were conducted.

Formalin. The data from the formalin tests (Table 4) indicate that *Trichodina* was more difficult to control with formalin than *Gyrodactylus*. Treatments with 5 and 10 p.p.m. formalin were unsatisfactory, giving an average of 55 and 82 per cent. control. A concentration of 15 p.p.m. was necessary to obtain a satisfactory control of 99 per cent.

Potassium permanganate. The data from the tests with potassium permanganate in aquaria are presented in Table 5. They indicate that this compound, when used at a concentration of 4 p.p.m., was superior to 10 p.p.m. formalin and was approximately equal to 15 p.p.m. formalin for controlling *Trichodina*.

After the tests in aquaria, the pond from which these parasitised fish were obtained was treated with 3 p.p.m. potassium permanganate as previously described. Seventy-two hours after this treatment, a sample of 40 fish was taken from the pond and the parasites were counted (Table 6). In this instance, the average percentage of control was 89.4 as compared with 90.9 per cent. control in the aquaria tests. Four weeks after treatment, a second sample of 40 fish was removed from the pond and found to be completely free of *Trichodina*.

Ichthyophthirius multifiliis

Specimens of this parasite were obtained from bigmouth buffalo (*Ictiobus bubalus*) fingerlings that had been taken from one of the Agricultural Experiment Station ponds. A population of blue-gill sunfish (*Lepomis macrochirus*) was exposed to this parasite in order to obtain a uniform parasitic population for experimental work. After a heavy infestation had been obtained, each of five 40-litre aquaria was stocked with 10 fish taken at random from the parasitised population. Concentrations of 5, 10 and 15 p.p.m. formalin were used in an effort to control this parasite. One aquarium was maintained as a control.

Within 48 hours, 100 per cent. mortality of the host fish occurred in the control and in the 5 p.p.m. treatment. In the 10 and 15 p.p.m. treatments, mortalities of 80 and 50 per cent. respectively occurred. Two fish from the group that received the 10 p.p.m. treatment and five fish from the group that received the 15 p.p.m. treatment recovered and did not become reinfested within the 2-week period of observation.

The aquaria tests seem to indicate that *Ichthyophthirius multifiliis* may be controlled by means of a single application of 15 p.p.m. formalin if the parasitised fish are treated before they have become badly weakened by the parasite. No tests of this have yet been conducted in ponds.

LITERATURE CITED

Embody, D. R. (1942).—A method of measuring the number of ectoparasites infesting hatchery fish, with particular application to *Gyrodactylus*. *Trans. Am. Fish Soc.* **71** (1941): 122-130.

Welch, P. S. (1948).—In *Limnological methods*. 381 pp., illus. Philadelphia.

This article is reprinted from "The Progressive Fish-Culturist," U.S.A.

TROPICAL FISHKEEPERS' REFRESHER COURSE: *by Pisces*

Aequidens curviceps

Aequidens curviceps

ORDER: Percomorphi, from Greek *perke*—a perch, and Greek *morphe*—shape.
FAMILY: Cichlidae, from Greek *kichle*—a kind of sea fish.
SPECIES: *Aequidens*, from Latin *aequabilis*—equal, and Latin *dens*—a tooth, and *curviceps* from Latin *curvus*—curved and New Latin *ceps*—head.

AEQUIDENS curviceps is not one of the larger chichlids, seldom reaching an overall length of 3 inches. The exact locality from which it originally hailed is not known. It has many staunch admirers, but is not everybody's choice. But what fish is? This year's favourite may be completely ignored next season. Fashions in fishes change far more rapidly than those of the bird or dog fancy. This is one of the headaches of the breeder who tries to estimate what the aquarists—or should I say "fishkeepers"—will require, and breeds his stock accordingly. *A. curviceps* is of a normally peaceable disposition, going about his business without bullying other fishes or tearing out plants, content to live and let live provided that he has adequate space and ample food, of which a major portion should be live.

Like most cichlids, *A. curviceps* likes a choice of mates, so that it is best to purchase several in the hope that one pair will suit each other. Let them run all together in as large an aquarium as you can provide, feed them well and maintain the temperature between 74° and 80° F. You may or may not witness the wrestling matches which are reputed to be part of the business of selecting a mate

equally matched for strength and vigour, but when the couple have found each other, you will certainly notice them busily digging pit after pit in the compost.

Loose, coarse sand or grit is the best compost to use. A flower pot turned on its side, or an arch of rock, should also be provided in time for them to get used to it before spawning. Pit digging may continue for days, and the ovipositors begin to show, emerging a little more each day. Colour will be intensified but variable and almost of a chameleon quality, changing while one is watching.

The fishes show a marked preference for the archway, or flower-pot "cave" in which to lay their very numerous eggs. The roof overhead seems to give them a feeling of greater security. Some writers say that the fishes are likely to eat their eggs, but when one considers that to remove the parents after spawning will most likely lead to the loss of the eggs through growth of fungus, it is best to take a chance. In any case, the parental care of the eggs and young seems part of nature's plan for the procreation of this species! I think it likely that the apparent egg-eating is confined to infertile eggs which may cause harm to the others adjacent to them.

Assuming things to take a normal course, the eggs will be vigorously fanned by either female or male, the parent not on duty either eating or searching for enemies. To reduce its anxiety and generally lessen both the fishes' and your own tension it is wisest to remove any other fishes from the aquarium, and crush any snails there may be on the plants, feeding them to the spawning fishes.

Pit digging continues at odd intervals until the eggs hatch. The fry are gathered in the mouths of the parents and spat into one of the depressions. They are not allowed to stay long in any particular nursery, being removed lock, stock and barrel from one to another, and then to a third. This constant moving goes on until the babies are free swimming. What a sight it is to see the mass of little ones suddenly swim up like a flock of birds rising from the ground.

They are always hungry, and at this stage will not take any dry food whatever. Small live foods like rotifers, brine shrimp, *Cyclops* nauplii, tiny *Daphnia* and the like, can be taken almost immediately.

As soon as the youngsters are swimming well and strongly, remove the parents to another large aquarium, for within a few days they will be anxious to start another family, and may find the present horde of youngsters such a nuisance that they will eat them. What a wasted effort that would be!

The Strange Behaviour of the Grunnion

by H. J. VOSPER

AQUARISTS are aware of many strange spawning habits among freshwater fishes and, as may be expected, there are similarly strange methods adopted by saltwater specimens. A case in point is that of the grunnion, a member of a group allied to the mullet, which does not spawn by depositing eggs upon leaves, rocks or the substratum nor by really spawning in water at all. Instead it chooses to deposit its eggs in the sand at the extreme edge of the highest tide line on certain beaches in Southern California—and adds to this eccentricity by coming "ashore" so regularly that its appearance can be predicted years in advance.

The female grunnion (some 6 or 7 in. long, the male slightly smaller) is ready to spawn in the late spring or early summer, at the time of the highest spring tides. These tides occur at night during the new moon and 2 weeks later at the full moon. At just about high tide, or very shortly after, the grunnion come in to the highest point reached by the water and, as the foam hesitates before falling back and while the sand is soft and saturated, the female sweeps her tail from side to side and thus buries herself several inches in the sand. As the water falls away she may be seen to be held upright and with some two-thirds of her body below the surface. In this position she deposits some two or three hundred eggs, these being fertilised by the males which lie on the sand alongside.

The action can only take a few short moments for the fish must quickly wriggle free and escape into the following waves. It will be appreciated that if the eggs are deposited too soon they will be washed out by the still-rising tide, and if buried too late then the high tide of the following night would reach that spot and again they would run the risk of being washed out of the sand. The time chosen ensures that not until after the eggs are fully developed and ready to hatch will the rising waters reach them.

Although originally deposited just below the surface, the action of succeeding waves, together with winds, etc., eventually results in the eggs being buried to a depth of up to 18 in. Thus protected from harm by a thick covering of sand, surrounded by the correct amount of moisture at the right temperature, the eggs mature—a process which takes about 7 days.

In the meantime the level to which the high tides reach is dropping, until some 6 or 7 days after deposition the eggs may actually be several hundred feet from the water's edge. If all goes well the returning sea will reach the eggs again some time between the ninth and fourteenth day after spawning. Yet should the waters be delayed by storm or wind conditions the eggs will rest quietly until reached by a succeeding high tide a further 14 days later. Nature has taken this aspect into account, for the eggs will not hatch out until the water strikes them with sufficient force to cause some turbulence. It is not known exactly why this is, but laboratory experiments have confirmed the facts, for gentle insertion into sea water fails to stir the fry, whereas turbulence causes them to emerge, up to one month after the spawning.

The shells of the grunnion eggs are very tough, about one-sixteenth of an inch across and of a light golden-pink colour. The egg membranes cannot easily be breached, for if the eggs are dropped on the floor they will bounce and are quite hard to pierce with a sharp point. It is thought that salt water and the activity of the fry are aided by the production of a "hatching enzyme" which weakens the egg wall. Once freed the fry quickly wriggle away and escape to deeper waters.

As mentioned, the nights of the grunnion "runs" can be predicted beforehand and they have become regular features of certain beaches. Local newspapers keep their readers informed and on the appropriate evenings the beaches become studded with camp fires and the visitors settle down to picnic meals of hot sausages and coffee. A careful watch is kept on the time and as zero hour approaches, lookouts at the water's edge give vocal warning of the incoming grunnion. At a shout all make their way down the beach, with bowls, buckets and other containers in which to catch the unsuspecting fish.

The fish are easy to pick up, of course, but perhaps we aquarists may gain some consolation in knowing that King Neptune does not allow such liberties to be taken unavenged: few of the "fishermen" escape the following waves and often retire from the fray soaked to the waist.

Microscopy for the Aquarist—34 *by* C. E. C. COLE

LAST month I mentioned the use of a "stop" in the filter tray of the substage condenser for obtaining "annular" illumination, and mentioned that it should not be large enough to produce a black background.

This black background is the aim when we start using dark-ground illumination. It may sound a little odd, but the first essential for obtaining a dark ground (or dark field) is a good light. You are recommended therefore to change your 60-watt lamp for a 100-watt lamp.

The stops, for use with an ordinary condenser, are made in sets, and consist of a blackened "wheel" of metal, the "hub" being of different sizes for use with objectives of different numerical apertures (N.A.). Quickest and most convenient is what is known as a Traviss expanding stop, but these seem to be few and far between. They operate like an iris diaphragm in reverse, permitting light round the outside of the stop but not through the centre.

For objectives up to 4 mm. (1/6 in.) the stops are quite satisfactory, but above this power a special substage condenser gives best results. There are several types of these. Before going into details concerning them it would be as well to consider the uses of dark-ground illumination and whether or not it is worthwhile from our particular point of view as aquarists.

It has been mentioned before in this series that it is useless to use the full N.A. of an objective with ideal lighting unless the image formed is visible.

Visibility can be enhanced to a degree by the use of colour screens, by minimising glare or by staining with various chemicals, but with a great many transparent or semi-transparent subjects which we wish to observe alive, e.g., infusorians, dark-ground illumination makes things a great deal easier. In fact, until one has used it, it cannot be said with certainty that we have seen all there is to see in a given drop of water.

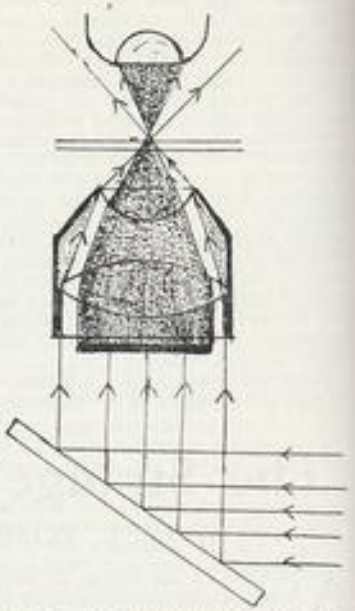
Successful application of dark-ground illumination is dependent upon cutting out entirely all those rays of light which would normally enter the objective directly. All rays entering must be scattered or reflected by the object or objects in the field of view, which then appear to be brilliantly illuminated, self luminous in fact. The rays utilised are the very ones which would have caused glare and a hazy image in ordinary transmitted light.

It is obvious, then, that the substage condenser must be of a larger N.A. than the objective, otherwise the oblique rays which are used will simply not be present, and complete and absolute blackness will result; nothing at all will be seen. Which brings me once more to the discussion of dark-ground condensers.

At one time paraboloid condensers were popular, and these may sometimes be found among the miscellaneous accessories for sale by dealers in second-hand microscopes. If they fit your substage, it will probably be considerably cheaper to purchase one when found rather than invest in a modern concentric type. The advantage of the latter type is the crisper image produced.

Wheel stop

Traviss expanding stop



Principle of dark-field illumination. Arrows indicate path of travel of rays of light

Both condensers have to be oiled to the slide in order to operate correctly. The rays of light which illuminate the object are so oblique that they would never emerge from the condenser at all into air, but must be provided with a medium of similar refractive index to that of the glass.

The cost of a special dark-ground condenser, or illuminator as it is often called, is in the region of £7. Sets of patch stops cost about £2.

Desirable accessories, if we are really going in for dark-ground illumination, are funnel stops, or Davis shutters or both, but more of these next month.

Turpentine Preparations

I have received a protest that these articles incline more than they used to the technical side of microscopy. I frankly admit it—they do, but that is only because we are now past the elementary stage, and I still believe that it is best when we do a thing to know within a little the reason for so doing.

However, for those of you who are straining at the leash, and who have examined in detail the external characteristics of the larger aquatic animals, here is something practical to do. Take some of your pickled specimens and drop them into pure turpentine. A small cosmetics jar, thoroughly cleaned, will act as an admirable container.

Should you have no preserved specimens, freshly caught ones will be even better. Drain off as much water as possible before placing them in the turpentine. Death will ensue in a matter of seconds. Leave in the turpentine, and examine every 2 days, making notes of what you observe. Keep the container closely covered.

You will probably be surprised and delighted at the action of the turpentine. The first time I performed this experiment I was frankly amazed. Next month we shall see how far your experiences coincide with my own.

In the Water Garden in September *by* ASTILBES

WATER gardens should now be in good condition, with plenty of underwater oxygenating plants in rampant growth. It is probable that the pond water will be in better state than at any time during the year. There are several reasons for this change taking place. One is that the summer cycle has been completed and the green algae which may have discoloured the water have died and left the water clear. The algae may have been overcome by an excess of underwater growing plants or may have been choked out by either a quantity of surface-growing plants such as duck weed or many water-lily leaves shading much of the sunlight from the water. If water fleas (*Daphnia*) have become established in the pond these may have eaten much of the algae. Whatever the cause, it is well known that many ponds which have been cloudy for a large part of the summer clear by themselves towards the autumn.

There is no doubt that one of the main causes of water clearance is that the oxygenating plants have become well established and where this is the case it will be found that the green algae can no longer thrive and so the water clears. A good oxygenator is *Elodea canadensis*, a small-leaved plant which grows rapidly once it makes a few roots, which enter the mulm at the pond base. It is possible for it to become too rampant and almost fill all the space in a small pond, but it is quite easy to drag out any surplus and this can be done once the green algae has disappeared. Another strong growing oxygenator is *Egeria densa*, a very brittle-stemmed plant which can make long shoots up to 4 ft. in length in a short space of time when the plant is in good surroundings. Being so brittle it is possible that small pieces will be broken off and float to the surface. After a short space of time roots will be sent down to the bottom and so fresh plants develop.

Oxygenating plants can still be added to a pond, as although there is not a great deal of time left for growth this season it is probable that the plants will keep growing for some weeks yet. It is only when rather heavy frosts occur that most oxygenating plants will die down If they have rooted well it is almost certain that they will shoot out afresh in the spring.

Many ponds which were made during the early part of this year will have taken on that well-established look. It is surprising how soon a correctly made pond can mature. Water-lilies which were planted only in May will by now have made enough growth to cover a large area of the water's surface. The rate of growth of such water-lilies will have been proportional to the type or quantity of feeding material in the compost in which the plants were set. Suppliers of water-lilies issue lists of their plants giving depths to plant and types suitable for varying depths of water. Although these lists are of great value to beginners it must not be thought that all the plants will act exactly according to the accounts given in the lists.

Some water-lilies may be listed as suitable for planting at a depth of 18 in. to 2 ft. deep. If such plants are placed in very small containers and with little soil it is probable that it will be some years before the lily will send out many large leaves and flowers. The size of the pond can alter the whole development of a water-lily, so that what should be a plant of medium growth can become a pygmy type all through insufficient nourishment. If a certain lily provides leaves of up to 8 in. across under good conditions, the same type may have leaves not more than 2 in. across if the plant has been set in a small shallow pond where there is little food for it. The same applies to the flowers. Under good conditions these may be 9 or 10 in. across but under bad conditions they may not be more than a couple of inches. In a large lake with a natural bottom it is possible for some water-lilies to cover huge areas by September, and the size of the leaves can be enormous, whereas the same species of lily in a small concrete pond can be almost a miniature. Under suitable conditions the *Nymphæa* James Brydon can produce huge cup-shaped flowers and large, handsome leaves, but if this plant is grown under poor conditions the leaves and flowers will be but a small replica of what would have been under better conditions.

A bog garden always looks well if incorporated into the water-garden scheme. It can be merged into the pond, perhaps at one side so that any overflow from the pond proper will keep it always moist. It is not good enough to create a bog garden merely by allowing the pond to overflow at one spot and leaving it at that; it is possible that during dry spells the bog garden will dry up and this may be fatal to many of the moisture-loving plants growing there. If a bog garden is needed it is better to construct it correctly in the first place to save trouble later on.

About 18 in. of soil should be removed from the bog site and a concrete base laid. Construct this as if a shallow pond were being made. Then a layer of broken bricks can be put in and this covered with a layer of good soil. This should be composed of good loam and plenty of horticultural peat. Lime is not necessary for most of the bog plants but could be given to any individual plant requiring it. The compost need not be level; some raised portions will enhance the appearance of the finished project. Sufficient moisture will be drawn up to the roots by capillary action from the water held below in the concrete basin.

It is a good plan to make one or two small openings, a few inches down from the top of the concrete, fitted with stoppers which can be removed during very wet periods. It is not necessary to keep the roots of bog plants flooded all the time. Most of them flourish well as long as there is water down below on which they can draw for a supply. The actual crowns of the plants do much better well above the water level. It is possible to lay some large rocks or stones to make stepping stones if the bog garden is fairly large. This will enable you to get to the plants for attention at any time without trouble. In dry weather, with the possibility of the water being used up in the under-water basin, it is a good idea to run water into the main pond so that the overflow can supply the water for the bog. This will probably benefit the main pond at the same time.

There is a large number of plants suitable for the bog garden. In fact most of the water plants, with the exception of the water-lilies, will grow better in a good bog garden. than in the actual pond. Such specimens as primulas, *Menyanthes trifoliata*, *Thalia dealbata*, *Pontederia cordata*, *Caltha*, *Lysichitum camtschatense*, *Butomus umbellatus*, *Trollius* and *Mimulus* are all subjects which will thrive in the bog garden. It is possible to plant some of these subjects in the autumn, and although they will die down for the winter they will make rapid growth in the spring and so become established much better than if the planting was delayed until the following year.

Once the bog garden is made and planted it will need little attention for some years as long as there is always sufficient moisture below. After a few years it will be found that the very vigorous growers have spread out too far and may be encroaching on some of the more tender plants. It will then be necessary to cut away and dig out some of these strong growers so that the others have a

(*Please turn to page* 131)

THE PORAQUÊ

by JOHN B. BOURSOT

(Continued from last month's issue)

SOON my electric eel was tame enough to take fishes from the fingers, even allowing itself to be stroked. But again its quarters were becoming too cramped, so I bought a plastic swimming bath. This proved most unsatisfactory. The sides scratched the eel's skin and condensation between the bottom of the swimming bath and the tiled floor on which it rested lowered the temperature too far. The eel refused all food, and I feared for its health.

Without further delay I bought a second-hand enamel bath, rested it on slats and filled it to the level of the overflow. In the bath the eel fully recovered its appetite, downing dead mullet, smelts, marine half-beaks (with "beak" removed), all of about 5 to 6 in. long, and 3 to 4 in. *Dormitator* sp., from the submerged hand. At this point it is interesting to note the eel's extremely keen sense of smell. Many fishes, though perfectly fresh, were refused. I put this down to the eel's detection of minute particles of decomposing matter lodged among the scales and in the gills. To obviate this I washed fresh but rejected fishes with soap and water. After a thorough rinsing they were usually accepted without hesitation. When not, I threw them away. The eel always signalled its disgust by waving its head from side to side, frequently seizing the unwanted fish and tossing it aside with a jerk of the head. Catfish (*Pimelodella* sp.) 5 and 6 in. long were considered a delicacy. The eel was now over a yard long, and its electrical discharges, ranging from slight tingling to severe shocks, were an unending source of entertainment for friends.

Electricity in animals is by no means so rare as was once thought. It has now been established that all animals, from the most primitive worms on, produce internal electric currents, reaching one-tenth of a volt in man. These currents are coupled with movement and the functioning of the senses. But of all living creatures it is only among certain fishes that these currents have been developed for purposes of defence, offence and "radar." The device is an old one. In the ancient seas of the Ordovician some 460 million years ago a large class of primitive fish-like creatures, the Ostracoderms, began to evolve, reaching their zenith about 190 million years later in the Devonian. Some of these Ostracoderms had developed electric organs of unknown voltage on each side of the head; by the end of Devonian times their race had become extinct. But electricity among fishes has continued on through the millions of intervening centuries to the present day when we find the West African jerfar (*Gymnarchus niloticus*) emitting "radar waves" at the rate of 300 a second from batteries of three-hundredths of a volt. Some of the South American knife fishes manage a current of three-tenths of a volt for "radar" purposes; *Gymnotus carapo* discharges about 65 impulses a second, *Gymnorhamphichthys hypostomus* 100 a second, and the pretty glass-knife fish (*Eigenmannia virescens*) 300 a second. Back to the sea, we find skates able to emit a feeble one-half of a volt from organs in the tail. Slightly better are the efforts of the fresh-water elephant fish (*Mormyrus kannume*) of Africa, which is able to discharge a 6-volt current at 100 impulses a minute. The electric stargazer (*Astroscopus y-graecum*) of the sea gives an appreciable shock. But from here on electricity becomes a formidable weapon.

The author demonstrating a simple technique for lighting a neon-glow lamp by current taken from the body of the living poraque

The electric catfish (*Malapterurus electricus*) of Africa jolts its enemies with 80-100 volts from batteries under the skin, and the 30 or more species of marine torpedoes (Torpedinidae) will unhesitatingly assail an enemy with 50-150 volts from batteries next to the head. But the real power-house is the electric eel, with an average discharge of 550 volts, though some individuals generate as much as 650 volts.

The electric eel is the star turn of the fish house, and the aquarist may give a physical, audible and visible demonstration of its powers with little effort. For a physical demonstration a friend (or enemy) is asked to handle it. Clicks and "static" may be heard in wireless earphones or over a loud-speaker whenever the eel moves about. But it is the visible demonstration which really makes an audience gasp in wonderment. Since the electric eel discharges in pulses lasting about 2 milliseconds (two-thousandths of a second), and the ordinary incandescent bulb has a lag of about 50 milliseconds (fifty-thousandths of a second) before lighting up, it is obvious that such a bulb will not respond visibly. Furthermore, discharges vary in voltage according to the eel's position in relation to the electrodes. Voltage also varies from eel to eel.

A bulb which will burn at a variable voltage of, say, 100 to 1,000 volts, with an instantaneous response, is what is required. Westinghouse Electric Co. manufacture a 2 watt neon-glow lamp (NE 34, S 14 bulb, medium base) which serves the purpose admirably. General Electric Co. also carry a full line of neon-glow lamps, all of which would doubtless suit the purpose. The bulb is fitted into a regular socket attached by two wires to a pair of metal rods, each rod being soldered at the other end to a broad, smooth, round-edged, convex metal base. Each lead is then gripped in a dry, many-folded handkerchief or piece of paper and lowered on to the eel, one near the head and the other near the tail end. When the eel discharges, the lamp will glow

instantly. A pretty experiment with a General Electric neon-indicator lamp (type NE 34, medium base) is to show the irreversible polarity of a positive head and a negative tail. The eel is, of course, D.C. Bulbs may be filled with argon or neon gas, and will burn with a purplish or reddish glow respectively. Argon bulbs, however, give only one-third the output of neon bulbs. For home demonstration one bulb suffices, although as many as 55 in a row will light up simultaneously.

These lighting experiments were all performed when the eel was living in the bath, none having been attempted in any of the previously mentioned tanks. Direct contact with the eel's body was not necessary. One electrode placed behind the eel's head, and the other on the wet edge of the bath, gave the same result. As time went on the eel became so tame that considerable prodding was necessary to make it "put the light on." On one occasion it received a bad sunburn from unaccustomed sunshine falling upon the water. Its appetite vanished and did not return until the skin had sloughed off in the thinnest imaginable wisps. A continual shedding of mucus, if not of epidermis, seems perfectly normal and is more easily seen when the clouding effect of foreign matter adhering to it lends it visibility. But a sweep of the hand along the eel's back or a jet of water from the hose at cleaning time rectified matters immediately.

At about 40 in. the eel's speed of growth had decreased enormously, but adequate accommodation was still a problem. The bath had become too small. The eel's appetite slowly waned until in desperation it slithered out on to the floor twice in one night. This brought matters to a head, and I commissioned an ironsmith to make a 6 ft. by 5 ft. by 1 ft. galvanised-iron trough. Raised on wooden slats, and with nothing in it but water, the trough was an immediate success. Within 48 hours the eel had developed a prodigious appetite, gulping down large numbers of catfish (*Pimelodella* sp.) and *Mollienisia sphenops*, which it sucked in with such violence as almost to pull my fingers in with them. Its slippery lips were soft, thick and fleshy to the touch. The change from bath to trough made the lighting of a bulb impossible. This I put down to the lack of an enamel lining, which helped to confine the current in the bath. However, a long narrow stretcher of smooth linen served to lift the eel momentarily from the water in order again to demonstrate the lighting of the bulb. With its forepart as thick as a man's arm, the eel now measures 52½ in., and is still growing.

Many are the dubious reports of men having been killed by electric eels. That horses have sometimes been thrown while fording a river or marsh is well known. But whether death was due to electric shock or to subsequent drowning remains obscure. However, the current is more than sufficient to kill a man, and the combined shocks of a number of eels crowding under the belly of an unfortunate horse may be imagined.

There are three electric organs consisting of 98 per cent. water and 2 per cent. protein. Of these, the large organ is the most powerful, and releases trains of packets of about 10 pulses each at the rate of 300 to 400 a second. The bundles of Sachs deliver about 50 volts, and discharge immediately before each train from the large organ. They also emit 20-50 single pulses a second for "radar" purposes when cruising. The long, thin organs of Hunter discharge irregularly, and are not perfectly understood. A rate of 500 discharges a minute is normal activity for an eel though it may increase the rate to cover 6,000 a minute when provoked.

An exhaustive disquisition on the technical nature of electricity in fishes would be tedious and highly involved. Putting it in round terms the current generated by *Electrophorus electricus* is chemical in origin. For many years science has recognised the presence of a substance called acetylcholine, which is inseparable from the production of electricity during nervous activity. An enzyme, acetylcholine esterase, is also present, one molecule of which inactivates one molecule of acetylcholine in three- to four-millionths of a second. Electrical impulses in nerves are a phenomenon of the rapid break-down and removal of acetylcholine. The electric organs of the eel consist of a series of 5,000 to 6,000 plates or electroplaxes separated by electrically resistant tissue and arranged as in a voltaic pile. Each plate carries a potential of one-tenth of a volt. Added together, shocks of 500 or 600 volts result, and travel along the body at about 2,500 yards a second near the head, and only about 450 yards a second near the tail. At the moment of discharge a sharp drop occurs in the resistance of the electric tissue, allowing the escape of the current. The resistance is subsequently restored.

Apart from the possible fault of size the poraqué is extremely hardy, disease-resistant, long-lived, easy to feed and an endless source of satisfaction to any serious aquarist able to accommodate it.

In the Water Garden in SEPTEMBER

(*continued from page 129*)

better chance. The number of plants which can give an almost continuous supply of flowers throughout the warmer months of the year seems almost endless, and these will give pleasure to the water gardener and enhance the general appearance of the garden. Even a small garden pond can be made to look quite large when a bog garden is incorporated at one side, whilst if a rockery is constructed at the opposite side the effect will be excellent

Towards the end of the month see that the fishes in your pond are given some extra food, so that they can build up sufficient body stores to enable them to go through the colder part of the winter in safety. Garden worms appear to be the one food which almost all types of fishes appreciate. They may be given each day, but it is always a good plan to break these worms up so that any of the small fishes are able to get a meal. Although there may have been enough natural food in the pond for the fishes during the warm weather it is probable that at this time of the year the natural food supply will have diminished greatly. Lack of sufficient food in the autumn often means that the fishes succumb to troubles such as fungus disease during the following spring.

CACTI IN THE FISH HOUSE

MANY cacti may have set seed pods. These pods should not be removed until they are quite ripe or the seeds may not have developed sufficiently for them to germinate when sown. Many cactus seed pods turn red when almost ready, but this does not mean that the seeds are ripe. It is only when the pods begin to shrivel that the pods should be removed. Place them in containers labelled with their name and allow to dry out well before attempting to remove the seeds. Most cactus seeds will keep for several years under correct conditions, but if left in the seed pods until needed they will keep almost indefinitely.

AQUARIUM WATER PLANTS

by E. E. TOLEMAN

(Photographs by Laurence E. Perkins)

THE range of plants grown in aquaria is fairly extensive and covers plants from most parts of the world, of varying types and habitats. To grow all these successfully requires some forethought and knowledge of their particular requirements. As the general basic needs have been listed in a previous article perhaps some details of individual plant requirements may be of interest to those aquarists who want their plants, as well as their fishes, to be of a high standard.

For cultural purposes we may classify our aquarium plants into three sections: (*a*) those grown for underwater effect; (*b*) those rooted under water, but with some or all of their foliage raised to the surface or above; (*c*) those grown as floating plants. We must, of course, bear in mind that in several cases we are growing plants in what is not really their true environment. For example, plants such as the *Cryptocoryne*, which are really bog plants in their natural state.

The majority of plants in aquaria are grown for underwater effect, and here there is a good range from which to choose. Perhaps the most well-known of these is *Vallisneria spiralis* and its twisted-leaf variety, *V. spiralis* v. *torta*. These will grow in most tanks and have a wide temperature range. They propagate rapidly from runners and occasionally from seed, the male and the female flowers being borne on separate plants. The former are small white buds borne near the roots, whereas the latter are carried at the end of a spiral stalk which grows to the surface of the water. The male flowers break away from their plant and rise to the surface, where they open and release their pollen to fertilise the female flowers. The stalks of these then contract to allow the seeds to ripen under water.

Sagittaria are of another genus of common plants, and have much to recommend them. The usual species grown in aquaria are *S. guayensis*, *S. lorata*, *S. natans* and *S. subulata*. All grow rapidly under good conditions and propagate themselves from runners, which are produced freely. Sometimes flowers, usually white, are produced during spring and summer, and from these seed may be had from which further plants can be raised.

Of the finer-leaved plants *Myriophyllum* is much grown; there are several species and varieties in cultivation but their general requirements are similar. Some will thrive only in warm water and others only in cold; this is one reason why losses can result by giving the plants too great a change in temperature, especially in the downwards direction. They are easily increased by taking shoots a few inches long and inserting them in the compost in the tank. At all times good light is required and where conditions suit them growth is very rapid, and often flowers will be produced.

Sagittaria natans

Elodea (Egeria) densa

Cabomba is similar to *Myriophyllum* in requirements and is a very rapid grower, making growths several feet long if allowed to do so. *C. aquatica* and *C. caroliniana* are the two species most grown; there is also a rather rare variety of the latter, *rosaefolia*, which has foliage of a light-red shade which makes it a desirable and attractive addition to a tank. All *Cabomba* are easily propagated by means of cuttings a few inches in length.

A pretty and easily grown plant of the same general habits and requirements to the above is *Limnophila*, sometimes known to aquarists as *Ambulia*. The commonest species are *L. heterophylla* and *L. sessiliflora*, and when given good light and warm water will soon fill a tank with their attractive foliage, and sometimes produce their small flowers.

Elodea is well known to most aquarists and *E. canadensis* is excellent for coldwater tanks; *E. callitrichoides*, *E. densa* and *E. minor* will thrive under both cool and warm conditions. They are rapid growers, and propagation is easy from cuttings a few inches long.

Eleocharis is a large genus of which only two species are commonly grown in aquaria—*E. acicularis* and *E. palustris*, both small grass-like plants of considerable merit. They are not very suitable where large bottom-feeding fishes are kept as their root system is not strong, but for tanks of small fishes they are most effective and they increase rapidly in either cold or warm water.

A plant that has become very popular in recent years is *Hygrophila polysperma*, and its ease of culture and good appearance make it a most desirable plant for our tanks. *H. stricta*, now popularly known as giant *Hygrophila*, is useful for larger tanks, and both species should have the tips of their growing shoots removed frequently to make bushy plants. Propagation is easy and very quick by means of cuttings, and even individual leaves will soon produce new plants. Some of the *Rasbora* like to use this plant for egg-laying, and a further point in its favour is that it will grow in cooler water than most tropical aquatic plants.

Bacopa amplexicaulis and *B. monniera* are both bog plants that will adapt themselves to growing in cool or warm water, the former being the hardier of the two. Both have small blue flowers which are produced above water where there is plenty of light, and cuttings and seed provide a quick and easy means of increasing the stock.

Littorella uniflora, a plant native to Britain, is unusual in its growth and makes a change from the usual forms of coldwater plants. It spreads very rapidly by means of runners and will quickly form a thick mat of foliage covering the compost, making it a useful plant to use where bottom-spawning fishes are bred. *(Continued overpage)*

Cabomba caroliniana

Elodea crispa (Largarosiphon major)

Hair grass (Eleocharis)

TELMATHERINA LADIGESI

by JACK HEMS

THIS exquisitely formed and daintily coloured little fish belongs to the family Atherinidae (Silversides) and is closely related to the Australian rainbow fish (*Melanotaenia*). Generally speaking, the Atherinidae inhabit the seas of the temperate and tropical zones, but some species ascend rivers, and even spend their entire lives in fresh water—*Telmatherina ladigesi*, for instance, is found in the sparkling, clear, fast-flowing mountain streams of the Celebes.

A characteristic of this family is the presence of two separate dorsal fins on the back. In *T. ladigesi*, the first or anterior dorsal is small and spiny; the second or posterior dorsal fin is quite large and, in the mature male, sweeps back over the root of the tail. The front rays of the male's dorsal project beyond the membrane to form needle-like filaments. The front rays of the dorsal and anal fins (in both sexes) are marked with black.

The basic or ground colour of the fish is shining lemon yellow, almost glass-like in quality. A metallic-green stripe underlined with some greenish gold extends from about the centre of the body to the caudal peduncle. The upper and lower lobes of the yellow tail fin are bordered with black, giving way to white at the tips. The dark eyes are ringed with phosphorescent green.

Differentiating between the sexes presents no problems for, as mentioned above, the male has the more elaborate dorsal fin and his colours are richer. The female is paler in body and fins.

The neon glass fish, as the species is popularly called, is very active and swims at all levels in the water. It likes sediment-free, well-oxygenated water and plenty of swimming space. A temperature of 74° F. is about right for it, though a rise or fall of six degrees on either side of that figure will not do any harm. If some direct sunlight can reach the interior of the aquarium so much the better. But if the aquarium is situated in a sunless part of a room, then provision must be made to brighten the interior of the tank with electric light for at least 5 or 6 hours every day.

T. ladigesi is not difficult to feed, for it will take dried, live or substitute foods (scraped lean meat, minced shellfish and so forth) freely. The fish seldom takes food from the sandy floor of the aquarium. It prefers to take it while it is swimming or falling through the water. As the fish seems to need a lot of food, it is a good idea to feed it several times every day (or, if more convenient, during the evening).

When the fish is in breeding condition, the female shows fuller sides and slightly richer colours, and the posterior dorsal fin (in both sexes) usually assumes a pinkish to red hue. To spawn the fish, it is essential to have a tank containing a thick growth of feathery-foliaged plant life. Well-clothed sprays of *Myriophyllum* or *Fontinalis* anchored to the sand fill the role admirably.

After some flirting and chasing in and out of the submerged vegetation, the female, closely attended by the male, deposits one or two eggs in the plant life. The eggs are provided with a tiny sticky thread which adheres to the chosen leaf or stalk. It is unusual for the female to lay more than a few eggs at a time. She spreads egg-laying over a period of a week or more. Fortunately for the aquarist, the parent fish do not seem to interfere with the eggs after they have been deposited in the plant life. The eggs take a full week to 9 days to hatch out, and soon after the fry emerge from the eggs, they need plenty of small live food. So, for the next few days, the aquarist must introduce freshly cultivated Infusoria into the water.

If the baby fish do not get enough of the right-sized live food, they will disappear as quickly as the proverbial flies in wintertime. If, however, the baby fish appear to be settling down and growing well, the aquarist can take heart and set about introducing such things as micro worms, tiny *Daphnia* and newly hatched mosquito larvae into the aquarium.

Properly fed and cared for, the fry should reach a length of an inch or so within three months. After that, growth is not so fast. A maximum length of almost 3 in. may be reached inside a year.

T. ladigesi has never achieved the popularity it so richly deserves. Perhaps World War II can be blamed for this, for the fish was not introduced into Europe until 1935. And there were only one or two importations of the fish from Germany before war broke out. Then aquarists had to wait for something like a decade before the fish was seen on the market again. Even at the present time, it is not a common fish; but tropical aquarists who feel they would like to keep and breed something "different" are strongly advised to obtain a pair or two of this interesting species.

Aquarium Water Plants

(*continued from preceding page*)

Ludwigia mulertii and *L. palustris* are used in both cold- and warm-water tanks, and as they have rather pretty foliage are very decorative. Cuttings, or seed when available, are easy methods of increasing this plant.

A not-too-common genus is *Heteranthera*, of which *H. graminea* and *H. zosteraefolia* are the most easily obtainable species, both thriving best in warm water. They form masses of foliage and give excellent shelter for small fishes, and are readily increased by cuttings.

The water clover is a name given to several species of *Marsilea*, which are useful for their clover-like foliage borne on long stems under water, although they are really plants of marshy ground. They spread by means of runners and to thrive really well must have plenty of light, and warm water.

Cardamine lyrata is a pretty little plant for either cold or warm water, its leaves resembling watercress, and small shoots root readily. *C. rotundifolia*, with round leaves, grows really well only in cold water, becoming very thin and straggly in water that is too warm.

(*To be Continued*)

F.N.A.S. Secretary to Emigrate

MR. GERALD ILES has resigned his post as superintendent of Belle Vue Zoological Gardens, Manchester, to become the first director of the new zoological park being built at Montreal, Canada. The Montreal park covers more than 400 acres, and is estimated to cost more than $9 m.

Mr. Iles joined Belle Vue in 1928, and was appointed superintendent of the Zoological Gardens in 1933. He has for many years been secretary to the Federation of Northern Aquarium Societies and is well known to aquarists and television viewers in the north. He expects to take up his new duties in October.

AQUARIST'S Notebook——

by

RAYMOND YATES

SOONER or later every hobbyist has to come face to face with the risk of disease in his tanks and it is surprising how one finds, in the course of conversation with other aquarists, how many followers of the hobby are quite uninformed on this aspect. Many believe that all they have to do if trouble occurs is to go to the nearest dealer for a cure-all bottle. Dealers do sell remedies, often very good remedies, for the more common ills but there are many instances where these are of no avail. Notwithstanding some books and many articles on the subject very little is really known about fish diseases. Living in another element we are at a great disadvantage, as fish troubles belong to another world outside our ken. Then again it is only in the last few years that this section of aquatic biology has been paid much attention, mainly because it offered little financial reward. Hobbyists in general have been keeping fishes for quite a time now and there has been a very wide field of experience but only a mere handful have bothered to keep records. In short, only the fringe of this very large subject of fishy ills has been touched.

By and large, for the majority of aquarists a sick fish is a dead fish and even the most experienced in the hobby can, at best, suggest remedies for a very small percentage of the maladies which beset our aquarium inmates. There is, however, no cause for alarm. The vast majority of the troubles which occur prove to be one of four or five well-known diseases which respond to certain specific treatments. Open any book on the dog fancy and turn to the chapter on dog diseases and pests. The reader is appalled at what is in store for his dog, whereas, in fact, few pet dogs are subject to more than half-a-dozen major ills, all relatively easy to treat when recognised. Similarly, fish keepers can be scared out of their wits reading about piscine ills which can occur but which, in fact, are rarely encountered. A case in point is mouth fungus. This is always mentioned in aquarist literature and given quite a horror write-up, but it is a rare trouble restricted mainly to dealers' stocks and others who ship fishes long distances.

Prevention being better than cure it is a wise precaution to give some attention to the conditions which reduce fish resistance to disease. These can be grouped under five headings: 1, bad living conditions; 2, introduction of fish pests and enemies; 3, keeping unsuitable fishes together; 4, temperature and changes in water composition; 5, incorrect feeding. All these can be summed up in one word —carelessness.

* * *

Just what is meant by bad living conditions? These cover a wide range including cramped quarters, insufficient water surface, too little or too much light, too many fishes crowded together, too much dirt and organic matter present in the tank, rockery of the wrong type, excess of food and other fouling, too few plants or too many sickly plants, wrong pH or incorrect hardness of water or both. Long as this list is it could well be extended. Fish kept in such adverse circumstances will weaken in time and fall victims to some illness which is ever ready to make its presence known when conditions favour it. Aquarists often cannot understand how they could possibly have introduced pests or fish enemies into their tanks.

It should be realised that many live foods contain parasites, often of an internal nature, and these we are powerless to eradicate. Examples are *Daphnia* and *Tubifex*, the latter benefitting from being kept a day or two after purchase and well washed before feeding to the fish. However, the benefits from these foods probably outweigh their dangers. Snails are often carriers of all sorts of pests as also are wild water plants or even unwashed plants from a dealer's tanks. To add pond water to a tank is asking for trouble. Nets and containers should always be sterilised after use, a habit which should become a must. It is a wise plan to have a separate net for each tank. Perhaps the easiest way to introduce trouble to your aquarium is failure to isolate newly purchased fishes for a period, say a fortnight. Patience is absolutely essential in the hobby. Too many fishkeepers just can't wait to see newly acquired fishes introduced to the community tank. Well, they may get away with it once, or twice, or even half a dozen times but a day will come when they will bitterly regret their failure to quarantine their new purchases.

Obvious disease in a fish is easily recognised and nobody buys diseased fish, although some buyers are too casual and leave it to the dealer with touching faith. Never buy fish from a tank in which any single fish is diseased—it isn't worth the risk. You have another day to live; have patience. Many fish troubles have long incubation periods so that sick fish may appear to be perfect when purchased, but two weeks' isolation is sufficiently long to show if they are as healthy as they look. Chilling on the way home from the shop can cause trouble.

* * *

Never keep pugnacious fish with more timorous kinds. Some fish are "bad actors" as the Americans say; if in doubt ask at the shop if the fish you want are safe bedfellows. No matter how beautiful, how rare or how cheap it is wiser to exclude all fin-nippers, chasers, bullies and large predacious types. It is possible to have a "lion-and-lamb" effect occasionally, but sooner or later you will find that "the book was right" and you are wiser but poorer. I remember keeping some half-inch platys with two large blue gularis; all went well for a fortnight and I thought I had a strain of soft-hearted gularis when suddenly all my platys vanished. Tiger barbs are fin-nippers but do not always show this trait. You may have 11 well-behaved tigers but the twelfth is not with the rest—he is skulking round the plants looking for a tasty fin to nip. Chasers also cause trouble merely because the chase is endless. The fish chased never get any rest or peace and quiet and therefore never a square meal. Before introducing newcomers to a tank give the existing occupants a good meal. The invaders will then get a better reception. New fish are best put in during darkness when they can get used to the water and their surroundings in peace.

* * *

Temperature conditions are important in disease prevention. Badly chilled fishes need keeping at a high temperature for 10 days or so, bearing in mind that all changes (up or down) must be very gradual. A daily rise of 5° F. and a similar fall at night seems beneficial with many fishes, a steady constant temperature results in weaker fish when a fall takes place. Don't tinker with thermostats, least of all last thing at night. In the morning you might find your fishes cooked! Far more fishes are lost through a rise in temperature than die through chilling. Never transfer fish to a lower temperature, not even two degrees lower.

Feeding troubles are legion. Overfeeding dried food has speedy and obvious effects. Like humans, fishes enjoy

variety but don't always get it. Too many hobbyists use the same dried food year in, year out. Variety is the spice of life. Feed little but often with a really wide variety of foods and your fishes will reflect your care. See that all get fed; shy fish often get pushed out and this can't go on long without trouble. Because Jones down the road feeds once a day one big meal don't follow blindly his lead; the same quantity spread over three meals daily is better.

* * *

Newcomers to the hobby worry occasionally in case any fish diseases are transferable to humans. They need entertain no fears on that score as there is no piscine disease which is likely to affect the fishes in their tanks which could be passed on to them. However, fish pass their troubles on to other fishes and any obvious sufferers should be destroyed or quarantined where they can be given treatment under hospital conditions. It is useless moving a fish with white spot, because the whole tank will already be infested and within hours other fish will show the signs. Neons with neon disease must be removed and the bottom siphoned or all other neons will fall victims.

Having considered the main causes of lowered resistance to disease we can not consider what action should be taken when trouble starts. Five possibilities are available according to the nature of the trouble. Let us consider each in turn.

1. Nature's way. Comprising the natural or biological way, it is most useful when the fish is simply run down or in a delicate condition. Broadly speaking it entails transferring the patient to shallow, green water, giving varied live food and solitary confinement. This restful treatment often works wonders but is useless where parasites have attacked the fish.

2. Surgical operation. This is possible for ulcers, tumors, wounds and so forth, but a few aquarists feel themselves capable of doing a worth-while job. The fish can be quietened by the use of urethane or sodium amytal, both quite harmless to the fish when used correctly. Nobody will resort to these treatments for old or common fish, so they should not be attempted except for rare and expensive specimens which can be saved by no other means.

3. Heat treatment. Used mainly for external pests it consists of raising and lowering the tank temperature some 10 or 15° F. every 12 to 24 hours. The object is to kill off parasites at various stages of their life cycle. It is often used in conjunction with chemical treatments. The major fault is the difficulty of regulating the temperature changes.

4. Chemical methods. The most popular method but open to abuse. Main dangers are the use of too large a quantity of the chemical in question, mixing different treatments and lack of patience in the time taken to effect a cure. Some chemical cures are rapid, others very slow. It is impossible to hurry things with any degree of safety.

5. Leaving things as they are. Unfortunately this is the method followed by the least number of aquarists, although it often gives excellent results. Of course, it is useless with parasites, which would only get a firmer hold if left in control. Many hobbyists panic when a large or valuable fish goes off colour or does not act normally. All kinds of remedies are tried and the fish is worn out with treatment. This can prove fatal. If you feel something is wrong but the trouble is not obvious feed it more varied live food and perhaps give it a change to a larger and quieter tank. Improve aquarium conditions and do not use chemicals until you are sure your tank conditions are perfect and that some outside agency must be at work.

* * *

Newcomers are the ones who experience most losses and they, of course, are the ones most concerned about losses. Much advice is given to beginners, some good, some bad, but all intended helpfully. The novice should seek the advice of a fishkeeper of long standing when trouble comes; this is one of the advantages of club membership. Advice followed which ends in loss is not always bad advice. Two tanks together are never the same, conditions are different everywhere and are always changing. What works in one tank is no guarantee that it will work elsewhere. Experts cannot diagnose troubles without seeing the fish or the tanks in question. If your fish die you have probably done all you could and the cleverest fish "expert" in the world couldn't guarantee to save any sick fish. Much of what we do is just trial and error. Most of our troubles are due to familiarity breeding contempt. If more aquarists would experiment with sick fish and record the results it would be a great help to the hobby. Of course, any results obtained prove nothing more than that the particular case proved positive or negative. It does not mean that similar action with other types of fishes elsewhere would give the same result, but might provide a pointer for others to work upon.

* * *

The Pakistan Ambassador in Washington is devoted to the hobby and has recently had a new all-marine aquarium installed. It is the only one of its kind in any embassy in the U.S.A. and the species on view are all-American. From the Pacific, Atlantic and Gulf of Mexico, about a dozen varieties of marine fishes swim happily together in a white coral- and blue quartz-filled tank, artificially lighted and with the latest in filtration and salinity gauges. According to the Ambassador the fishes never fight although they sometimes play tag. The smallest is the electric-blue neon-goby (about the size and shape of a match stick), and there is a disk-shaped specimen in black, striped in yellow, called a black angel. Others are clownfish, sergeant major, beau Gregory, the pale-yellow butterfly fish and the coral bandit. The Ambassador believes there is nothing like it for relaxation at the end of the day. Does he perhaps wish that nations could get on together so well as his fishes?

* * *

The Fish and Wildlife Service aquarium in the basement of the Commerce Department at Washington has been the scene of some unusual happenings. Tests were made with a patented "fish-caller." The aquarium director provided a 5 feet length of three-ply (170 lb. test) white wrapping twine to which was attached the batter-operated buzzer in a plastic case, which was supposed to call the fish. Held over the tanks in true fishing-rod manner the operators were prepared for anything. The "fish-caller" was slowly lowered into a tank teeming with eastern brook trout which had not been fed for 6 days. The concerted rush hit the apparatus for six but the initial excitement over, the fish resumed their circling, ignoring the noise made by the instrument. Other tanks produced equally negative results, the fish taking as much notice of the "fish-caller" as the average aquarist half way through cleaning a tank does of "supper's ready!" What a pity these tests proved negative. How very useful to have a fish-caller when fishing! In England fish-callers are something quite different; they come round when you don't want them, stay for hours and are quite used to being ignored.

* * *

I have had quite a lot of success flowering my *Aponogeton*, which have kept throwing up spike after spike of flower although restricted entirely to electric light. Some time ago I had considerable success with *Cabomba*. On both occasions people say, "How do you get them to flower?" to which my answer must be "Ask the plants themselves." The plants flower because conditions are just right but the aquarist cannot do this to order; it just happens. In both cases temperature was about 78° F., hardness about D.H.4, pH about 6.6 and about 8 hours electric light daily (one 40 watt lamp for each 15 in. of surface length). Of course, it is not hard to flower water plants which get full daylight, but in electric light it is another matter.

OUR EXPERTS' ANSWERS TO TROPICAL AQUARIUM QUERIES

Many queries from readers of "The Aquarist" are answered by post each month, all aspects of fish-keeping being covered. Not all queries and answers can be published, and a stamped self-addressed envelope should be sent so that a direct reply can be given.

Please will you give me some information on the breeding habits of *Pelmatochromis kribensis?*

P. kribensis breeds like most other cichlids. Before spawning the male colours up and the female shows darker colours on the fins and sides. She also grows plumper. Courtship follows the typical cichlid pattern: the fish circle about each other, join lips and pull and tug to their heart's content. In-between times they will select a place to lay the eggs. Like so many other cichlids, the couple may lay their eggs on rockwork, inside a flower-pot or even on the glass side or bottom of the aquarium. Old water with an acid content suits this species best. Plenty of chopped earthworms, and other meaty live food helps to bring them into tip-top condition.

I have a tank containing Buenos Aires tetras, black widow fish, Siamese fighting fish and guppies. Just lately I have found several of the guppies dead on the bottom. Some of them look as though they have been partly eaten. Can you tell me which fish is causing the trouble?

All the fishes mentioned, when they reach medium to full size, are a potential danger to such small fish as guppies, especially male guppies. The larger tetras and fighting fish are best housed with fishes of their own size. Siamese fighting fish, though not genuine killers, have a tendency to rip the fins of slow-moving fishes, or fishes which remain quiet in the plant life or corners for short periods of time. Fishes for a community tank should always be chosen with great care.

Are *Corydoras* catfish easy to breed?

A few species of *Corydoras* catfish are easier to breed than others. *C. aeneus* is one of these easier-to-breed species. It should be given clear, shallow water with a pH of 7 or higher. In other words, water rather alkaline. The light should not be too bright. A temperature of about 68° to 72°F is about right. The female develops plump sides and a pinkish tinge on the underparts when she is ready to spawn.

My black mollie is experiencing great difficulty in rising from the bottom of the water. She swims in jerks, and when she does eventually reach the surface for food, sinks, as though weighted, to the bottom again. Please can you tell what is wrong with her?

Your mollie is suffering from swim-bladder trouble. You might be able to cure the fish if you transfer her to shallow water maintained a few degrees warmer than her original aquarium. A teaspoonful of Tidman's sea salt to every gallon of water in the hospital tank will help to afford relief. Feed on live food or tiny pieces of red meat or chopped earthworm. If the fish gets worse, the kindest thing to do is to put her out of her misery.

I recently bought two tiger barbs. The day after I bought them I noticed that one of them swam to the surface of the water, turned over and then sank to the bottom. Within 5 minutes it was dead. Please can you give me any idea why this fish died so suddenly?

The shock occasioned by being transferred from the dealer's tank to your own aquarium might have killed the fish. Some fish are more susceptible to shock than others. On the other hand, the fish might have been unwell when you bought it, and being netted, and being placed in water at a slightly different temperature from that in which it had been living probably contributed to its death.

I have heard a lot about mosquito fish. Can you tell me something about them?

The fish usually known as the mosquito fish is *Heterandria formosa*. This fish is the smallest livebearer and is best kept in a tank by itself. The male is so small that it is easily mistaken for live food and swallowed by other fishes, even the so-called peaceful species. But the term 'mosquito fish' is applied to several species which have been introduced into mosquito-ridden countries of southern Europe, Africa, America, and the Orient for larvicidal purposes. The fishes eat the larvae of the malaria-producing mosquito and so help to combat the disease. Many areas of the world which used to be malaria-ridden have now been made safe for human habitation by utilising the services of these small species of tropical fishes. For instance, parts of Italy, and the isthmus of Panama, to mention but two regions of the world. The fishes chiefly used to help in the control of malaria are guppies, *Gambusia*, *Fundulus* and *Heterandria*.

Is it safe to use ordinary tap water to fill a tropical aquarium? I wish to set up a tank within the next few days.

Ordinary tap water should prove quite suitable if you leave it to stand for a few days before introducing any plants or fishes into it. If you strain a gallon or two of the water through some scalded peat or scalded rotting oak or beech leaves so much the better.

I am a beginner to tropical fish keeping, and should like your opinion on the following question: I have the choice of two aquaria: one is stainless steel; the other is chromium plated. Which would be the better choice of the two?

We advise the stainless-steel aquarium. Chromium plate wears away after a time, and does not look so good; stainless steel will last almost a lifetime, and as it does not rust is ideal for tropical fish keeping.

Is it safe to leave a couple of swordtails in a tank with their babies?

In a large aquarium, well planted with bushy plant life, it is quite in order to leave one pair of swordtails with their young, though even then one or two of the more venturesome fry may be caught in open water and eaten. But in a tank measuring about 18 in. by 12 in. by 12 in. it is a bit risky to leave the parent fish with their young.

My angel fish have spawned twice within the last few weeks, but both spawnings have been unsuccessful: the eggs have turned white and failed to hatch out. A friend has told me that the first two or three spawnings of angel fish often turn out this way. Is this correct?

Sometimes the first or second spawning of angel fish does not result in fry. Perhaps the light was too strong, the eggs infertile or the water too alkaline. Make sure the fish are in tip-top condition, the aquarium not too brightly illuminated, and the water on the acid side before you spawn them again.

I am setting up a community aquarium in our lounge. I want to place fishes in this aquarium which will get on well together and have plenty of colour. I should also like to have fishes which will swim at the top of the water as well as at the bottom Can you suggest some species to fill these requirements, please?

Choose zebra fish and pearl danios to swim at the top of the water. These fishes are brightly coloured and look very lovely under electric light. The following fishes will swim a lot of the time in the middle of the water: *Pristella*, guppies, lemon tetras, flame fish, bloodfins, harlequin fish, platys. The eel-like loaches, neon tetras and *Corydoras* catfish will keep to the bottom. All the above fishes should get on well together, and will make a lovely picture.

COLDWATER FISH-KEEPING QUERIES answered by A. BOARDER

I have a goldfish which is 8 years old; is this an unusual age and how long can a goldfish live?

Goldfish can live for 20 years or more but it is probable that very many die before they are 12 years of age. A lot depends on where the fish is kept, the space it has and the warmth of the water. Generally speaking the fish kept in cold conditions would be likely to last much longer than one kept fairly warm. A good aquarist should be able to keep goldfish for up to 20 years.

I am making a garden pool and at the rate I am progressing it looks as if the winter will be here before I have finished! If it is finished by the autumn would you advise me if it is as well to stock the pond then or wait until the spring? If the latter, should the pond be left without water or should it be filled?

If you can complete the pond by October, it could be filled with water and partially planted. If you can obtain any plants which are already in pots or are well rooted they could be introduced into the pond as soon as you have the water fairly free of lime. The plants will not grow much, if any, from then on but they will be ready to start into growth as soon as the water begins to warm up in the spring. On the other hand there is little use in putting in unrooted pieces of oxygenating plants as they are not likely to get established so late in the year. Such plants as water-lilies could be put in provided that they were in pots or other containers. If you are too late to plant, then the pond can be left partially filled with water. If filled right up it can freeze in bad weather and there is probably more likelihood of damage to the sides than if there was a certain amount of mulm and plant life in the pond.

Can you offer any tips for keeping cats from interfering with fish in a garden pond?

Cats do not like getting their feet wet if they can help it, and so if you can arrange for a small shallow trench of water around your pond this will keep the cats away. It is possible to erect a wire fence around the pond so that it slopes outward away from the pond. Another method is to arrange some builder's tiles round the edge of the pond so that they overlap. When the cat treads out on one it will tip up and give the cat a wetting. This will deter it from coming back again. You are not likely to hurt the cat by a slight ducking as cats are very good swimmers.

If I install an electric pump for my pond will this keep the water pure?

Not necessarily, as once the water becomes impure the effect of a fountain will be that it circulates the foul water but does not mean that it will purify it. A fountain does help to move the water around and assists in getting rid of much of the foul gases. It also allows fresh oxygen to get into the water. If the conditions continue which have caused the fouling of the water running the fountain alone is not likely to improve matters a lot, although it will help. During hot spells a fountain helps a great deal as it gets plenty of oxygen into the water, and such fish as golden orfe, which are often the first to be in trouble in hot weather, could be kept healthier. Most water-lilies do not like water splashing over them too often and so if you install a fountain see that the spray does not go on the water-lily leaves if it can be avoided.

I had a supply of white worms and fed them with bread soaked in milk. They were kept in soil. I was told that they would multiply but instead they have almost disappeared, why is this?

You should not have placed them in soil. Damp peat is much better. I use only brown bread slightly soaked in water. If your worms were too hot in the container they would die off. They will thrive in a temperature of up to 60° F., but if over 70° for long they may decrease instead of increasing. To be able to feed a number of fishes regularly with white worms I consider that a number of boxes should be used. I have one for each day, so that each box gets a chance to recover when a number of worms are removed. It is always difficult for the average aquarist to keep the worms healthy during hot weather. They should be in as cool and shady a spot as possible; to partly bury them in the ground is a good plan.

FRIENDS & FOES
No. 60
Water Beetles *(continued)*

Larva of the water beetle Hydrous piceus

COLEOPTERA: Silver water beetle

FAMILY: Hydrophilidae, from Greek *hydro*—water and Greek *philos*—loving.

SPECIES: *Hydrous piceus*, from Latin *piceus*—pitch black.

HYDROUS piceus is the largest British fresh-water beetle, nearly 1¾ in. long. Its size renders it easy of examination without the aid of more than a hand lens.

Its abdomen is covered with fine hairs, which imprison so much atmospheric air that the whole is given the silvery appearance responsible for the beetle's "popular" name.

Its legs are obviously not equipped for strong swimming, possessing only a few short hairs on the second and third pairs. The beetle has no need of swift movement, feeding on aquatic plants and spending its time crawling about among thickets of submerged vegetation. Males are distinguished from females by a thickened pair of joints on their first legs.

The females spin a tough, characteristic cocoon to bear the eggs, from 50 to 100, and this is attached to plants at the surface or near the surface of the water. An air tube at one end of the cocoon is above water level to ensure a supply of air to the larvae, who take it in via a pair of spiracles in the last abdominal segment. After some days crawling round in the cocoon the larvae break out to crawl about the plants. They are sluggish, but carnivorous, feeding upon snails for the most part. I have no records of them attacking fishes, or of fishes attacking them, although big, hard-mouthed fishes could probably eat them.

Pupation takes place in soft mud near water. Hibernation of adult beetles occurs in the mud of the pond bottom. They prefer ponds overlaid with a dense layer of duckweed.

C. E. C. Cole

our readers write

Readers are invited to express their views and opinions on subjects of interest to aquarists. The Editor reserves the right to shorten letters when considered necessary and is not responsible for the opinions expressed by correspondents.

Address letters to The Editor, *The Aquarist*,
The Butts, Half Acre, Brentford, Middlesex

Hardy Eggs

I HAVE kept sea-water aquaria for 5 years now, with a very good degree of success. At the beginning of July I found a good-sized bunch of cuttlefish eggs (about 500). These eggs had rather a rough time before they arrived in my tank, as I found them while I was at work several miles from home, stranded on a beach in strong sunshine for about 3 hours. They also had a journey of over 4 hours, wrapped in a wet newspaper in the cab of a bus, so that I did not have much hope of any cuttlefish hatching. I placed them in a 12 gallon tank, empty of any stock except a small hermit crab, and secured them just above a diffuser stone to create some circulation of water through them.

I was surprised to see, on 1st August, a couple of small cuttlefish (about 6 mm. head and body) on the sand, and very much more surprised to see the next day that at least 100 had hatched out. The rest of the bunch was very quickly removed to the sea, with more cuttlefish hatching all the time. I have since released about 80, leaving at present about 25 very active cuttlefish of about 15 mm. in length. I have also found four bodies, which I think is very few, considering the size of the hatch. After hatching I fed them on brine shrimp, plus quite a few copepods naturally present, and after the first week I tried white worms, which were readily taken and now form the main diet.

J. P. Brown, St. Leonards-on-Sea, Sussex

No Three Counties Show

IT is regretted that this year there will not be a Three Counties Show, which has for the past three years been promoted jointly by Oxford, Reading and High Wycombe Societies. It is a great blow after working to establish the show as being one of the bigger provincial shows in the aquarists' showing calendar. However, it is hoped that conditions will exist very shortly which will permit the revival of the show.

In the meantime the three organising clubs will be holding their own individual shows. For our own part (Oxford) we intend to hold an open show of furnished aquaria during the 3 days Thursday 26th to Saturday 28th September, 1957. The show will be staged in conjunction with the Abingdon and District Branch of the National Cactus and Succulent Society, at the Oxford Town Hall.

M. Gmas, *Show secretary*, Oxford Aquaria Society

Oak-Apple Live Food

HAVE any readers tried feeding their fishes on the grubs to be found in oak apples? During last winter, when live food was scarce, I offered this larva to my fishes and found that they were readily taken.

Having cut open the "apple" I find that by puncturing the grub with a pin, the smaller fishes can easily tear them into suitable sized particles. I find that the grubs stay in perfect condition for a long period, as I am still using oak apples which I collected during the winter.

Brayton Holt, Whaley Bridge, Stockport

Exophthalmos and Snails

SOME while ago I decided that snails in a tropical tank were more nuisance than they were worth, and have managed since without their doubtful assistance. However, the recent wave of tropical weather made the glass of my aquarium cloud over with algae, so I gathered a handful of ramshorns from the local pond, and put them in a tankful of young livebearers.

I noticed that the small fishes swam right inside the shells of the ramshorns, which have no protective "trap door", and constantly pecked at the soft flesh of the snails. I therefore transferred the snails to my large show tank, 3 ft. by 1 ft. by 1 ft.

The following evening, just before I switched off for the night, I noticed that the fishes were "scratching" themselves in an unprecedented manner, dashing themselves against the plants and sand frantically. I knew something was wrong, but at eleven o'clock at night one does not feel like changing 18 gallons of water.

The following morning my first thought was to check the large tank. Four fishes were floating on the top dead. With the exception of a large lace gourami, all the others had pop-eye, or exophthalmos. I took the gourami out and transferred it to another tank, but later that day it too passed on, although this may have been caused by the change of water after the poisoning of the main tank. I have found that gouramies do not like changes of water.

Reverting to the main tank: first of all I dosed it with mercurochrome, at white-spot treatment strength, to kill any infection in the water, and then consulted my aquarist specialist at the aquarium shop. He could only tell me that it was some infection in the water...could be several things. I then looked up Axelrod and Schultz's *Tropical Fish*, and gleaned the information that the cause of exophthalmos was uncertain.

The mortality continued, so I completely changed the water in the tank, but the death toll continued to pile up. I completely changed the water a second time, and then the thought occurred to me that I may have introduced some infection with the snails. I removed all these, and the stench nearly knocked me over. The snails which had been pecked by the young fishes had died, and were putrefying in the tank. Having had the cause of the trouble removed, the tank has now recovered. Incidentally all the fishes

bore the signs of carbon dioxide poisoning, i.e., the blood-streaked gills and mouth.

A long time ago, I had experienced carbon dioxide poisoning in my tank, but this was caused by putting methylene blue in a heavily planted tank. The blue cut off the light and the plants were breathing in the oxygen and breathing out carbon dioxide, but there were no signs of exophthalmos on that occasion. I would therefore say that the exophthalmos was caused by poisons, or irritants in the water set up by putrefying animal matter, such as dead snails or fishes. In the midst of all the chaos, a golden guppy gave birth to a brood. The mother has recovered from her pop-eye, and the young ones, such as I have kept, are doing well.

One of the fish I saved was an adult Berlin swordtail female, but in her case, the exophthalmos has left her nearly blind. The protuberance of the eyeballs has nearly gone, but at its worst phase, the eyes clouded over with a cataract effect. As the swelling died down, the cloudiness concentrated in a white spot right in the centre of the pupil of the eye. This particular fish appears to find food, and can negotiate obstacles, provided she is not startled. When this happens she blindly dashes into the plants. Not being a fish surgeon, I hesitate to try any treatment for this as I may do more harm than good, and I am hoping that at a further stage the trouble may cure itself.

I am particularly interested in this Berlin because, as a virgin, she got herself mated to a green swordtail male. The result was half green offspring and half Berlins, only the Berlins were solid black from the middle of the body to the tail.

One of these youngsters is in fact all-black except for a red-tipped nose, and a slight silvering on the front of the belly. I am hoping that this one will turn out a male, as I want to pair the young males back to the parent female, which is why I would not like to lose the partly blind mother. This semi-blindness may be an asset, enabling the males to sneak up on her and do their mating without too much argument.

Another feature of these youngsters is that several of them had a large round tail, almost like a railway signal. I can only assume that there must be a very strong streak of black mollie in the Berlin mother. Unfortunately, I lost some of them in the big tank, as at 2 months they were able to look after themselves among the larger fishes, and I wanted them to have the benefit of the larger tank and the more plentiful supply of algae.

F. V. D. BERRY, Southampton

This reads very much as if the trouble commenced because the snails collected from the local pond were infested with larvae of the worm Diplostomum. These larvae at a later stage infest fishes, and in particular affect the eyes, and kill their hosts in a surprisingly short time. The adult worm arises after the dead or dying fish is eaten by a water bird, and then it starts the cycle again with eggs reaching the water (and later the water snails) in the birds' droppings. Snails from natural waters near the coast are frequently carriers of this parasite. —EDITOR.

An Appeal from Cyprus

I AM a soldier serving in Cyprus, and although I have managed to procure a little of the necessary aquarium equipment, there seems to be no source of fishes on the island. There is no lack of adherents to the hobby, but our activities are limited to goldfish (which every owner of a water supply is obliged, by law, to keep in his reservoir). In view of this I wondered if it would be possible for one or two of the more philanthropic members of the cult in England to risk a few eggs, or very young livebearers. I am afraid it will prove necessary to send the package by air mail, since sea mail takes about 15 days to reach us out here.

I would like to thank potential friends in advance, and to assure them that on no account must they send more than half a dozen specimens, for the limit on our resources is quite small.

22825131 PTE. MOORWOOD,
238 Army Veh. Pk. R.A.O.C., B.F. P.O. 53

WHAT'S NEW ON THE MARKET

A New Fish Food

IF you ask the more experienced hobbyists what brand of "fish-food" they use they will generally snort in disgust and inform you that they make their own and have no time for manufactured prepared foods. Many do, but it is a great deal of trouble and in course of time enthusiasm wanes and they augment live-food feedings with one or other of the commercial foods available.

In the course of many years in the hobby I have seen many commercial products come and go and have been very surprised at some of the claims put forward by advertisers in support of their product, bearing in mind that most of the better foods are basically very much the same. One of the difficulties with a prepared food is keeping it, and wholesalers have found stocks go bad through the action of heat, cold, damp and insects. On returning it to the manufacturer they may have found themselves refused compensation or fresh supplies in lieu. (This excuse has also been used on occasion to explain away their failure to keep a particular brand, when, in fact, it pays better to sell some other make with better trade terms!) Be that as it may, dried food should be kept out of the reach of damp and insect pests and this is best achieved in tins, bottles or plastic containers.

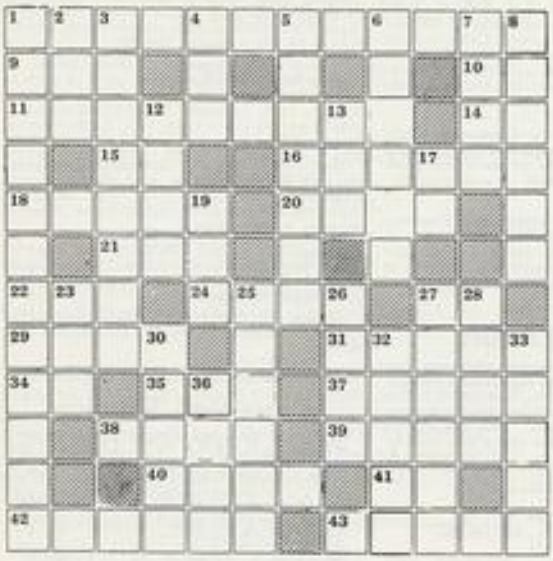
The plastic container is the method used by a new food which has recently appeared on the market—McLynn's Fish Food. The plastic containers are most attractive and keep the food in excellent condition; and, what is more, after use they can be used for cigarettes. Tested under many adverse conditions, this food has not gone bad and has proved popular with fishes and hobbyists alike. Many of the public aquaria in Britain now use it as well as the foremost dealers and breeders. Messrs. Whitwell and Smykala report that this food has saved them no end of worry and loss, as even wild fishes, often difficult to feed, leap at it. They use no other dried food. All fishes tried accepted it with relish, from cichlids to goldfish and even baby fry. McLynn's Fish Food is sold in three sizes, all the same grade which I should call medium coarse. If needed dust-fine this can easily be prepared by the hobbyist.

I am a great believer in dried food myself but one must be realistic; feed both dried food and live foods, but not at the same time. Frequent feeding of a very little is what gives results. I have seen people feed *Tubifex*, *Daphnia* and dried food all in the same operation, with the attitude "Well, they've had their share for today." That is all wrong.

R.Y.

The AQUARIST Crossword

Compiled by J. LAUGHLAND



CLUES ACROSS

1 Kubla Khan built one of a sort. The most magnificent specimen in England is at Chatsworth House (5, 7)
9 Start again for the religious leader (3)
10 A knock out is a setback but turns out well (1, 1)
11 Alias *Vallisneria spiralis* (4, 5)
14 Thanks apart for the volunteers (1, 1)
15 Part of the Dark Continent (1, 1)
16 Rock-clinging mollusc, sounds rather flaccid (6)
18 Char with nought to upset it becomes *Ruelia* (5)
20 Chopped worms can be kept fresh in this—but can you, in that case, keep the wife? (abbrev.) (4)
21 Though abbreviated, it means the same, notwithstanding (3)
22 She started man's troubles (3)
24 Ponder without sign of hesitation: better than the biggest tank (from the fish's point of view) (4)
27 By the Grace of God (1, 1)
29 Water boatmen? Bituminis? Upset rodents? (4)
31 Biggish and pugnacious cichlid, easily bred (5)
34 No drunkard (1, 1)
35 Movement of the head said to be as good as a wink (3)
37 Imitate (5)
38 'e's left leaves for the rest or wash (4)
39 As necessary as fish for the balanced tank (5)
40 Granulate (4)
41 Is a tailed and headed fish (2)
42 Young eels (6)
43 One of the Lake school of poetry (5)

CLUES DOWN

1 *Pistia stratiotes*, floating plant (5, 7)
2 Leader in *Agama stellio* (3)
3 When this is used for filling tanks it should stand for 24 hours before fish are introduced (3, 5)
4 Name of marine worm favoured as bait by fishermen (3)
5 One of the less important "limbs" of a fish (4, 3)
6 M.D. dies amongst the plankton (6)
7 Memo: Rise, Eton (4)
8 Usually practises on ice or rollers, but the water variety is common on ponds (7)
12 Leach loses a pound for every single one (4)
13 Style of address for a gentleman (3)
17 Portugal, in brief (2)
19 Movement of a frog (3)
23 Might conceivably be adapted as aquarium, but there might be some risk of inebriation (3)
25 Groups of genera having many important points in common (6)
26 Between dry and wet (4)
27 Ask after mother for the woven patterned fabric (6)
28 Smile (4)
30 This reptile influenced 22 Across (5)
32 Hair-like lashes borne by cells (5)
33 Cat or showman (5)
35 Rove in a roving way (4)

PICK YOUR ANSWER

1. The Hemirhamphidae (half-beaks) belong to the order: (*a*) Isospondyli; (*b*) Opisthomi; (*c*) Percomorphi; (*d*) Synennognathi.
2. "Hyphessobrycon minor" is said to be a colour variant of (*a*) *H. flammeus*; (*b*) *H. rosaceus*; (*c*) *H. scholzei* (*d*) *H. serpae*.
3. *Carnegiella* species may be distinguished from other hatchet fishes by: (*a*) larger pectoral fins; (*b*) larger scales; (*c*) no adipose fin; (*d*) no lateral line.
4. *Gambusia punctata* (blue *Gambusia*) is native to: (*a*) Cuba; (*b*) Florida; (*c*) Mexico; (*d*) Trinidad.
5. Which is the largest of the following species? (*a*) *Ambastis ambastis*; (*b*) *Ambastis borcensis*; (*c*) *Ambastis commersoni*; (*d*) *Ambastis lala*.
6. *Barbus nigrofasciata* (nigger barb) was named by: (*a*) Boulenger; (*b*) Day; (*c*) Günther; (*d*) Hamilton-Buchanan.

G. F. H.

(Solutions on page 142)

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.

THE new meeting place of **Hounslow and District Aquarist Society** is the Labour Hall, 20, Heath Road, Hounslow, Middx., where all former members and friends and also juveniles will be most welcome. The secretary is Mr. B. C. Boult, 47, Wave Avenue, Bath Road, Cranford, Hounslow, Middx. Recent speakers have included Mrs. B. Meadows and Mr. F. Katritzky, both being well known throughout the hobby.

* * *

A NEW society has been formed in Scotland, the title being the **Glentrothes and District Aquarists' Society**. Meetings are the first and third Tuesdays of each month and the venue is the Art Club, Cotlars Cottage, Alburne Park, Glenrothes, Fife. The name and address of the secretary is Mr. Allan Austin, 2, Buchanan Road, Glenrothes, Fife.

RECENT events of the **Bradford and District Aquarist Society** have included a contest with Dewsbury Society, which was won by Bradford by a narrow margin. Speakers at the meetings have included Dr. F. Ghadially of Sheffield and Mr. A. J. L. Rashley of Mytholmroyd. The closing date for the annual show is the 2nd October.

* * *

AT **Plymouth Aquarists' and Pondkeepers' Society's** open show, Mr. W. J. Burns of Bideford, won first and special and the cup for the best exhibit in the show, with shubunkins and veiltails (goldfish).

* * *

AT a recent members' table show and quiz, held by the **Middleton and District Aquarists' Society**, the attendance showed an increase on previous meetings. Of the 12 entries for "any variety fish," the winners were:—First, Mr. J. Consterdine (firemouth); second, Mr. F. Hawton (rosy barb); and third, Mr. Daniels (black mollie).

* * *

BURNLEY **Aquarists' Society** members have had a fine run of successes and it is now two-and-a-half years since they were defeated in a table show. In this time they have won about 50 team competitions and numerous trophies.

They have a nucleus of 15 active members who keep the standard as high as that of any club in England.

Their latest success was at the recent Bury open show when they won all the top prizes—a shield and two cups. In the club competition they won with 31 points, 18 more than the runners-up.

They also took many of the individual awards, as they have done in all the top shows in Lancashire during their unbeaten run.

* * *

A VERY successful display of 21 tanks of tropical fish was held by **Leamington Spa Aquarists' Society** at the Kenilworth Agricultural Show. Nearly 2,500 people from all parts of the Midlands visited the exhibition and the Society's efforts have been rewarded by a handsome profit. The present hon. secretary of this Society is Mrs. A. G. Johnson, 8, Union Road, Leamington.

* * *

THE **Folkestone Aquarist Society's** annual show was held in conjunction with the Folkestone Flower Show on the 18th July.

The exhibits were judged by Mrs. W. Meadows, who was impressed with the cleanliness of the plants, and the very good condition of the fishes. She was astonished to learn that six of the exhibits were first time efforts. The results were: Furnished aquaria.—1st, Mr. Evans; 2nd, Mr. Rees; 3rd, Mrs. Bukin. Furnished Aquaria (Juniors).—1st, Terry Bukin; 2nd, John Pilcher. Best Fish in Show.—Mr. Bukin, female red-eyed-red sword. Best Fish in Show (Juniors).—Terry Bukin, X-ray. Plants Cup (group of three).—1st, Mr. Rees; 2nd, Mr. Bone; 3rd, Mr. Rees. Best Pair of Fishes.—Mr. King, rosy barbs.

* * *

THE **Carassius Club** held their monthly meeting at the Carnegie Library, Pranton Road, Portsmouth, on the 29th July, and this will be the headquarters of the Club for future meetings.

Discussions and views of enthusiastic goldfish breeders and the season's activities were also given, speakers were Messrs. Evans, Cole, Summers, Smith and Mason. Hon. secretary, Mr. E. Knight, 125a, Haslemere Road, Southsea, and Mrs. E. B. Knight (assistant secretary).

* * *

THE **Colwyn Bay and District A.S.** held a Table Show recently. Exhibits were all of a very high standard and judging proved to be a very difficult task. The first prize was awarded to a chequered barb, exhibited by Mr. J. Reed of Colwyn Bay. Second prize was won by Mr. Plumb of Rhos-on-Sea, with a serpae, and the third prize was awarded to Mr. Hanley of Pydew for a cherry barb.

* * *

AT the last meeting **Leeds and District A.S.** had a highly entertaining and instructive evening when Dr. Elliott gave a talk on pond life. The Open Show is to be at Trinity Church Hall, Boar Lane, Leeds, 1, from 18th to 21st September. Show secretary, G. Boothroyd, 6, Wellhouse Drive, Leeds, 8.

* * *

THE exhibition staged by the **Nuneaton and District A.S.** as part of the town's Annual Show, held at the Pingle Fields, Nuneaton, was well attended; the wide variety of fish in the many attractive settings excited great interest and the Society's decision to display the fish in natural surroundings rather than as a competitive show with single specimens each in an undecorated tank, was amply justified.

The placing of miniature maps above the tanks indicating the natural habitat of the exhibit proved quite a good innovation and the show secretary, Mr. Beazley, is to be congratulated for his artistry in this matter.

The response to the raffle for the furnished aquarium was very good and the Society's aim, to provide a complete fish tank at the Children's Home, Caldwell, near Nuneaton, was thereby achieved.

* * *

THE **Independent A.S.** has a very interesting and varied programme mapped out for the coming months, and is now stronger in membership and enthusiasm than ever before. Regular lectures are given by Mr. Riddle, that well-known and hard-working aquarist and judge, and a visit has been arranged on 13th October, to a well-known breeding establishment.

Meetings are held every Monday, 8 p.m., at the Isledon Men's Evening Institute, Hornsey Road, N.7. (about 3 mins. from the Nags Head). New members interested in tropical, or cold-water fishes are really welcome. Hon. secretary, Mr. L. W. Dare, 17, Lady Somerset Road, N.W.5. Tel.: Gul 6709.

* * *

ON August Bank Holiday **Sleaford and District Aquarist Society** held their annual exhibition in a marquee at the Garden Holders Association Horticultural Show. This year the tanks were staged as an art gallery being in gilt, frames against blue polka dot papered walls. It is very pleasing to report that from the Society angle, this year's show proved to be a record.

* * *

RECENT events of the **Glenrothes and District Aquarist Society** included a talk on "balanced aquaria" by the president, Mr. A. Douglas. Six new members were also enrolled.

AN innovation in the **Smethwick and District Society** is a programme and news sheet. Future events include a talk by R. Marshall on Characins. This is on the 25th September. On 9th October is a table show. The secretary is Mr. A. E. Allsopp, 800, Stratford Road, Birmingham, 11.

* * *

FUTURE events in the programme of **Guildford and District Aquarists' Club** include an Inter-Club Table Show at Farnborough with the North Hants Club on the 25th September. On the 9th October the club will have a lecture from Mr. John Edwards.

* * *

AT the last meeting of the **Carassius Club** among the subjects discussed was the breeding of twintails, particularly the means whereby the dorsal fin of the variety could be strengthened.

* * *

IT is expected that the **Leeds and District Aquarists' Society** will hold their annual dinner in November. As usual they are exhibiting at the British Aquarists' Festival at Belle Vue, Manchester on 5th October.

London Lecture

AT the first of the Saturday afternoon free lectures this year at the Horniman Museum (London Road, Forest Hill, London, S.E.23), Dr. F. N. Ghadially is to discuss the Technique of Breeding Tropical Fishes. This talk will be illustrated by lantern slides and a film will be shown. It takes place on 12th October at 3.30 p.m.

Aquarist's Calendar

14th-15th September: **Willesden and District Aquarists' Club** open show. Schedule are available from Mr. F. W. Keen, 18, Walton Close, Cricklewood, London, N.W.2.

18th-21st September: **Leeds and District Aquarists' Society** annual open show. Entry forms are available from show secretary, Mr. G. Boothyroyd, 6, Wellhouse Drive, Leeds 8.

The Aquarist's Badge

PRODUCED in response to numerous requests from readers, this attractive silver, red and blue substantial metal emblem for the aquarist can now be obtained at cost price by all readers of *The Aquarist*. The design is pictured here (actual size). Two forms of the badge, one fitting the lapel button-hole and the other having a brooch-type fastening, are available.

To obtain your badge send a postal order for **2s. together with the Aquarist's Badge Token cut from page x.** to Aquarist's Badge, *The Aquarist*, The Butts, Half Acre, Brentford, Middlesex, and please specify which type of fitting you require.

21st September: **East London Aquarists' and Pondkeepers' Association** annual open show: Schedules can be obtained from show secretary, Mr. J. Bryden, 22, Kingston Road, Ilford, Essex.

26th-28th September: **Oxford Aquaria Society** open show of furnished aquaria, in conjunction with the cactus show at the Oxford Town Hall. Schedules are available from Mr. M. Gibbs, 37, Hurst Street, Oxford.

28th-29th September: **Federation of Guppy Breeder's Societies** show of guppies at the Pavilion Cafeteria, Zoological Gardens, Regents Park, London. Entry forms are available from show secretary Mr. L. Stevens, 9, Anerley Hill, Upper Norwood, London, S.E.19.

16th-19th October: **Scottish Aquarium Society** annual show at McLellan Galleries, Glasgow. Entry forms from Hon. Secretary, K. A. M. Robertson, 32, Edzell Drive, Newton, Mearns, Renfrewshire.

26th-27th October: **Oldham and District Aquarists' Society** open show. Schedules are available from Mr. F. Greasley, 346, Featherstall Road, Oldham, Lancs.

1st-2nd November: **Bristol Aquarists' Society** annual open show at Bishopston Hall, Bristol.

Crossword Solution

W	A	T	E	R	G	A	R	D	E	N	S
A	G	A	■	A	■	N	■	E	■	O	K
T	A	P	E	G	R	A	S	S	■	T	A
E	■	W	A	■	■	L	I	M	P	E	T
R	O	A	C	H	■	F	R	I	G	■	E
L	■	T	H	O	■	I	■	D	■	■	R
E	V	E	■	P	O	N	D	■	D	G	■
T	A	R	S	■	R	■	A	C	A	R	A
T	T	■	N	O	D	■	M	I	M	I	C
U	■	L	A	V	E	■	P	L	A	N	T
C	■	■	K	E	R	N	■	I	S	■	O
E	L	V	E	R	S	■	L	A	K	E	R

PICK YOUR ANSWER (Solution)

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