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and Pondkeeper

DECEMBER, 1961

MONTHLY
Vol. XXVI No. 9

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Editorial

AFTER listening sympathetically to the tale of troubles an aquarist friend had been experiencing over the establishment of a large new aquarium for his lounge, it seemed unkind of us to point out that it is really remarkable that community tanks are possible at all. There can be few other groups of animals from which a selection of some dozen or so different species can be made and placed together in close confines without a holocaust resulting! And yet many aquarists soon begin to think that something must be seriously wrong if they have difficulty in keeping one particular kind of fish in a tank in which several other species are already thriving. The truth is that tropical fishes, at least, are very accommodating for us in this matter, and provided that we do not step beyond reasonable bounds most of them tolerate the proximity of strange and un-natural tank-mates very well.

It is not uncommon, however, to hear aquarists in disagreement over the suitability of one fish species for community life, some vouching for the peaceful character of the fish that is the subject of the dispute and others recommending isolation for it. Both sides can be right, too, for there are certainly individual variations in temperament of some fishes and there are also many other factors that will determine the way the fish will behave. These include such considerations as whether the fish is introduced to the aquarium before, together with or after the other fishes, its age when it is introduced, the nature of the furnishings of the aquarium, the size of the aquarium, the total number of individuals in the community, the number of species present and the type of diet provided. When it is also realised that the behaviour of a fish is not a constant factor anyway—it might become a bully with attainment of breeding condition, for example, the scope for trouble seems unlimited. In general, to start the mixed tank with young specimens, all brought together at about the same time, is the way to minimise the possibility of mishaps later on.

Fish Without Fathers

by JAMES W. ATZ

Curator, New York Aquarium

Photographs by the New York Zoological Society

THERE are more than 4,000 fishes in the Genetics Laboratory of the New York Aquarium. They are small ones and although some of them have attractive or unusual colour patterns, none could be considered as all spectacular. It is not their appearance, but their usefulness in scientific research that makes them noteworthy and important.

About a tenth of the Laboratory's fishes form a group perhaps even more nondescript in appearance than the rest. A local fisherman might take them for some kind of killie—to which they *are* distantly related. A tropical-fish fancier would undoubtedly recognise them as one of the mollies, but certainly not of any variety that he would choose to grace his home aquarium. The fancier would certainly be struck by one peculiarity: all of them, both young and old, are females. As for males—there aren't any! For the astonishing truth is that here is a species of fish in which more than 99 per cent. of the individuals are females which regularly give birth to broods consisting only of females like themselves.

The Amazon mollie, as it has been appropriately named, was first described in 1859, but its peculiar reproductive behaviour was not discovered until 1932 when Professor Carl L. Hubbs and his wife, Laura, began to breed the fish at the Museum of Zoology of the University of Michigan. Dr. Hubbs had been studying the different kinds of mollies and he knew that although he had in his Museum collection hundreds of preserved specimens of *Mollienisia formosa* (from *formosus*, Latin for graceful or beautiful), which had been caught in many places in north-eastern Mexico and southern Texas, every one of them was a female. Soon Dr. and Mrs. Hubbs reported that gravid females captured alive and brought into the laboratory gave birth to broods consisting entirely of daughters. At first this looked as if it might be a case of parthenogenesis, or virgin birth, but any *M. formosa* kept isolated from male fish never produced any young. When virgin *M. formosa* were mated with male mollies of other species, however, the offspring were all females that looked exactly like their mother! In Nature, *M. formosa* lives side by side with other mollies, *M. sphenops* and *M. latipinna*. It was logical to conclude that the all-female species "used" the males of the others to propagate the race, the offspring never being hybrids but pure *formosa* just like their mothers.

For 12 years Dr. and Mrs. Hubbs carried on their breeding experiments with the Amazon mollie. In all, they bred about 8,000 of them, all female and all carbon-copies of the fish that bore them. The Michigan investigators found that the Amazon's mate did not have to be a mollie, but that when another type was used the number of offspring was decidedly less than when a species of mollie acted as pseudo-father. At least ten different, but more-or-less closely related, species have been mated with Amazon mollies and have produced not hybrids, but more Amazons. Evidently it is necessary that the Amazon mollie, or what is much more likely, its eggs, be stimulated by some physiologically compatible male before development can occur. The exact process is uncertain, but most probably the sperm "triggers" development of the egg but contributes nothing to the heredity of the new generation—and so "father" is really not the father. Biologists have found similar "fatherlessness" in a beetle and a few worms and have produced it experimentally under laboratory conditions in some frogs, newts and invertebrates. (They call the phenomenon gynogenesis or pseudogamy.) When Amazon mollies were microscopically examined, in an effort to find out exactly what was happening to their eggs, no direct evidence could be found, but this might have been because the cells of fishes are notoriously difficult to study under the microscope—much more so than those of frogs, insects and many other invertebrates.

At any rate, there were still many provocative, unanswered questions about how the Amazon mollie propagated itself and what was the exact genetic relationship between mother and daughter. In fact, the situation was so startlingly different from anything known to occur naturally in a backboned animal that some biologists expressed doubt about its very existence.

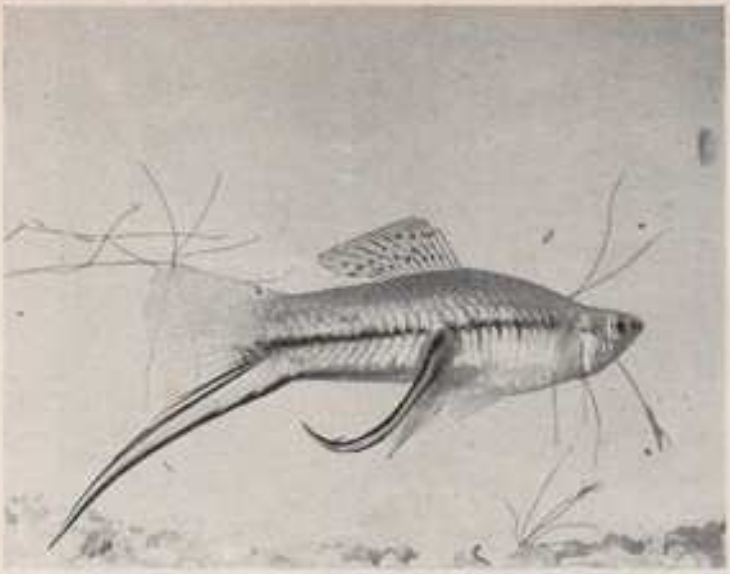
What was needed was some new way to analyse the problem, and Klaus D. Kallman of the Aquarium's Genetics Laboratory had developed a new technique exactly suited to this need. He had developed this new research tool for another purpose, but as is so often the case in science, it proved to be perfectly adapted for another, unanticipated task.

In 1953, Kallman was a new graduate student at New York University with a keen interest in the genetics and physiology of fishes. Naturally he sought advice from Dr. Myron Gordon, who was a member of the faculty as well as the Aquarium's geneticist. It was arranged that Kallman would do his research work in our Genetics Laboratory. When the time came to select a thesis subject, Dr. Gordon made a suggestion that was to open up a whole new field of investigation in the Laboratory. Why not, he asked, try to transplant fins between members of the inbred strain of common platyfish in the Laboratory?

Behind this deceptively simple suggestion lay a good deal of up-to-date biological theory, in addition to 15 years or more of painstaking, single-purposed effort of Dr. Gordon himself. Transplantation is not a new experimental procedure in biology; some of the pioneer experiments with endocrine glands and embryos involved the transplantation of organs or tissues from one animal to another. In medicine, too, skin grafting became an

A view of the Genetics Laboratory of the New York Aquarium. The Laboratory is situated in New York's American Museum of Natural History. Seen working amongst some of the Laboratory's 655 tanks is Dr. Klaus D. Kallman, research Associate in Genetics, who is continuing the work of the late Dr. Myron Gordon

Preparation of a platy for fin transplantation. It is placed on some wet cotton wool in a dish beneath a dissecting microscope; usually the head and gills are also covered with wet cotton wool during the operation



In the Genetics Laboratory of the New York Aquarium are maintained inbred swordtails as well as platys. This swordtail has developed an extra 'sword' after an early transplant of a tail fin

approved treatment for extensive burns, and bone grafts for use in orthopaedic surgery. In all of these procedures, however, successful permanent transplants or grafts could be obtained only if they were made from one part of a single individual's body to another, or between identical twins or members of the same closely inbred strain. (Embryos are often exceptions in that they do not react adversely to strange tissues.) Otherwise, although the transplanted, foreign tissue or organ might at first look healthy, eventually it would break down, disintegrate completely and disappear. The basis for this incompatibility was eventually shown to be hereditary, and in some cases could be traced to the activity of definite genes. The ability of the body to produce specific substances that destroy the foreign tissue that has "invaded" it is related to its ability to overcome disease-producing micro-organisms, but whereas doctors try to enhance the latter ability, there are times when they wish the body would not react to tissues belonging to other more-or-less unrelated individuals. If this defence mechanism could be circumvented, doctors foresee lifesaving "banks" of hearts, kidneys and other vital organs, just as blood banks are now a regular part of the medical scene.

Fish scarcely differ from man or mouse in this regard. Up to the time Kallman started his experiments, no one had ever succeeded in transplanting fins, or any other structure for that matter, from one fish to another. Dr. E. E. Held of the University of California showed that the dorsal fin of a common platyfish could be moved to its belly region, but that fins from another platyfish survived for less than a month. Held's work had led Dr. Gordon to suggest that the strain of platyfish he had been so carefully inbreeding for the past 15 years be used in a similar experiment. Dr. Gordon predicted that these fish, which had been systematically bred brother-to-sister for nearly 20 successive generations, would accept fins from each other as if they were their own, because he believed they were genetically as alike as identical twins. His prediction was abundantly fulfilled. As soon as Kallman had mastered the mechanical details, he was able to transplant fins with 100 per cent. success.

Since the summer of 1954, when he made his first successful fin transplants, Kallman has made thousands more of them. In the course of one series of experiments, he made almost 3,000 transplants involving about 4,000 fish. This work comprised his doctoral thesis and dealt with how genes function in affecting survival of transplanted tissues. In another series of experiments, Kallman determined that at least 12 genes were concerned in the reaction of the platyfish host to a foreign fin.

Having developed an infallible transplantation technique, Dr. Kallman could now use it to determine the genetic relationships between fish. In other words, if fin transplants between two fish were successful, it would be safe to assume that they were genetically identical, or very, very nearly so. This is exactly what biologists wanted to know about the Amazon mollie and her offspring! Are they genetically alike? And if each daughter is really a genetic carbon-copy of her mother, she and all her sisters must be in effect the same as identical twins. Transplantation tests on Amazons donated by Dr. Caryl Haskins, and their offspring, showed that in any Amazon family all the members are indeed alike, since fin transplants among them "took" without exception, while those involving fish

from different families did not. Each fatherless group could be considered a "clone," which is the biologists' term for the animals or plants descended from a single parent.

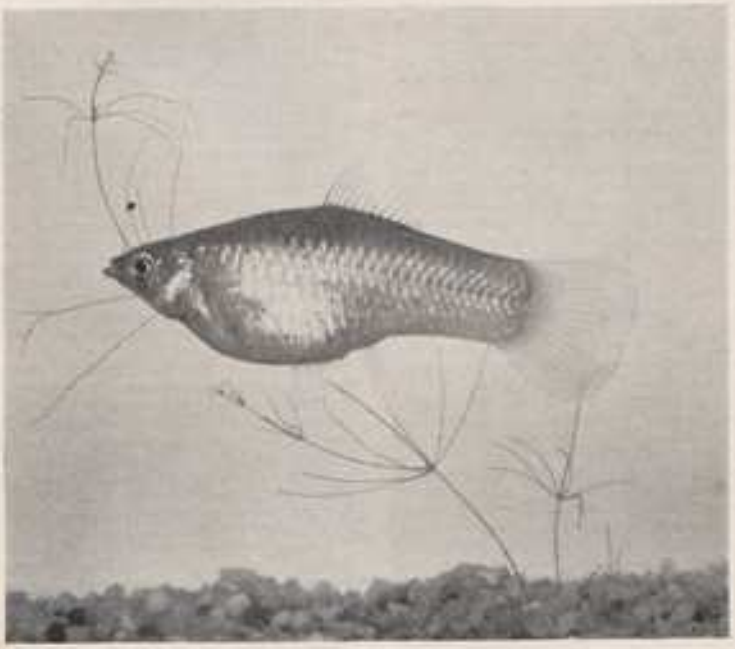
The next step was to obtain wild Amazon mollies for testing, which Kallman caught near Brownsville, Texas. Fin transplants showed these fish to be even more homogeneous than expected. All of them proved to be members of but three clones. The implications of this for evolutionary theory are too complicated to outline here; suffice it to say that they have given Kallman plenty of food for thought. One of his current projects is to obtain more samples of wild Amazons for testing. His transplantation test gives him the rare opportunity to describe the population structure of the species in Nature, which should in turn provide definite clues about how its unorthodox method of reproduction evolved.

Mention ought to be made of the fact that once in a great while, a male *Mollienisia formosa* turns up. If and when Dr. Kallman gets a chance to test one of these and its offspring (supposing that it does actually contribute to the heredity of the young) a better understanding of the significance of such masculine rarities will be forthcoming.

Last year Dr. Kallman's fin-transplantation test enabled him and Dr. John Kilby of the University of Florida to prove that true parthenogenesis can occur in fish. Dr. Kilby was conducting extensive breeding experiments with mosquito fish (*Gambusia affinis*), and two females that he was sure were virgins had thrown a few young. In such cases, there is always the nagging possibility that somehow a male got in and out of the female's aquarium unseen. To clinch the matter, Kallman made a trip to Gainesville and transplanted fins from the young fish to their mother. They "took", thus demonstrating that no male had contributed to the heredity of the off-spring to make it different from that of the mother. Dr. Kilby's case for parthenogenesis is air-tight now.

Fins are not the only structure that Dr. Kallman has been able to transplant from fish to fish. Skin, scales, pigment cells, heart, spleen, kidney, gonad and pituitary gland have all been removed from one fish and made to flourish in another. Thyroid tumours and pigmented cancers (melanomas) have been transplanted from sick to healthy fish. The possibilities for new experiments seem endless. For example, Dr. Kallman is inbreeding a strain of hybrid origin that regularly develops a melanoma on its dorsal fin, which is an ideally accessible location for observation and transplantation. With these and other special strains—some already in existence in the Laboratory, others to be made-to-order—Dr. Kallman is planning critical experiments on the origin, migration and development of normal and cancerous pigment cells. The Genetics Laboratory stands on the threshold of exciting and fruitful times.

(First published in "Animal Kingdom," U.S.A.)



An Amazon mollie (Mollienisia formosa), caught in the San Marcos River, Texas. It is a female, as are more than 99 per cent. of this species

An Aquarium Control Panel

by P. LEE

MOST fish-keepers take a great deal of trouble over the appearance of their tanks, especially those of us who have managed to gain a foothold in the living-room.

Unfortunately, in most cases a peep "round the back" all too often reveals a tangled mass of wiring with flex and switches at intervals for pump, lights etc.

For some strange reason, several visitors lately have shown excessive interest in my air pump, causing me great embarrassment at the state of my own wiring when they have peered "round the back." At last I decided to make the effort to neaten up the job with the result described here. The facilities required were: (1) some attempt at earthing (does your face go red, too?); (2) easy switching of the air pump; (3) easy switching of lights; (4) facilities for controlling the intensity of lighting (if the cover houses two lamps, why not use them to full advantage?).

To produce these facilities a circuit was designed (Fig. 1). The series/parallel switching for the dim and full lighting may look a little confusing to the uninitiated, but the wiring diagram (Fig. 2) should sort out any difficulties. No switching has been provided for the heater-thermostat circuit for obvious reasons. It has been assumed that the thermostat will be connected here, and the thermostat lead broken to connect the heater, as is done by some thermostat manufacturers.

Attention was then turned to the method of construction. A small wooden box could be used or made, but I used a Christmas gift toffee tin. The tin was turned upside down and a piece of Formica offcut was obtained (from a local handicraft shop) and cut to fit into the bottom of the tin on the outside. This material fitted in perfectly, within the ridge round the bottom edge of the tin. This provided a box with a Formica front panel (as the Formica will be retained by the fixing nuts of the switches it need not be glued). At this stage it is as well to consider how the completed box is to be secured.

In my case, the tank stands on a wooden table, and the box was to be secured to the cross member which runs across the front, below the front of the table top, as in Fig. 3. It is as well to mount the box at this stage so that the holes for the securing screws are decided upon, also the positioning of the components. With all this decided, the box is removed and the components are fitted. The switches S1 and S3 can be ordinary single-pole toggle or even push-push switches. The series/parallel switch S2, however, must be a double-pole double-throw toggle switch (obtainable from radio dealers or government-surplus suppliers). Needless to say, all switches must be for mains voltage. The connections into and out of the box are made via a 12-way connecting block (obtainable from Woolworths). A small piece of Formica left over from the front panel can be fitted under the terminal block (it should be of the same length, but wider) to provide some insulation from the tin beneath, in case of a wire strand working loose.

When all internal components are fitted, the internal wiring may be carried out, using only wire with insulation intended for mains voltages. Special care must be taken to avoid "whiskers" when making a soldered connection and when connecting wires into the terminal block.

It will probably be easiest to connect the external wiring before finally securing the box. Of course, the mains cable should not under any circumstances be connected to the mains until all work is fully completed, and the box secured ready for operation.

Anyone who already maintains a tank will be conversant with the normal tank wiring, but the earthing arrangements call for some comment. The ideal method, of course, is to drill a small hole in the top rear member of the tank frame, and after cleaning down to bare metal around the hole, to connect an earthing lead with nut, bolt and washers. The metal stand, if used, is treated in a similar manner. With a tank in use, however, this is not a practical proposition, so I suggest the following alternative as a temporary measure until the tank is next completely emptied.

First, siphon out as much water as possible, then slowly and carefully slide the tank sideways or backwards until an inch or two of the underside of the bottom rear frame member can be scraped free of paint. The tank is then carefully slid back into position with a piece of thin brass or copper foil under the tank to make contact with the frame at the point where the paint has been removed. A wire is connected to the foil as an earthing lead.

When all wiring is completely finished, carefully check everything. When you are fully satisfied, check it all again. Remember, you are dealing with the mains supply.

Before fixing the completed box, any lettering round the sides of the tin is, of course, painted over. Fasten the box in its operating position and fit the rear cover. If you are using a toffee tin, then this rear cover is, of course, the original lid. This cover will need to have part of one edge cut away to provide access for wiring to and from the box, and if it is metal, great care must be taken that there are no sharp edges which could damage wires. The mains may now be connected, and the device tested. It is important that the two lamps used should be of the same wattage, or the "dim" and "full" arrangement will not work satisfactorily.

It will be seen that in a community tank some fishes look better in a dimmer light, but the main point to me is that if the lights are regularly dimmed before being turned out for the night, then the fishes soon get used to this warning. Not yet having reached the stage where I think like a fish (despite my wife's comments), I cannot say whether they consider this to be any advantage, but surely it must be disconcerting to be suddenly plunged into total darkness, at night, with no more warning than the vibrations of the switch being operated.

A more comprehensive panel could easily be made for, say, two tanks, simply by duplicating everything and mounting all switches on one panel.

For anyone not using a fused plug at the mains supply a small cartridge fuse-holder could be obtained (at a radio dealers) and wired into circuit where indicated in Fig. 1.

Who knows, the domestic harmony introduced by tidying things up a bit may even result in permission being granted to instal an extra tank!

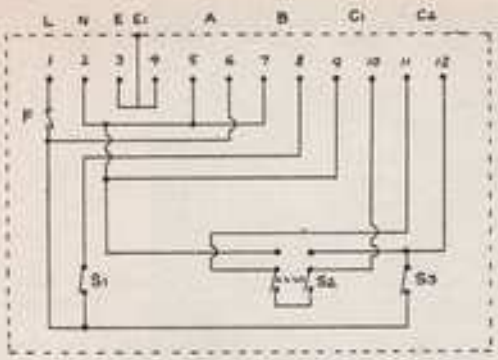


Fig. 1. Electrical circuit for the control panel. The mains input is at points 1, 2 and 3 (L, live; N, negative; E, earth). E_1, Tank earth; A, heater-thermostat connection (5 and 6); B, aerator connection (7 and 8); C_1 and C_4, cover lamps (9, 10 and 11, 12). F is a fuse. S1, S2 and S3 are switches for aerator, light-dimming and light on-off control respectively

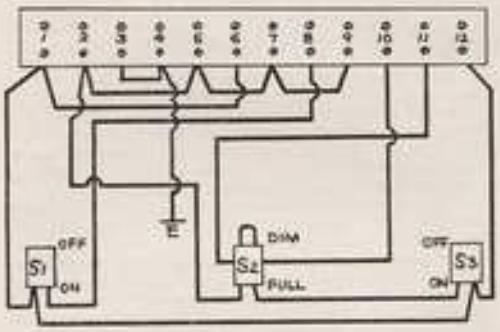


Fig. 2. Diagram of wiring used for the circuit shown in Fig. 1. E, Earth wire soldered to control box if this is of metal. S1, S2 and S3 are the switches identified in the caption to Fig. 1

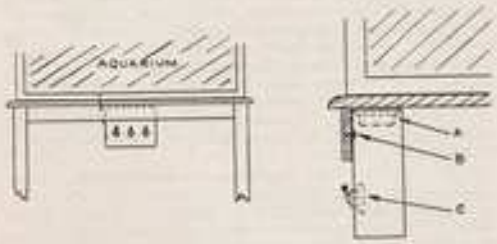


Fig. 3. Control panel and box fitted in position beneath the aquarium (front view, left; sectional side view, right). A, Terminal block; B, fixing screw; C, switch

BOOK REVIEW

Living Fishes of the World by Earl S. Herald. Hamish Hamilton, London. 304 pages, 300 illustrations. 63s.

THIS book is one of an excellent series written in the United States, which is intended in time, to cover the whole animal kingdom. A feature of these volumes is the superb photographs, of which in this book 145 are in full colour. I was most taken with photographs of a moray eel (*Gymnothorax mordax*) visiting parasite-removing shrimps (*Hippolysmata californica*), the incubation of eggs in the mouth of the male sea catfish (*Galeichthys felis*), parasite-removing wrasse and superb photographs of various scorpion fishes (*Scorpaena*) and cryptic angler fishes (*Antennarius* and *Histrio*).

The reviewer would especially wish to recommend this book to the aquarist who really wants to know about the wonderful diversity in fish life. Each group is treated in turn and the text is crammed with "out of the way" information. Dr. Herald writes about the favourite species of tropical fish fanciers, others that locate food and obstacles by discharges from electric "batteries," a fish with spines more deadly than a rattlesnake's fangs, and fishes with luminescent light that they can turn off and on. The author is at pains in the Preface to explain that his approach is different. He writes: "In the text an effort was made to avoid going over material ably covered in many books on tropical fish, and more emphasis is placed on groups less often covered in popular works. The text is organised along systematic classification lines, following the scheme long used by the British Museum but with some modification based on recent revision."

Despite its high factual content and strict scientific accuracy, the text is most readable and herein lies its strength. Dr. Herald has managed to write about the lesser known aspects of fish life in a most enthralling way. He is Curator of Aquatic Biology at the California Academy of Sciences' famous Steinhart Aquarium in San Francisco. His interest in fishes has taken him to many parts of the world.

I would like to commend *Living Fishes of the World* as one of the most successful texts on fishes that I have read.

H. R. B.

Cacti in the Fish House

DO not start watering cacti too early in the year. Wait until they show signs of growth. Give only enough water at a time to dampen all the soil in the pot thoroughly and do not water again until the soil is quite dry. If cacti are continually watered the roots will rot and the plant dies.

CACTI can be propagated by various means. Many of the globular types make small off-sets which can be taken off and rooted. Others such as the *Epiphyllum* can have stems cut off, dried at the cut and rooted. Most pieces of cacti will form roots if properly treated. When a piece is cut off it must be laid on the bench until the cut part has formed a covering "skin." Then place it on a mixture of peat and sand, and water the pan in which the pot stands. Roots will soon form, when the cutting can be potted on into normal compost.

The Sargasso Fish

by JOHN BOURSOT

PASSENGERS from the West Indies on vessels sailing north across the Sargasso Sea gaze out over a vast and lonely waste of water. Away to the horizon and beyond, the deep blue ocean rolls with a broad and heavy swell under a white tropical sun. Striding briskly over the water surface, little oceanic pond skaters (*Halobates sericeus*) skim about in search of food, investigating bits of driftwood or the discarded feather of a sea bird. Shoals of steely-blue flying fish leap from the water and sail through the air to safety like fleets of tiny gliders. Related to the jellyfishes, small convoys of by-the-wind-sailors and Portuguese men-of-war dangling from gas floats spread little iridescent sails to catch the breeze of the north-east Trades, as they ride up the waves on one side and slide down on the other. Occasionally a school of dolphins will race the ship at 30 knots an hour, effortlessly streaking along like black torpedoes beneath the wave that curls and thunders under the bows. And on every side for days at a stretch clumps of brownish yellow seaweed float by in tangled masses and long windrows that hang like tattered ribbons in the clear bottomless water.

Photos: R. F. L. Stoughton

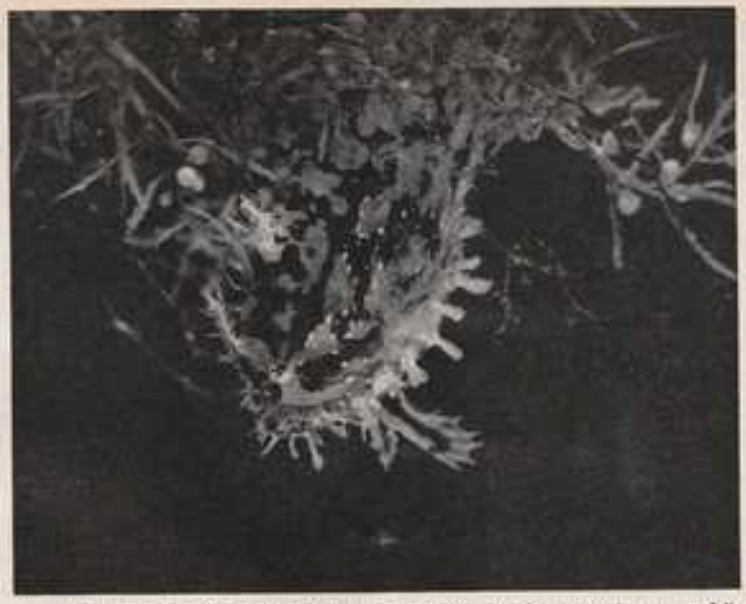
Sargasso fish swimming free beneath the seaweed in which it spends so much of its time foraging for food

One of 150 species, this seaweed, mostly *Sargassum bacciferum*, may reach a yard in length, and consists of a "stalk" or tallus with innumerable lateral outgrowths differentiated as leafy segments, air bladders, and spore-bearing bodies. Should the weed be thrust too deep, as by storm waves, for instance, the air bladders implode and it begins to sink.

The Sargasso Sea is continuously circulating clockwise over a section of the Atlantic almost as big as continental Europe. Slowly, imperceptibly, the water advances upon its journey bearing along the seaweed with its remarkable and in some instances peculiar fauna. The barnacles (*Lepas fascicularis*) and bryozoa (*Membranipora tehuelcha*), like the tiny colonies of hydroids (*Zanclea costata* and *Setularia cornicina*) that crowd the seaweed like the spines on gooseberries, are permanent fixtures. Soft brown Sargasso slugs (*Scyllaea pelagica*) with two pairs of leaf-like blades for gills, and intriguing little Sargasso crabs (*Planes minutus*) so closely resemble the weed as to be indistinguishable from it. Pretty Sargasso shells (*Litiopa* sp.) glide smoothly about the floating masses, undaunted by the large Sargasso pipe-fish (*Syngnathus pelagicus*), whose richly mottled seaweed pattern conceals its whereabouts, as with watchful eye it lies thrust among the stalks and leaves in wait for food.

Common among the drifting rafts is the mouse-fish, so called because of the elongation and modification of the hypercoracoids and hypocoracoids into wrist-like processes bearing the 10-"fingered" hand-like clasping pectoral fins, which enable the fish to stalk the weed for prey. A more common name is Sargasso fish, in allusion to its weed-like appearance. Here Nature has surpassed herself in camouflage. The fish's scaleless body and intricate white and brown markings appear continuous with the shifting patterns of light and shade in the weedy labyrinths; the leaf-like tabs of skin on the head, the lips and the belly duplicate the leafy outgrowths of the weed. The fish can also enormously reduce or intensify its colour. The dorsal fin is thick and fleshy, the first spine being modified into a betasselled lure on the head, the badge of the Order to which it belongs. The thick stumpy jugular ventral fins, standing out at right angles to the body, are slung from a low fleshy eminence, and are used as legs. The anal fin is extremely thick and fleshy, and the eye is small and unobtrusive.

The Sargasso fish, the shallow-water batfish (*Opcocephalus*), the angler (*Lophius*), with its recurved depressible teeth, found as deep as 2,190 ft., and those fantastic, long-fanged, often luminous-mouthed, shapeless nightmares, the deep-sea anglers (*Photocorynus*, *Melanocetus*, *Linophryne*, *Lasiognathus* etc.) belong to the Order Pediculati. All are distinguished by the modified hypercoracoids and hypocoracoids already referred to, jugular ventral fins and



Sargasso fish emerging from a tangled mass of seaweed. The fish harmonises successfully with its surroundings.

a lure or illicium with a fleshy bait or esca at the end. The gills are entirely encased in the skin of the body, and do not open to the exterior in the usual way, but through a small orifice behind or near or on the pectoral fins. All members of the Pediculati are highly specialised and beautifully suited to their remarkable ways of life. The large black deep-sea anglers, for example, living in the perpetually cold and pitch-dark middle depths of the ocean, or prowling the ocean floor 3 miles down, have luminous lures which glow with a mauve or blue-green or yellow light according to the species, and are all females. The odds against the meeting of the two sexes in the thousands of square miles of utter darkness are so great, that when a tiny male does find a female he fastens on to her anywhere with his mouth for life. Turning into a complete parasite, his organs, except those of reproduction, degenerate, his flesh becomes one with the female's, his blood vessels join with hers and his only function is to fertilise the eggs.

Nevertheless, despite the Sargasso fish's special requirement of a life at or near the surface of the open ocean, and its ability to withstand days and weeks of fierce insolation, or raging storms and mountainous seas which cripple the largest liners, it is an excellent subject for a small home aquarium.

At least five species of Sargasso fish are recognised: *Histrio histrio* and *H. ranina* are East Indian and Pacific forms; *H. gibba* and *H. jagua* hail from the West Indies and Bermuda; *H. pictus*, the subject of this article, is the common Atlantic form from the Sargasso Sea.

The Sargasso fish, which must be shipped by itself, travels well and upon being unpacked will readily accept a meal while still in the plastic bag. The temperature of the aquarium should range from about 75° to 80°F, and the rockwork should be so arranged as to provide plenty of free swimming space. Shells and an odd piece of brain coral will add interest to the scene, but sharp or pointed branching coral, especially in thickets, must be avoided. Accustomed to clamber about in soft masses of floating seaweed, the Sargasso fish might be tempted to try the coral thickets with deplorable results. It lacks the agility of true "coral fish." Although Sargasso weed dies in the aquarium the Sargasso fish thrives and quickly becomes tame. A 15 gallons tank for a 1½ inch fish is sufficient to start with, but a larger tank must be provided in course of time as growth is exceedingly rapid. A 1½ inch baby which I purchased almost reached 7 inches in 3 months. The fish is quite disease-resistant.

The Sargasso fish's favourite food is live fish, which are gulped down whole, often of a size almost equal to its own. It is an inveterate cannibal, and must, of course, be kept alone. For convenience I use red flag mollies as food, stunning them slightly to expedite their capture and so avoid the possible danger of a spreading outbreak of white spot on the mollie as the result of a too long sojourn in a hostile element. When hungry the Sargasso fish will approach the mollie with slow steady deliberation, moving the tail fin in a series of small quick ripples. When close to the prey it slows down to something almost imperceptible. Tail movements stop, but the Sargasso advances nevertheless. Using the gill pore at the base of the pectoral "arm" for jet propulsion, the fish now moves with the quiet stealth of an hour hand. Suddenly there is an explosive thrust, jaws flash and all is over. Should the Sargasso fish and the mollie be of almost equal length, the Sargasso fish will seize as much as it can of the mollie in the first gulp. What happens next is an amazing sight. The remainder of the mollie, still wriggling, is gradually drawn down into the stomach, which accommodatingly stretches to the required dimensions. With the feat of gluttony successfully

accomplished and the eyes of the mollie clearly visible inside it, the captor immediately becomes the picture of docility and innocence. And although it is convulsed from nose to tail by the violent if short-lived struggles of the stupendous meal amidships, it weathers the upheaval with a dignity and unconcern that is the envy of princes. Large prey is always seized by the head for obvious reasons. Live earthworms are accepted, and raw shrimp is readily taken from the end of a toothpick when the Sargasso fish has become tame.

In order to appreciate fully the Sargasso's cavernous mouth it has to be seen yawning. It is like looking into the gaping jaws of a great war plane ready to load jeeps and tanks when the entire head seems to open up, and one is left with the impression of also having seen the stomach.

The Sargasso fish is a common species and does not have to be collected hundreds of miles from land. Of the enormous amount of seaweed blown off its course, a considerable quantity reaches the shores of the south-eastern United States, where it may be intercepted by a rowing boat a few hundred yards from land, or picked up among the bathers at the edge of the water. I have seen Sargasso fish collected in a foot of water at Crandon Park beach, Miami.

Examination of these masses of weed when hauled from the water is apt to be disappointing as the Sargasso fish is "never there." Nonetheless, when each bunch is picked to pieces and shaken out in a bucket of sea water a number of Sargasso fish along with small file-fish and other exciting creatures will very likely appear in the bottom.

It is encouraging to recall that the Sargasso fish has been bred in captivity. And although it appears that none of the fry survived, it is a challenge to the stout-hearted aquarist, and speaks well for the adaptability and "plasticity" of this highly specialised species, which with normal care will live for years in the home aquarium.

The Blind Cave Fish

(Anophtichthys jordani)

by AQUARIUS

THIS characin, from caves near San Luis Potosi, Mexico, resembles *Astyanax fasciatus* in shape, and attains a length of just over 3 inches. The male is slightly smaller than the female and is more slender. The fish has little colour, being rather transparent white to pink. There is a mark on the caudal peduncle on young fish similar to that seen on many fish in youth, as the yearling green tench. The lack of eyes makes the fish a very odd one indeed and it is certainly far from attractive. In fact the fish has a gruesome appearance and would have little appeal to aquarists except that it is totally blind. It is thought by some people that these fish became trapped in dark underground caves, where there was no light at all, and over many thousands of years during which the fish had no use for eyes, these organs gradually became superfluous and so disappeared. To-day they have only a faint dark mark to show where the eye should be.

A feature that causes some astonishment is that although the fish is quite blind it is able to swim about among rocks and other fishes without colliding with them at any time. It seems as if they have some special organ which determines the proximity of other objects, such as the bat has for use when flying at night to enable it to dodge objects in its path. Another surprising feature is that the fish can find its food without difficulty and in captivity is no trouble at all to feed. It is not particular about type of food and can be kept with other fishes and fed on the usual type of diet. There is no need for special water as the fish does not appear to be troubled either by slightly acid or alkaline water. As for temperature, as the fish lives normally in an underground cave a lower temperature than that given to most tropicals can be tolerated with ease.

The cave fish can be bred in captivity but there are one or two snags which make this fish rather a challenge to breeders. One point to watch is that the parent fishes are avid eaters of their own eggs. The experienced aquarist knows how to deal with this fault but the difficulty with this fish is that it will spawn only in the dark. The eggs fall from the female after the male has rubbed itself along the side of the female. The eggs are not adhesive and drop to the bottom of the tank, where they are searched for by the parents. Some eggs that were laid after the male fish had been removed have been known to hatch, which indicates either that the male sperm is able to live for long periods after having been ejected or else that the female fish is able to use the sperms at the time of spawning.

The main task of the breeder is then to ensure that the eggs are not eaten once they are laid. The usual crop of marbles or pebbles on the bottom or a glass-rod trap can be used. If the pebbles are used they should be of sufficient depth to stop the fish from sucking the eggs up through them. The water does not have to be too warm for spawning, which has been known to take place at from 65° to 75° F. The fry hatch on the fourth day at a temperature of about 70° F, and become free-swimming in about a week. They are able to find their foods, the usual Infusoria or substitute, and will grow quite quickly if well fed on gradually increased sizes of foods. They may breed at about 4 months of age if they have been correctly reared.

As the fish spawn in darkness it can be realised that it is not easy to know when spawnings are taking place so that the parent fishes can be removed afterwards. However, a little ingenuity will enable the aquarist to provide a suitable spy-hole in the tank covers so that an occasional inspection can be made. The successful rearing depends almost entirely on preventing the parent fishes from eating the eggs and if that can be overcome there is no reason why these odd fishes should not be bred.

Movements in Aquatic Plants

by Dr. R. O. B. LIST

GOOD heavens, I'm tired. I must have an early night. How many times have you said that or something similar? Why should the subject of sleep interest the aquarist? Fishes don't sleep, so we are told, or do they? No, of course they don't sleep, as they can't close their eyes. That is what we sometimes hear and see in print.

It is difficult to define sleep, that is the nightly sojourn in bed, or, for that matter, the daily sojourn if we are nightworkers. If that is a complete rest, then we must include the annual close-down, or change in our daily affairs, which we call holidays. We can also include the relaxing in our favourite chairs, if we become limp as a piece of wet string, but we are instantly awake if a certain rhythm is broken.

The medical profession have for a long time expressed interest in a forced form of sleep for certain medical conditions, and one can enjoy, if that is the correct word, a complete divorce from all worldly cares by having enforced sleep as a holiday.

Again, why should aquarists think twice about sleep for fishes and plants? We switch our tank lights on at various times and then switch them off again. Every day for 7 days a week, for 52 weeks each year and every year, until either the fishes or plants die, or we give up the hobby. Thereby, we expect our fishes and plants to be at our beck and call. Is this correct? Have we the right to govern conditions in our tanks, because many of us do not rightly know what conditions should be like.

Now have a chat with the gardener. He rests his plants, particularly his bulbs. He feeds his plants in some form or another. In general he nurtures them. And the aquarist? What does he do? Well, ask yourself.

The intelligent aquarist will, of course, have noticed a difference in certain plants at various times. If you haven't done so, make a study of your *Cabomba*, *Limnophila*, *Ludwigia*, *Nymphaea* and your *Hygrophila*. You will then notice leaf movements, particularly in the core or heart leaves. These movements are called nyktimastic or daily period movements. In the evenings the leaves will tend to close and in the mornings to open again. As the average aquarist looks at his tanks in his leisure hours, it usually means that it is at these times that they will be lighted. Not many of us get up during the night to look at tanks, unless we are insomnia prone!

It naturally follows that the opening and closing of the leaves, when observed during lit times, could mean that the lighting times control such leaf movements.

In various tests made on this subject, it has been proved that the leaf movements change every 12 hours. However, if you change your lighting periods from light to dark during day-to-night periods, and to light to dark periods during night-to-day periods, you will find that the same leaf movements take place each 12 hours, and the rhythm remains the same. These movements also take place when the tanks are completely dark, day and night.

You will note that some of your text-books record Linnaeus referring to "flower clocks." The botanist will also know of temperature control in the plant world, i.e. the forcing of plants and bringing bulbs into warm rooms at certain times.

Tests on aquatic plants have shown that temperature changes, although affecting plant life in a variety of ways, do not necessarily alter the leaf-movement rhythm. What therefore causes the nyktinastic movements?

I consider that there are two causes, that are independent of one another, yet neither cause performs its function on the same plant at the same time.

Various plants have tissue suitable for great ease of movement without breaking. Through the increase or decrease of cell pressures in the plant, the soft "movement tissue" either raises or lowers itself. Consider the *Mimosa pudica* plant.

Those plants that do not have such soft tissues, must therefore have other means of movement. The younger the plant, so the greater is the leaf movement, as opposed to that in older plants. Therefore growth is also a factor to consider. This can be confirmed chemically. The influence of light develops the supply of auxin in younger plants, and this substance spreads itself throughout the plant. The properties of auxin are various but the more important one for our purpose is that auxin increases the porosity of the young cells in the plants. This, of course, gives growth, but we know that the growth hormone is not systematically placed in equal quantities all over the plants. We therefore get the raising and lowering of the leaves at regular intervals in correct rhythm to the all-over spreading of auxin in each plant and its division throughout the plant.

Now we must ask ourselves, can we hinder or stop the spread of auxin, despite the use of light? Selective controls used on various types of plants have shown us that growth takes place only at night and in the dark. Never at night in the light, or during the day in complete darkness.

We are all familiar with plant functions in relation to gases, known as assimilation and dissimilation. These also function at regular periods and we therefore consider that the 12 to 13 hour lighting period for plants is the ideal period of activity. Longer uses of light are apt to break the movement rhythm as the combination of causes then becomes irregular. This is difficult to put under scientific control, but logic tends to show a marked similarity to that which happens at times to humans.

Taking as an average for a human that a day consists of

16 hours' activity of various sorts and 8 hours' sleep, out of every 24, this gives us 112 hours' activity and 56 hours' sleep each week. Ever tried working 112 hours non-stop and sleeping 56 hours in one go? Do you want another poser? Go to bed each evening at 9 p.m. and get up each morning at 5 a.m. on alternate days, and sleep from midnight to 8 a.m. on the other days.

Don't just wish for the best of plants. Go out and do something for them. Get to know their ways and obey their laws, which after all, are of course, Nature's laws. It will repay you.

We buy our plants, plant them in our tanks and usually leave them. We wish them well and keep our fingers crossed. An aquarist should make it one of his rules, that such treatment is not enough. Take a little time and give the matter some thought. The results will surprise you.

The Diamond Tetra

by J. STOTT

ALTHOUGH it is true to say that the diamond tetra (*Hemigrammus pulcher*) is not the easiest of fish to spawn one would not describe it as a really difficult breeder. What appears to help is to use a pair that are the result of self-selection and over 12 months old. To get such a pair it may be necessary to obtain five or six young fish at about 3 or 4 months of age and grow them on together, feeding on plenty of live food, particularly finely shredded earthworm. For dry feeding use dried *Daphnia* and Bemax.

Diamond tetra

When conditioning the pair, separate them by a glass partition in a tank containing clear water at a temperature of about 75° F. Plenty of finely chopped earthworm and live *Daphnia* should be given and the conditioning should be carried on for at least 9 or 10 days. During this period the breeding tank (24 in. by 12 in. by 12 in.) can be prepared. First of all the tank must be thoroughly sterilised and then filled to a depth of about 6 inches with rain water that has been passed through a filter paper. This water should be adjusted to give a pH reading around 6.6 before it is poured into the tank.

Willow root, weighted down along the rear half of the proposed breeding tank, may be used to receive the eggs but this must be sterilised by boiling before it is used. The back and end panels of the tank should be shaded and the temperature set at 80° F. Allow the breeding aquarium to settle and the water to mature for about a week before introducing the breeding pair. Several days may elapse before any activity occurs but when it does the actual spawning takes place quickly and will in all probability be over in an hour. During this period, however, there is much activity in and about the willow root, where eggs will be deposited. Some of the eggs adhere to the willow-root fibres but quite a large number will fall to the bottom of the tank, for the eggs appear to be only semi-adhesive.

When the spawning is completed remove the breeding pair and shade the front panel in the same manner as the back and end panels. The top glass should also be covered. Hatching should occur in about 36 hours and the fry should be free-swimming in 3 days, when the top and front shading can be removed entirely. Commence feeding with Infusoria as soon as the fry are free-swimming, and green water is also to be recommended. At the end of 14 days begin to decrease the Infusoria and green water gradually and introduce brine shrimps. In another fortnight micro worms can be given and, as growth permits, change the diet to white worms.

The diamond tetra is, in a quiet sort of way, an attractive fish but always looks best when seen shoaling in really clear water and a bright top light. When fully grown they are about 1¼ in. in length and quite suitable for the community tank.

"Hawaiian mouthbreeder"

Observations on the Hawaiian Mouthbreeder

by BARRY R. JAMES

IN his article "Reflections on the Cichlids" (*The Aquarist*, October), I was rather surprised to read Mr. H. Loder's comments on the new fish recently imported under the name of the "Hawaiian mouthbreeder." He stated "The 'Hawaiian' mouthbreeder (just what species this fish is, scientifically speaking, no one seems to know) is really new but there is nothing about it except newness. I don't predict much of a future for it."

Two months ago I ordered a trio of this species from my wholesaler, out of curiosity. On arrival they were just over an inch long, coloured a greyish brown with several vertical bars on the sides and a prominent eye spot on the rear portion of the dorsal fin. Typically cichlid in shape, they were dull, uninspiring creatures. However, I decided to give them a run for their money and removed them from the quarantine tanks and transferred them to one of my private aquaria.

I gave them a 24 in. by 12 in. by 15 in. tank well planted with *Hygrophila*. I placed a couple of inches of gravel and a flower pot in their abode as extra furnishing. They proved to be very timid, only venturing out of the thickets at mealtimes, when they fed ravenously on a diet of *Tubifex* worms, *Daphnia*, chopped earthworms and boiled duckweed.

The fish grew rapidly and at the end of a month had nearly trebled their size. They had now lost some of their shyness and were very active, constantly rooting in the gravel in their search for food. The eye spot now gradually began to fade and more yellow began to appear in the body coloration. After a further 2 weeks had passed I judged the fish to be around 4 inches in length, so rapid was their growth.

Then quite suddenly the largest fish began to grow much darker in colour and within 2 days had turned jet black. The edge of the dorsal fin took on an orange hue and a band with a reddish tinge at the rear portion of the caudal fin appeared. The pectorals were pinkish and the lower jaws an ivory colour. I was, of course, delighted, and overnight my Hawaiian mouthbreeder changed from the Cinderella to the most admired fish in my collection.

I then took a closer look at all three fish and discovered that the transformed fish and one other had longer and more pointed dorsals than the third fish, so I assumed that I possessed two males and a female, which ultimately has proved to be correct.

The following day the black fish began to scoop a depression in the gravel until he reached the glass bottom. He did this by sucking in mouthfuls of gravel from the chosen spot and transporting it to the opposite corner, where it was deposited in a neat pile. This process was continued until a hole some 8 inches in diameter was formed.

This task completed, he began to court the fish I assumed to be the female. He went about this in the most peculiar manner. There was no locking of jaws as is usual in many cichlids. The male simply swam around the female at an angle of about 75 degrees to the horizontal and performed a "ceremonial dance", wagging his tail furiously and attempting all the time, so it seemed, to guide the female towards the nest. There was no actual physical contact and no aggressiveness in the male's manner. When the female did approach the nest he became most excited and commenced to shovel the gravel furiously in an attempt to deepen the nest, leaving off only to continue to woo the female if she showed signs of losing interest in his endeavours.

During the next few days I watched eagerly for signs of

spawning, with no result. Then complications set in. Overnight the second male assumed breeding colours. Up to this time the first male had showed little interest in his rival but now he decided that the time was ripe to assert his authority, and began to chase the other male around the tank. However, the second male did not take kindly to this treatment and retaliated. No damage was done to either fish and sometimes they would merely circle around one another, head to tail, for 3 or 4 minutes at a time.

Meanwhile the female, seemingly alarmed at the turn of events, retired amid the plants and refused to come out except to feed. About this time I decided it was time to remove them to larger quarters.

I selected a 36 in. tank arranged similarly to the first, and transferred the fish. This time both fish began to excavate nests in close proximity to one another. Their antics at this time were rather ludicrous, in that they would peep over the edges of their holes every so often to see how the other was progressing.

Finally the female made up her mind, swam to one of the nests and began to assist in the digging operations, much to the delight of the owner. The rejected suitor immediately gave up in despair and retired to a corner of the tank. Within a few hours he lost his vivid colours and became a very drab fish.

This is it, I thought, and waited impatiently for the expected spawning. However, once again I was disappointed, as after a couple of days the rejected fish made a comeback, assumed breeding colour once more and drove his rival off.

Up to the time of writing breeding has not taken place, to my great exasperation. However, please Mr. Loder don't write the "Hawaiian mouthbreeder" off just yet. I believe this species to be very interesting indeed.

I have been informed by the importer of this species that the original breeding stock came from Hawaii, although he assumes that they were taken there from Africa as a food fish by the United Nations as part of their plan for feeding underdeveloped countries. They belong to the genus *Tilapia* but the species has not yet been determined.

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.

I have stocked my community tank with angel fish, guppies, black widows, mollies and mosquito fish. Will these fishes get along all right together?

So long as your aquarium is thickly planted along the back and ends the livebearers should do very well, and you may even save some of the fry of every brood delivered by the females. But in a thinly planted aquarium, the mosquito fish will come in for some bullying. If your angel fish and black widows are small, say, under 2 inches long, they will not cause any trouble. But angel fish and black widows larger than 2 inches will bully, and maybe kill, small fishes such as male mosquito fish and male guppies.

I planted several *Vallisneria spiralis* in my tank, but in less than a fortnight the leaves turned brown and disintegrated. The stumps of the plants remain green. Should I uproot the plants, and set a different sort of plant in their place?

Vallisneria often takes a little while to establish itself in the aquarium. If the crowns of the plants (that is, the part where the leaves join the rootstock) look alive and healthy, do not uproot them. Given sufficient bright light, they will soon throw out new leaves and develop a strong root system.

Is *Hasemania marginata* suitable for a community tank maintained at a temperature range of 72-75°F?

H. marginata is quite at home in the average community tank. It is easy to feed on dried or live foods, and is hardy enough to stand a temperature down to about 65°F.

I would appreciate some information about the breeding habits of *Pterolebias longipennis*.

This highly interesting species deposits its eggs in sediment or peat layering the floor of its aquarium. At a temperature of 78°F the eggs hatch out in about 12 weeks, and the large fry can be fed on brine shrimps, mosquito larvae and so forth right away. Some breeders claim that healthier fry are produced if the newly laid eggs are removed from the water and stored in jars of moist peat (at about the same temperature as the aquarium) for a month or two. They are then returned to the aquarium to finish hatching out.

I have just bought two small tiger oscars. Although both of them eat well and are in good colour, one of them stays a lot near the top of the water and vibrates its body as though it is shivering with cold. What is wrong with it?

We suspect that your baby oscar has contracted a chill. The best thing you can do is to keep it in shallow, slightly saline water for a few days. So long as it is not too badly affected, it should recover before a week is out. Gentle aeration and a little extra warmth will help it along the road to recovery.

I cannot find any information in my books about fishes belonging to the genus *Clarias*. I have two small *Clarias* catfish in a 12 gallons tank, and would appreciate all facts you can tell me about them.

These eel-like catfish will eat anything, and are extremely active after dark. They are exceptionally hardy and have a temperature range of roughly 60-90°F. Small specimens will not molest other fishes, but medium-sized to large specimens will swallow tiny fish on sight, that is, if they are hungry. Strictly speaking, fishes of the genus *Clarias* are best kept by themselves because aside from their rapid growth, and increasing need of swimming space, they uproot plants and muddy the water by burrowing in the compost. Full-grown *Clarias* catfish often exceed a foot in length.

A few days ago I purchased a paradise fish. I am rather worried because it persists in lying on its side in floating plants immediately beneath a 60 watt top light. Can you tell me the cause of this odd behaviour?

Some paradise fish like to lie among surface vegetation and bask in the warmth provided by a bright top light. Your fish will not come to any harm.

I am a novice tropical fishkeeper, and wonder whether I am doing right in keeping my filter working right round the clock. I have been told that prolonged filtration removes beneficial organisms from the water.

There is no need to keep your filter working all day. Normally a few hours of filtration in every 24 hours, and

an occasional siphoning of the bottom to remove heavy sediment, is enough to keep most aquaria in spick and span condition. Ordinary filtration does not rid a tank of beneficial organisms.

Is ordinary window glass strong enough to glaze a 36 in. by 15 in. by 15 in. aquarium frame?

Ordinary domestic window glass is not strong enough to glaze a 36 in. tank. Quarter-inch-thick plate glass should be used.

As a beginner, I should like to know why angel fish introduced into my community tank of healthy swordtails, black widows, pearl gouramies, tiger barbs and neon tetras always go off their food, develop ragged and closed fins and soon die.

Angel fish are not among the most assertive or robust of tropicals, and if smallish specimens are placed in a sparsely planted aquarium containing boisterous or bullying fishes, they are usually driven away from food and made unhappy by persistent bullying. Naturally their health quickly deteriorates and they soon die.

I bought two angel fish a week or two ago, but they are extremely nervous and dash against the sides of the aquarium whenever I approach it. How can I cure them of their "nerves"?

Perhaps your tank is not very well planted? Angel fish often take a short while to get used to new surroundings, and they are more likely to settle down if they have lots of plant life to hide in until they have mastered their fears. In the meantime, disturb the fish as little as possible, and whatever you do refrain from poking about the aquarium with a dip tube, or tapping on the side of the glass.

Photo: *Lawrence E. Perkins*

Angel fish are sometimes difficult to establish in a community aquarium that contains boisterous fishes

COLDWATER FISH-KEEPING QUERIES answered by A. BOARDER

I have been breeding tropical fishes for 12 years and I now wish to go in for breeding coldwater fishes. I have a large pond and several 24 in. by 12 in. by 12 in. tanks. I have searched high and low for a good book on how to breed goldfish but with negative results. Please will you tell me where I can buy such a book?

Invest 2s. 10d. for *Coldwater Fishkeeping* (obtainable from *The Aquarist*), and you will find all you need to know about breeding goldfish. After you have studied this book I feel sure you will have success as the information contained in the book is the result of many years' experience of breeding and exhibiting fancy goldfish.

Can you tell me what goldfish with large tails and fins and those with three tails are called?

Goldfish with a single large tail are called nymphs. Those with three tails are known as tritails and are the mis-shapen and throw-out fish from breeding fantails or veiltails. These are of no value as show fish. The fantail has a divided tail held out without drooping. The veiltail has a much larger tail which hangs down in graceful folds like a curtain. Orandas have the same shaped tail but have a bison-like head. Lionheads have this same type head but have a fantail's tail and no dorsal fin. Moors are black fish with protruding eyes and can be either fantails or veiltail in shape and fin formation.

Last year I purchased a house with a garden pond, the sides of which have gone murky. When can I clean out the pond and refill with fresh water?

You can clean out the pond once the majority of leaves have fallen from surrounding trees and shrubs. Scrub round the sides of the pond with a stiff brush and remove most of the mulm in the bottom. If a pond is refilled at the beginning of the winter the water usually remains clear until the warm weather commences the following year.

I have a fish pond in my garden with 30 to 40 goldfish in it and up to a short time ago I have had no losses. During the last 2 days I have lost four fish and they do not appear to be damaged in any way. What could have caused the deaths?

When goldfish are found dead in a pond with no signs of damage or disease it is almost certain that they have died through lack of oxygen in the water. Goldfish do not just die overnight unless there is something radically wrong with the water. If fish die from disease they usually ail for some time and show by lowered fins etc. that there is something wrong. In thundery or close weather it is possible that the water becomes foul, being overcharged with gases from decaying vegetation or uneaten food. It is probable that the fish would have been seen mouthing at the surface of the water trying to get oxygen. In such a case, if fresh water is played into the pond the fish recover in a short space of time and in a matter of minutes they can be swimming around quite normally and even feeding. It may not be necessary to clean out the pond entirely but most of the water should be changed. Overcrowding can be a factor in this trouble and often it is the largest fish which die first, as they require more oxygen than a smaller fish.

I have a 24 in. by 10 in. tank with four small goldfish. About a week ago I covered the base of the tank half an inch deep with gravel compost. Now the plants I set in this have floated to the top; why is this?

It is unwise to push unrooted cuttings into pure gravel compost. They will almost always float to the top. It is much better to place some good loam under the compost so that the plants have something into which they can send their roots and become firmly anchored. If you put about an inch depth of loam near the back of the tank only and cover this with a layer of compost you will find that your plants do much better.

Breeding the Neon Tetra

by R. E. MACDONALD

THE neon tetra is one of the most impressive of all the freshwater fishes and perhaps one of the most difficult to spawn successfully. Until fairly recently, the breeding requirements were a closely guarded secret, but popularity of the species has demanded that these secrets be revealed.

The neon tetra (*Hyphessobrycon innesi*) is a member of the family Characidae and its natural habitat lies in the comparatively cool, shaded jungle waters of South America. It grows to about 1¼ inches in length (breeding size 1 inch), and as one would expect of such a small fish, it is extremely inoffensive by nature. With this in mind and the knowledge that this species fares well in aquaria, it is obvious that neons make an ideal addition to the community tank.

Neons show themselves to their best advantage if kept in schools of about a dozen fish in a tank measuring no less than 24 in. by 12 in. by 12 in. The tank should possess top lighting and be heavily planted at the sides and rear with a swimming area left at the front and centre. It will be found that neons also like to inhabit the lower regions of the tank and are quite content to poke around at sand level for hours on end if left unmolested.

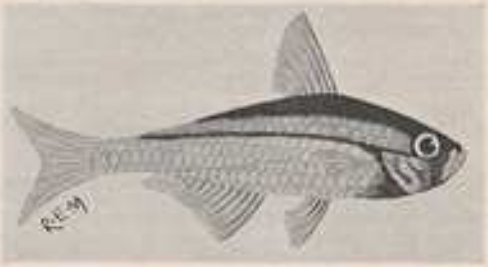
Feeding the fish presents no problems, for they will accept both live and dried foods, although to promote good health it is advisable to feed them with a good varied diet of both.

As tropicals go, this fish could hardly be called a "hot water species," for a temperature range of between 68° and 75° F is quite sufficient heat. Hardness (DH) and pH (acidity) values should be closely watched and DH readings should never exceed 4DH and the pH value should always be kept in the region of 6.5. It is most important to remember that unless absolute attention is given to the smallest detail, successful breeding will not be achieved.

Breeding Tank

To breed this species it is necessary first to sterilise the breeding tank, preferably a 16 in. by 8in. by 8 in. all-glass type, to ensure thorough cleanliness. Enough distilled water is added to fill the tank to a depth of five inches and then it is left to age for a period of at least 2 weeks. In the meantime, some bark of an oak tree must be thoroughly dried in the sun (under glass to prevent impurities, i.e. dust and smoke particles, from fouling the bark during the drying period). When the oak bark is dry, distilled water is poured over it, collected and the solution is filtered through glass wool (or its equivalent) until it is absolutely clear. It may then be added to the aged water in the breeding tank until a pH value of 6.5 is recorded. The water temperature is then raised to 74° F in readiness for it to receive the fish.

Sand must never be used in the breeding tank but bunches of willow moss (*Fontinalis gracilis*), that have been treated by immersion in a solution consisting of 1 tablespoon of alum to 1¼ pints of distilled water for 5 minutes, should be added as a spawning medium. After treatment, the plants should be rinsed before they are introduced to the breeding tank, where they may be placed so that a swimming area is left clear.



Neon tetra

A pair of young neons are then chosen and introduced to the set-up. It is essential to bear two points in mind when selecting fish. First, choose specimens that have just reached maturity, i.e. about 10 to 12 months old. Second, the choice should be made from fish previously seen chasing each other in the community tank. These two points will help to reduce the chance of an unsuccessful attempt.

It is now absolutely necessary to keep the breeding tank in subdued light and to refrain from introducing food until the eggs have hatched. The breeding pair should be introduced at evening time and the following morning they will spawn and lay about 100 eggs. When spawning is completed, the parents must be removed and the tank completely covered with black cloth to ensure that no amount of light reaches the eggs. Covering the tank to exclude light is very important, for it appears that both the eggs and fry are extremely sensitive to light and Infusoria.

The tank must remain covered for a period of 5 days, after which the cloth can be removed to reveal the fry already free-swimming. Some breeders prefer to uncover the tank after 2 days, when the eggs have hatched, but I think the chances of success are enhanced if the tank remains covered for the longer period. Feeding may be commenced immediately with brine shrimp nauplii and powdered dried food, with the formula for feeding being "little but often." An aerator should be left running to scatter the food throughout the aquarium and any excess of food must be carefully siphoned from the tank immediately to prevent the cultivation of Infusoria.

The first few days of life appear to be the danger period for neon fry, but once clear of this stage they become quite

hardy and grow fast until eventually, after some 2 months, they gain their colours.

Neon Disease

One cannot mention neon tetras without including some words on the lethal "neon tetra disease."

This infection manifests itself as white spots (similar in appearance to those caused by *Ichthyophthirius*), that show quite clearly on the blue-green luminous colour band that extends horizontally along the body of the fish. Other symptoms are emaciation, decaying fins, complete loss of colour and, in some cases, sterilisation of the female caused by the destruction of the ovaries. Death generally occurs within a week after the appearance of symptoms.

This disease, caused by spoeozoans of the genus *Plistophora*, is a highly contagious killer, and for infected fish there is no cure.

Infection is transmitted to other fish through expulsion of the *Plistophora* spores with the excreta into the surrounding water. Once infected, a fish will always remain a carrier until it dies and the infection of other neons becomes purely a matter of time. It is possible for this disease to be rampant during the early stages of infection without showing any apparent symptoms.

As soon as the disease is diagnosed it is advisable to destroy the entire neon population of the infected tank and to disinfect the tank with a 1 per cent solution of chlorine. Even accessories etc. should be subjected to this treatment; in fact, treat everything in contact with the set-up.

Some breeders adopt the practice of killing the parents once they have spawned and, by subjecting the internal organs to microscopic examination, they can determine whether the parents are carriers of this infective organism. If *Plistophora* spores are present, the eggs of the contaminated parents are destroyed to prevent the possible spreading of this terrible disease.

FISH PARASITES—1

Fish Leech

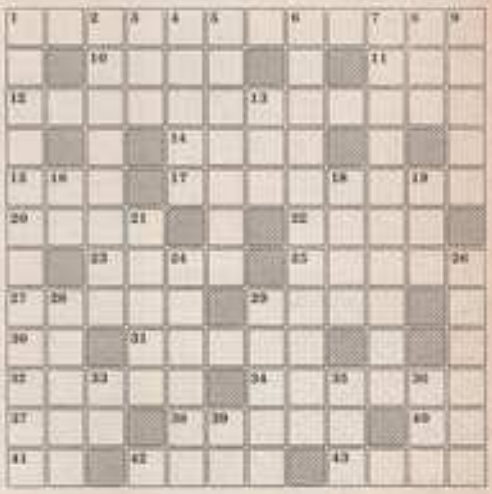
FISH leeches (*Piscicola geometra*) grow to a length of about 1 inch, have the appearance of worms with a sucking disc at each end and possess clearly defined transverse stripes. They are found mainly on pond fishes and will cause such an irritation that the fishes attacked by this parasite will try any means possible to dislodge their torturers. The presence of leeches will therefore be suspected when the fish is found to rub its body against objects such as the plants and rocks in the aquarium. The affected fish will also lose its colour as the slime cells are induced to emit more mucous when the skin is irritated.

The plagued fish can be successfully treated by immersing it in a 2½ per cent solution of common salt for 15 minutes. Any leeches that remain attached to the body after this bath can be removed with the aid of forceps. It is essential to remember that salt only paralyses the leeches and will not kill them, so measures must be taken against re-introducing them to the aquarium.

R. E. Macdonald

The AQUARIST *Crossword*

Compiled by J. LAUGHLAND



CLUES ACROSS

1. A fish that is kept in a tank (8, 4)
10. Leo (3)
11. Scots negative (3)
12. Fighting fish (8, 4)
14. She loses a pound of coral (4)
15. —and he loses a hundred and seems naked type of swamp (3)
17. Our brash confused shelters will hold fish (8)
20. Dash around for fish (not dart) (4)
22. God be with you, in Italian (1-3)
23. To the Christian era for this amphibian (4)
25. One who makes an estimate is more than a rat (5)
27. This fish sounded rather high (5)
29. Store for fodder (4)
30. The French of Lee leaves nothing more (2)
31. 1 croft morel sinister (3)
32. Popular cichlid (5)
34. Reddish brown (6)
37. Capital's local government (1, 1, 1)
38. Natural feature of crested newt (5)
40. Sapper (1, 1)
41. Car from 32 leaves the monocling body (1, 1)
42. Hide from sharks, perhaps (4)
43. Period of time is largely agreeable (4)

CLUES DOWN

1. Bass a la Islam (anagram) (5, 4)
2. Mate tail (anagram) (8)
3. Small island in lake (3)
4. Freshwater fish (5)
5. Or dab in for within the hull (5)
6. Larger kind of zebra fish (1, 1)
7. Unfeet (10)
8. Bag for a liquid (especially in biology) (3)
9. What your aquarium heater does, naturally (5)
10. Mistake of the herring is human we are told (3)
16. Exclamation (2)
18. Freehold estate (6)
19. Fish spawn (3)
21. Dealer could look older (5)
24. Set upon (6)
26. World news agency (6)
28. Moslem magnet (5)
29. Sea nymph (5)
33. Acara may be shark-headed (1, 1)
35. Abode of a pig (3)
36. A series of years from a point in time (3)
39. Old-style King Emperor (1, 1)

(Solution on page 193)

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.

TWO inter-club shows between the **Brighton and Southern A.S.** and the **Crawley College A.S.**, attracted a large number of entries and resulted at Crawley, as follows: A.V. Egglayers: 1, R. Bassett (Wton), Thicklipped Gouramy; 2, D. L. Wadey (Crawley), Zebra Danio; 3, T. Barnes (Crawley), Cherry Barb. Crawley won this show, but Brighton won the second part, for Characins, at Brighton as follows: 1, R. Bassett (Wton), Bleeding Heart Tetra; 2, S. Archer (Wton), Neon Tetra; 3, R. J. Wiggin (Crawley), Rosy Tetra. Both shows were judged by Mr. J. Blunt.

A show for the Best Fish of 1961 resulted as follows: 1, V. Breese (Orange Chromide); 2, J. Kail (Red-eyed Red Sword); 3, R. Bassett (Part Fish). The judge was Mr. D. L. Wadey of the Crawley A.S.

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AT the November meeting of the **Cambridge and District A.S.** members were privileged to hear Mr. Vosper, the marine biologist, talking on marine aquaria.

The speaker first dispelled the fears of potential keepers of marine aquaria regarding the hardiness of shore life, pointing out the extremes to which marine life had, through their evolution, become accustomed in the tidal zones of the sea shore. Continuing with his own methods of preparation and setting up a marine tank, Mr. Vosper gave members some useful tips for transporting home both sea water and living specimens after a collecting trip to the coast. After a comprehensive talk on the variety of marine creatures which can be kept in the home with success for varying lengths of time, a large number of exhibits and slides were shown depicting many of the creatures which are easy to keep.

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THE results of recent table shows of the **Goole and District A.S.** were as follow: A.O.V.: 1, F. Denby; 2, F. Marshall; 3, J. N. Banks. Livebearers: 1, F. Denby; 2, J. N. Banks; 3, R. Hunt. Livebearers, Pairs: 1, F. Marshall; 2, J. N. Banks; 3, R. Hunt. Livebearers: 1, F. Denby; 2, F. Marshall; 3, K. Coultish. Cyprinids: 1, F. Denby; 2, J. N. Banks; 3, R. Hunt. Anabantids: 1, J. N. Banks; 2, F. Marshall; 3, R. Hunt. Characins: 1, R. Hunt; 2, F. Denby; 3, J. N. Banks. The current for the club shield now stands at—F. Denby, 40 points, J. N. Banks, 33 points; R. Hunt, 30 points.

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THE annual general meeting of the **Northampton and District A.S.** was held recently and the following awards were announced: Aquarist of the Year, Mr. R. Webb; Highest Points Table Show, Mr. R. Memory; Best Fish of the Year, Mr. J. Wright; Outside Shows Cup, Mr. L. Prior; Junior Cup, Mr. M. Tarry and Mr. R. Holliday; Home Aquarium Competition, Mr. W. Stadker.

New officers elected were: Chairman, Mr. H. Malpas; Vice-Chairman, Mr. N. Lyon; Treasurer, Mr. R. Memory.

Members saw a coloured slide show of micro-photographs taken by Mr. A. V. Ashford, the subjects being specimens of pond life, all supplied by the Society.

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THE three-day show of the **Scottish A.S.** was held recently and the principal prizewinners were—The Bickmes shield for best fish in show and the Peter McNish trophy for the best tropical exhibit: A. Watt, Guiroads; president's prize for the best common goldfish: A. Hamilton, Glasgow; Robin Kerr trophy for best exhibit in cold water section: J. H. Hood and Miss H. B. Gibson, Newcastle. Scottish Aquarium Society trophy for furnished aquarium: A. T. M. Robertson, Glasgow; the Sanders cup for the best furnished aquarium set up by schoolchildren: Cranhill Secondary School, Glasgow; the Strachan Kerr trophy for a cold water furnished aquarium set up by juvenile member: A. Young, jun., Glasgow; Lang trophy for the best tropical furnished aquarium set up by junior member: D. F. Carruth, Paisley; best individual fish shown by a junior or juvenile member: S. Thomson, Glasgow.

* * *

IN the annual table shows of the shield and cup events of tropical fish held recently by **Hounslow and District A.S.**, winners were: Labyrinth class: 1 and 3, Mr. Pratt; 2, Mr. Woodward. Breeders class: 1 and 3, Mr. Woodward; 2, Mr. Boult. A.O.V.: 1, Mr. Pratt; 2, Mr. Woodward; 3, Mr. Boland. Best fish of the year: 1 and 2, Mr. Pratt; 3, Mr. Woodward.

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AT a well-attended meeting of the **Ilford Aquarists' and Poodkeepers' Society**, Mr. Cecil Creed, the well-known authority on fish-keeping, gave a talk on judging fishes, the showing of plants and preparing furnished aquaria for shows and exhibitions.

Table show results were as follow: Cichlids: Mr. Price, Plecos: 1 and 2, Mr. Stebbing; 3, Mr. Price.

Results of the 1961 Home Aquarium Competition were announced as follows: 1, Mr. Berges; 2, Mr. Bush; 3, Mr. Bull.

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AT the annual general meeting of the **Merseyside A.S.**, the following committee members were elected: Chairman, Mr. J. Conley; Vice-Chairman, Mr. D. Jones; Treasurer, Mr. H. Swanson; Secretary, Mr. S. Canavan; Show Secretary, Mr. H. Stamper; Librarian, Mr. T. Poole; Newsletter Editor and Publicity Officer, Mr. W. T. Kelly.

At the recent Open Show held by the Ouram A.S., Merseyside members gained the following awards: Mrs. E. Swanson, one first; S. Canavan, one first; H. Swanson, four thirds; H. Stamper, one first, one second, one third and the award for Best Livebearers.

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THE officers elected at the annual general meeting of the **Romford A.S.** were as follow: President, Mr. T. O'Farrell; Chairman, Mr. S. Dyer; Treasurer, Mr. A. J. Wilson; Secretary, Mr. A. H. A. Cartwright, 68, Cedar Road, Romford, Essex.

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AT the **Bradford and District A.S.** meeting, the table show once again had a very good entry and was won by Mr. B. Norris with Mr. G. Taylor second, and Mr. A. E. Thornley gaining third place. This win put Mr. Norris in the lead for the Sharp Trophy, but very close on his heels is Mr. Holmes and a lot will depend on the next show.

The members recently paid a visit to Blackpool in answer to a challenge issued by Blackpool Society for an Inter-Society Table Show. The result of this match was a win for Bradford with 37½ points against 29½ points.

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THE result of the month's table show of the **Nottingham and District A.S.** for Gouramies, Paradise and Pikeheads was as follows: 1, Miss M. Lindley (Nigerian Fighter); 2, Mr. A. Lindley (Lace Gourami); 3, Mr. T. Bateh (Dwarf Gourami); 4, Mr. A. Lindley (Thicklip Gourami).

At the meeting on the 19th December, there will be a table show of Goldwater Fish and Cichlids (two classes). The Secretary of the Society is Mr. T. W. Eatch, 47, Mansfield Drive, Bestwood Park, Nottingham.

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THE first open table show of the **Aireborough and District A.S.** was held recently and the results were as follow: Livebearers: 1, Mr. Holmes (Bradford); 2, Mr. Barclett (Skipton); 3, Mr. Taylor (Bradford). Barbs: 1 and 3, Mr. Marshall (Bradford); 2, Mr. Norris (Bradford). Characins: 1 and 2, Mr. Grimewich (Featherstone); 3, Mr. Matchin (Thorne). Carps and Minnows: 1, Mr. Armstrong (Aireborough); 2, Mr. Hardy (Tadcaster); 3, Mr. Nixod (Aireborough). Fighters: 1, Mr. Fairclife (Tadcaster); 2, Mr. Whitelock (Tadcaster); 3, Mr. Wilson (Bradford). Anabantids: 1, Mr. Norris (Bradford); 2, Mr. Wilson (Bradford); 3, Mr. Winterburn (Bradford). Cichlids: 1, Mr. Myers (Aireborough); 2, Mr. Hinton (Bradford); 3, Mr. Whitelock (Tadcaster). Catfish and Loaches: 1, Mr. Barclett (Skipton); 2, Mr. Holmes (Bradford); 3, Mr. Taylor (Bradford). Toothcarps: 1 and 2, Mr. Grimewich (Featherstone); 3, Mr. Greenhall (Tadcaster). A.O.V.: 1 and 3, Mr. Holmes (Bradford); 2, Mr. Moorhouse (Bradford). Breeders Egglayers: 1, Mr. Fairclife (Tadcaster); 2, Mr. Whitelock (Tadcaster); 3, Mr. Pattick (Dewsbury). Breeders Livebearers: 1, Mr. Rideing (Bradford); 2, Mr. Wilson (Bradford); 3, Mr. Fairclife (Tadcaster). Goldwater: 1 and 2, Mr. Booth (Bradford); 3, Mr. Fell (Airebrough). Ladies Class A.O.V.: 1, Mrs. Norris (Bradford); 2, Mrs. Holmes (Bradford); 3, Mrs. Storey (Skipton). Best Fish in Show: Mr. Grimewich (Featherstone).

* * *

THE last meeting of the **Dewsbury and District A.S.** was a Microscope Night, two members bringing instruments for viewing specimens of the lower forms of aquatic animal and plant life.

The table shows for both the specified variety (Carps and Minnows) and any other variety classes were won by Mr. L. Elliot (Dewsbury).

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A QUIZ conducted by Mr. D. Hammond was a prelude to a business meeting held recently by the **Blackpool and Fylde A.S.**

In October, forty guests from the **Bradford and District A.S.** were entertained by Blackpool Society at their inter-club table show and the result of the show was as follows: Bradford—37½ points, Blackpool—19½ points. The details were—Livebearers: 1, Mr. C. B. Wilson (Bradford); 2, Mr. B. Pearson (Blackpool); 3, Mr. E. Crowther (Blackpool). Barbs: 1, Mr. B. Dunn (Blackpool); 2, Mr. B. Norris (Bradford); 3, Mr. E. Crowther (Blackpool). Fighters: 1, Mr. C. B. Wilson (Bradford); 2, Mr. J. Worth (Blackpool); 3, Mr. R. Rideing (Bradford). Labyrinths: 1, Mr. B. Norris (Bradford); 2, Mr. C. B. Wilson (Bradford); 3, Mr. B. Pearson (Blackpool). Characins: 1, Mr. B. Norris (Bradford); 2, Mr. G. N. Hadley (Blackpool); 3, Mr. J. Taylor (Blackpool). Cichlids: 1, Mr. B. Pearson (Blackpool); 2, Mr. A. Whitfield (Bradford); 3, Mr. J. Holmes (Bradford) and Mr. G. N. Hadley (Blackpool). Catfish: 1, Mr. A. Whitfield (Blackpool); 2, Mr. G. Holmes (Bradford); 3, Mr. B. Dunn (Blackpool). Coldwater: 1, Mr. L. Booth (Bradford); 2, Mr. B. Simmons (Blackpool); 3, Mr. B. Norris (Bradford). A.O.V.: 1, Mr. A. Whitfield; 2, Mr. G. Holmes; 3, Mr. B. Pearson (Blackpool). The results of the Society Table Show, judged by Mr. G. N. Hadley, were—Singleton Trophy: 1, Mr. J. Fisher; 2, Mr. H. Moore; 3, Mr. B. Simmons. Robinson Trophy: 1, Mr. J. Fisher; 2, Mr. B. Simmons; 3, Mr. B. Dunn. Junior Single Fish: 1, Neil O'Hare; 2, Terrence Harrop; 3, Kenneth Silverwood. Junior Pairs of Fish: 1, Bryan Crowther; 2, Eric Wolstencroft; 3, F. Sczepiak and Neil O'Hare. Quarterly: 1, Mr. J. Fisher; 2, Mr. B. Simmons; 3, Mr. B. Dunn.

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AT the October meeting of the **Coventry Pool and Aquarium Society**, a talk was given by

Mr. Antowell a Midland wholesaler on fish importing and exporting. He gave a fascinating glimpse of the aquatic world seen through the eyes of a dealer handling thousands of fish at a time and dealt with the changes which have taken place in air transportation since the end of the war. In the early days hundreds of fish died on nearly every journey, but now whole consignments of 50,000 or more fishes arrive almost without loss. Plastic bags instead of tin cans, and the use of sedatives to keep fish quiet during the journey were partly responsible for the decrease in the mortality rate but the greatest single factor in this success in the use by air line companies of pressurized cabins for all consignments of live stock. Vast quantities of tropical fishes of course are imported not from the tropics but from Europe where they are bred in huge breeding establishments. As Mr. Antowell explained, many species of tropical fish are found to breed much more readily on the Continent than in the British Isles.

The table show was well supported, the results being: Mr. Grant (Nandanchanus) 77 points; Mr. Davies (Guppy) 75 points; Mr. Hatt (Nigger Barb) 74 points.

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THE third inter-society table show between **Thorne A.S.** and **Goole and District A.S.** recently took place at Thorne. The result was a win for Goole with 114 points against Thorne's 86. The individual results were as follow: Cichlids: 1, F. Marshall (G); 2, F. Denby (G); 3, D. Wells (T). Anabantids: 1, N. Saunders (T); 2, J. N. Banks (G); 3, F. Hill (G). Egg-laying Toothcarps: 1, K. Coulnish (G); 2, J. N. Banks (G); 3, F. Hill (G). Cichlids: 1 and 3, N. Saunders (T); 2, G. Lowe (T). Livebearers: 1, M. Hobson (T); 2, F. Hill (G); 3, F. Marshall (G). Breeders: 1 and 2, F. Denby (G); 3, K. Coulnish (G). Barbs: 1, N. Saunders (T); 2, F. Mackrill (G); 3, F. Hill (G). A.O.V.: 1, N. Saunders (T); 2 and 3, F. Denby (G). Danios Rasboras M. Minnows: 1, F. Denby (G); 2, F. Mackrill (G); 3, F. Hill (G). Characins: 1, D. Wells (T); 2, C. Fozar (G); 3, F. Marshall (G). Best Fish in Show: N. Saunders (T), Cherry Barb.

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THE third annual show of the **Oxram A.S.** was held recently and there were entries from 16 societies.

The following were the awards—Anabantids: 1, J. P. Williamson (Salford); 2, R. Bradley (Macclesfield); 3, H. Stamper (Liverpool). Fighters: 1, J. Hodgetts (Burnley); 2, C. Whitney (Blackburn); 3, C. Walker (Oldham). Small Barbs: 1 and 3, J. Hodgetts (Burnley); 2, M. Flöiger (Derby). Large Barbs: 1, R. Collins (Oxram); 2, J. Whitstone (Oxram); 3, M. Swanson (Liverpool). Sharks: 1, J. Corbett (Oxram); 2, W. Lander (Oldham); 3, G. Smith (Blackburn). Small Characins: 1, J. Hodgetts (Burnley); 2, P. Chappell (Middleton); 3, W. Smith (Stretford). Medium Characins: 1, R. Collins (Oxram); 2, A. Seyvenson (Burnley); 3, J. Corbett (Oxram). Large Characins: 1, M. Swanson (Liverpool); 2 and 3, R. Collins (Oxram). Dwarf Cichlids: 1, J. Williamson (Salford); 2 and 3, K. Whittaker (Oxram). Angels: 1, J. E. Shaw (Oxram); 2, J. H. Turner (Ashton); 3, 3. A. Abdy (Sheffield). Large Cichlids: 1, H. S. Lee (Macclesfield); 2, S. Procter (Burnley); 3, C. Walker (Oldham). Tooth Carps: 1, J. F. Williamson (Salford); 2, R. Bickhalph (Macclesfield); 3, C. Walker (Oldham). Dances: 1, S. Canavan (Liverpool); 2, J. Thomas (Middleton); 3, M. Flöiger (Derby). Guppies: 1, B. Morriss (Stretford); 2, J. H. Turner (Ashton); 3, M. Swanson (Liverpool). Swordtails: 1 and 2, H. Stamper (Liverpool); 3, K. Hudinson (Middleton). Mollies: 1, K. Bartlett (Skipton); 2, R. Bradley (Macclesfield); 3, C. Whitney (Blackburn). Platies: 1, K. Whittaker (Oxram); 2, J. Ashworth (Oldham); 3, M. Swanson (Liverpool). Loaches: 1, J. E. Shaw (Oxram); 2, A. Warwick (Oldham); 3, M. Swanson (Liverpool). Catfish: 1, K. Bartlett (Skipton); 2, A. Warwick (Oldham); 3, J. V. Hill (Ashton). Breeders Livebearers: 1, J. Hodgetts (Burnley); 2, H. Goodwin (Oxram); 3, G. Smith (Blackburn). Breeders Egglayers: 1, J. H. Turner (Ashton); 2, L. Lewis (Burnley); 3, W. Kippax (Burnley). A.O.V.: 1, J. E. Shaw (Oxram); 2, A. Seyvenson (Burnley); 3, M. Flöiger (Derby). Goldfish: 1, J. Yates N.G.P.S.); 2, W. Smith (Stretford); 3, L. Baxter (N.G.P.S.). Shubunkins: 1, R. L. Howarth (N.G.P.S.); 2, J. Yates (N.G.P.S.); 3, L. Baxter (N.G.P.S.). Veiltails: 1, L. Lewis (Burnley); 2 and 3, L. Baxter (N.G.P.S.). Orandas: 1, S. Smith (Blackburn); 2 and 3, L. Baxter (N.G.P.S.). The best fish in show, awarded to Mr. H. S. Lee of Macclesfield, who exhibited a Pike Cichlid.

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AT the last meeting of the **Thorne A.S., Goole A.S.** were the visitors for a challenge Table Show. Over 30 members from the two Societies attended and 82 fish were on show in ten classes. Goole were the winners, with 114 points to Thorne's 86 points.

The most successful member for Goole was Mr. Denby with 39 points and for Thorne, Mr. Sanders also gained 39 points, including four firsts. Mr. Sanders also won the best fish of the show with a Cherry Barb. The result of Thorne's own table show for Cichlids was: 1, N. Sanders (Kribensis); 2, G. Lowe (Severum); 3, N. Sanders (Jewel).

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THE annual general meeting of the **Macclesfield A.S.** was held recently and the following officials were appointed: Chairman, Mr. S. B. Dass; Vice-Chairman, Mr. B. Lee; Secretary, Mr. E. H. R. Davenport, 61, Coare Street, Macclesfield, Cheshire; Treasurer, Mr. G. Hankinson; Show Secretary, Mr. A. Beard; Committee: Messrs. R. Bradley, G. Day, J. Bailey, L. Walker, N. E. Hugo. P.N.A.S. Representatives: Mr. and Mrs. H. Wilson.

At the end of the meeting a vote of thanks was proposed to all the retiring officials by the Chairman.

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THE second issue this year of "The Independent," the journal of the **Independent A.S.**, was received recently. The death of Mr. G. Profi was reported. He was a founder member and a devoted worker in the society's activities. An advance notice was also given regarding the Christmas dinner which will be held on the 16th December and the full titles belonging to the society will be shown. The Secretary is Mr. R. N. White, 1, Lough Road, Barnsbury, London, N.7.

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AT a meeting of the **Northampton and District A.S.**, members were entertained by Mr. Mason-Smith of Cambridge. He showed several films of tropical fish, including a film of Siamese fighting fish breeding, and concluded with one entitled "Tree Tops" taken in the African nature reserve.

Winners of the home aquarium competition: 1, Mr. W. Snedker; 2, Mr. D. Bell; 3, Mr. L. Price. Monthly table show, for Anabantids: 1 and 3, Mr. Shenley; 2, Mr. Webb.

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OFFICERS elected at the annual meeting of the **Yeovil A.S.**, were: President, Mrs. Bryant; Chairman, Mr. M. Emmett; Vice-Chairman, Mr. S. Langdon; Secretary, Mr. G. Anson, 100, Larkhill Road, Yeovil; Treasurer, Mr. T. Perry; Committee, Messrs. B. Stokes, K. Mitcham, D. Silver, B. Stidson, H. Dodds and T. Sharp.

Recently an inter-club quiz between Yeovil, Weymouth and Bournemouth societies was held at Weymouth, Bournemouth winning the challenge cup by beating Yeovil 19 points to 18.

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AT the fourth meeting of the season of the **Dundee A.S.**, the table show was for Scott Trophy—A.S. Anabantids and the results were: 1, George M. Gibson; 2, 3 and 4, Peter N. Greening. This brings the Scott Trophy placings to date: Alex. Robertson 10 points, George M. Gibson 8 points, Peter N. Greening 4 points, Alex. Cruse 3 points, Andrew Pinkerton 2 points, David Annan 1 point. Recently, A. Pinkerton was third in a class of twenty with double-sword Guppies at the show held by the Yorkshire FGBS at Bradford, and Alex. Robertson was sixth in a class of thirty-five with Veiltail Guppies at the FGBS show in London. The Society's grateful acknowledgement goes to George M. Gibson for the very handsome trophy presented by him for the Member of the Year Trophy.

A very pleasant evening was had by the members who made the journey to Perth for the inter-club meeting. The results of the table show were: Barbs: 1, 3 and 4, P. N. Greening; 2, L. Melville. Breeders Livebearers: 1, 3 and 4, H. Reekie; 2, P. N. Greening. A.S. Anabantids: 1 and 4, H. Reekie; 2, F. McNaughton; 3, G. M. Gibson. Breeders Egglayers: 1, F. McNaughton; 2, H. Reekie; 3, P. N. Greening. Totals—Perth 29 points, Dundee 21 points.

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AT the recent meeting of **Southampton and District A.S.**, Mr. Morrice of Hendon judged a table show for the toothcarp and cichlid species of fish. He also gave an entertaining talk on fish keeping, his remarks being illustrated with coloured slides taken at London and Manchester fish shows, as well as a number showing rare fish kept by his friends.

A discussion took place on the organisation of the society's forthcoming home-furnished aquaria competition.

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ALL the officials were re-elected at the annual meeting of the **Thorne A.S.** They are as follows: Chairman, Mr. G. Lowe; Treasurer, Mr. M. Hobson; Secretary, Mr. D. Wells, 10, King Edward Crescent, Thorne, Nr. Doncaster; Committee: Mr. N. Sanders, Mr. F. Machin. Mr. G. Sweeting was elected to assistant Secretary.

The Society was formed in November last year, when six members were present, it has now 21 senior members and 8 junior members. The results of the competitions held during the year were: Furnished Aquaria: Mr. D. Machin; Breeders Class: Mr. G. Lowe; Table Shows: Mr. D. Wells. A shield given for the highest total of points for all competitions was won jointly by Mr. N. Sanders and Mr. D. Wells.

The result for the first table show of the new year, which was for Egglaying Toothcarps, was: 1, Mr. N. Sanders (Aphyosemion calliurum); 2, Pl.-Lt. Pedley-Martin (Aphyosemion bivittatum); 3, Mr. D. Wells (Panchax). The meetings of the Society are held on the second Thursday in the month, at the Grammar School in Thorne, commencing at 7-0 p.m. Anyone visiting the area will be most welcome.

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SECRETARY CHANGES

CHANGES of secretaries and addresses have been reported from the following societies: Chelsea Aquarium Society (Mrs. J. Tucker, Beaufort Court, 352a, Kings Road, Chelsea, London, S.W.3.). Macclesfield A.S. (E. H. R. Davenport, 61, Coare Street, Macclesfield). Skipton and District A.S. (K. Bartlett, 39, George Street, Skipton). Stourbridge and District A.S. (H. G. Oliver, 28, East Street, Quarry Bank, Brierley Hill, Staffs.).

Crossword Solution

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

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Powell, M.C.
The Honey Pot,
Claypath, Durham City.
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Westcliff-on-Sea
Telephone: Southend 44724
E.C.D. Wednesday. WR. C.T.P.AA.

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Fanday House, 129, Stratford Road, Sparkbrook,
Birmingham
Telephone: Victoria 3537
E.C.D. Wednesday. WR. C.T.P.AA. R. & A.

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The City Aquaria, Bird and Pet Supplies
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Telephone: Worcester 2005
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