

# The AQUARIST AND PONDKEEPER

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## Contents

	Page
Editorial .. .. .	41
Microscopy for the Aquarist .. .. .	42
The Colour Changes of Fishes .. .. .	43
Herpetologist's Notebook .. .. .	45
Strap-leafed forms of <i>Echinodorus</i> .. .. .	46
Hardy Snakes .. .. .	49
Gnat Larvae .. .. .	50
The Labyrinth Fishes of Asia .. .. .	51
Aquarist's Notebook .. .. .	53
Basic Marine Aquarium Technique .. .. .	54
Breeding the Dwarf Gourami .. .. .	55
The Garden Pond in June .. .. .	56
Primley's New Look .. .. .	57
News from Aquarists' Societies .. .. .	58

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## Editorial

SOME long-range weather forecasters, all unperturbed by their past failures, are promising us a summer of sunshine this year. In case this does materialise, we want to pass on a warning about sunburn—sunburn in fish. Surprising as it may seem, a report of the occurrence of this has appeared in a recent issue of *The Progressive Fish-Culturist* (U.S. Fish and Wildlife Service).

A batch of young rainbow trout that were moved from a hatchery to out-door artificial ponds in West Virginia during a period of cloudless days and bright sunshine were observed to swim erratically, to darken in hue and to show skin damage behind their heads and around the dorsal fins. Deaths occurred, and the fishery scientists set out to determine whether sudden exposure to the sun's ultraviolet-light rays could explain the changes that had been seen. It was found that trout placed in shallow (2 inches), flowing water with a sunray lamp 12 inches above the water surface soon showed signs of discomfort and developed the darkened hue and skin damage shown by the pond fish. About half of the fish so exposed died within 3 days, and microscopic examination of their damaged skin revealed that it was changed in the same way as the skin in those fish believed to have been affected by sunlight in the ponds. The investigators have described the condition as arising from "sunburn."

The report unfortunately does not mention the depth of water present in the ponds when the fish were exposed to sunlight, and it does not seem, in view of the rather exaggerated conditions required in the laboratory test to produce the same effect, that under ordinary circumstances fish in a garden pond would be likely to become "sunburnt." However, the remarkable thing is that it has happened at all. The episode does illustrate that fish can become discomforted by direct sunlight, so that provision of shade or surface water-plant leaves should always be made by pondkeepers in summer. Without shade, fishes may be driven to the shelter of the pond bottom, which, in hot weather, may also be an unfavourable position for them because of lowered oxygen content of the water.

## Microscopy for the Aquarist—49 by C. E. C. COLE

IN this series of articles we have considered in some detail the procedures necessary to produce reasonable or good slides of many of our freshwater creatures. It is only in the use of certain materials for specific purposes that you may need further guidance. So far we have largely confined ourselves to the preservation and mounting of large creatures or of parts of large creatures which were chitinous and needed little, if any, staining.

Now, however, as we progress, it might be wise to more closely examine the know-how of staining and the best stains for specific purposes. We will first confine our attention to small whole organisms, after an explanation of the action of stains.

First we must remember that before any alcoholic stain is used the creature or tissue must have its water removed (be dehydrated) to the strength of alcohol used to dissolve the stain; this is usually either 50% or 70%—the stockist will tell you if you ask him when purchasing.

Although the results of staining are well-enough known, the precise nature of what takes place when stain encounters tissue is even now not certain in all cases.

Only two things can happen, however: either the stain enters the tissue and remains there, or it settles on the outside, firmly adhering. In some parts of the tissue it enters readily (these stain deeply); in other parts it cannot so easily penetrate, and these stain less deeply—sometimes not at all.

Similarly, on the surface—in parts the stain will settle thickly, in other parts not so heavily: there is greater or lesser attraction according to the chemical structure of the tissue or cells.

### Types of Stains

When tissues are clearly defined by the stains they are called histological stains, but when the contents of cells are stained they are known as cytological stains. There are stains that are exceptional, which may stain both tissues and cell contents. According to whether the stain has an affinity for the cell cytoplasm or the nucleus it is called a cytoplasmic stain or a nuclear stain. The nuclear stains are particularly useful for chromosome study.

Nuclear stains are "basic" stains; cytoplasmic stains are "acidic" stains. It must not be assumed from this that neither stain has any effect upon the parts which have a greater affinity for their opposite number; it can only be said that there is a more marked effect on some parts than on others. Nevertheless, some specialised cells will dye equally well with either acidic or basic stains—they are neutral.

People who have studied these things deeply have given special names to the various parts of protoplasm to indicate their "staining nature." Those parts having an affinity for basic stains (the acid parts) are called basophilic, and those parts with affinity for acidic stains are called acidophilic. Those parts which stain equally with acidic or basic stains are neutrophilic. Stains do not necessarily stain all parts of the material the same colour as themselves.

Where a stain will not attach itself directly on or in the material to be stained, some other ingredient has to be incorporated in it, or alternatively the tissue is first subjected to immersion in another solution. The addition is known as the mordant. The mordant enters the tissue or coats the surface so that the stain can act in a normal manner. This is called "indirect staining." Sometimes a mixture of stains of contrasting colours, each with an affinity for a different part of the tissue or cell, is used, with very pleasing results. This is known as "multiple staining." A variation of this is

"counter" or "differential staining." Stains of contrasting colours are employed, but are applied separately, not mixed together.

### Methods of Staining

The method of staining we shall adopt is known as "progressive staining." In this the material we wish to stain is placed in the desired stain and kept under constant observation on a slide on the stage of the microscope. Stain is added gradually until the desired intensity of colour is apparent.

Sometimes we shall make mistakes, and too much stain will be absorbed. This defeats our object, rendering the material almost completely opaque so that we see just a silhouette, as it were, instead of any detail. In such cases we must take out some of the stain—we must "differentiate" or de-stain. I will not go into further detail at this stage, for there is no de-stainer with a universal application. It is sufficient to know that we can perform this operation if it is required.

Specific stains for specific material will be the subject of my next article.

## Cacti in the Fish House

CACTI and other succulents can be increased by taking cuttings during this month. Where off-sets are made it is possible to remove these and root them by placing them in sharp sand which covers potting compost to the depth of an inch. Where pieces are cut from members of such genera as *Epiphyllum* and *Opuntia* it is essential to get a fresh skin to form over the cut part before the cutting is placed in the striking pan. The pan should be kept just moist and the cutting should rest only at the surface of the sand. Tall cuttings can be supported by a stick. Once a good root system has formed the cutting can be potted up carefully and grown on. If any plant is required for exhibition it is unwise to break up a group as a plant which is naturally caespitose (grouping) would receive more points at a show if it had not been denuded of its offsets.

## DO YOU KNOW THE NAMES?

The vowels of popular names of fishes are given horizontally in the squares. Fill in the consonants from the jumbled list below to complete the names. One of the down columns will give the popular name of a well-known aquarium fish.

BBBBBBBBBBBCCCCDDDFGGHLLLLLLLLL  
MMMMNNPPPPRRRRSSSTTTTWWYY



G. F. H.

(Solution on page 50)

THE AQUARIST



# The Colour Changes of Fishes

by A. K. KENT

**M**OST fishes can change their colour. In some species the colour change is remarkably rapid. *Mollennia latipinna*, the common aquarium mollie, will change from pale to dark in 10 seconds; the soldier fish *Holocentrus* has been recorded as changing from red to white and back again in as little as 10 to 15 seconds. Usually, however, colour changes are relatively much slower and may take from an hour or two to several weeks before reaching completion.

The phenomenon of colour change in fishes has been observed by naturalists since earliest times. Pliny commented on the rapid changes of colour that are shown by a dying mullet, and it was not uncommon to have the fish brought on to the table so that the guests might watch the display before they settled down to eat it. But it was not until the middle of the nineteenth century that any attempt was made to investigate the mechanism by which the colour change took place. Since then much progress has been made towards a final analysis of the problem, not only in fishes, but in all cold-blooded vertebrates. Some idea of the amount of research done in this field can be gained from the observation that G. H. Parker, in his book *Animal Colour Changes and their Neurohormones*, which any one interested in this aspect of animal physiology should read, lists 1,200 papers relating to colour change published between 1910 and 1943.

## Pigment Cells in Skin

The colour of a fish is dependent on pigment contained in the cells of its skin, in both the epidermis and the dermis. Two types of pigment cell can be distinguished. The first type of cell is unable to alter the pattern of distribution of its pigment over short periods, though it may be able to alter the total amount of pigment contained within it over long periods of time. The second type of cell, usually more or less branched in appearance, contains a fixed amount of pigment but is able to alter its distribution, and thus its effect on the general coloration. These cells are called chromatophores, and may, like the inactive pigment cells, be of several colours depending on the pigment they contain. The commonest chromatophores are the melanophores, which contain a brownish black pigment, melanin; others contain red, yellow or white pigment. Figure 1 shows some typical chromatophores and the way in which a combination of two types of chromatophore with a third type of fixed pigment cell can cause marked changes in the general appearance of the skin.

Aquarists and naturalists will be aware that the males of many species of fishes alter their coloration in the early spring in preparation for the breeding season, and don the often extremely gaudy 'nuptial dress.' These colour changes are usually slow and take several weeks to attain their full

brilliance. Another, and much more rapid, sort of colour change is that shown by fishes passing from one coloured background to another. These changes enable the fish to adapt its colour swiftly to that of its surroundings, reducing the risk of its being spotted by a passing predator. The changes shown by *Mollennia* and *Holocentrus* are of this sort. Excitement may cause rapid changes in colour; a minnow, for example, will go pale within a few seconds of being handled. This 'excitement pallor' is common to many fishes. The colour changes associated with dying noted in the mullet by Pliny occur in many other species. Changes in temperature, transfer from light to darkness and treatment with a number of chemical substances will also initiate colour changes, both of a rapid and more prolonged nature.

The colour changes which occur in the dying fish are incompletely understood, but are presumably the consequence of general degenerative changes in the nervous system. Though they have no functional value to the animal an examination of the factors influencing these dying responses has been made by some workers and has led to a greater understanding of the way in which the chromatophores are controlled.

Excitement pallor is the result of liberation of adrenalin from the nerve endings of the sympathetic nervous system and from the adrenal medulla. It is related to the manifestations of fright and anger in mammals such as the erection of hairs and blanching of the skin which are brought about in the same way by the release of adrenalin. It is not clear what function, if any, excitement pallor has, though it is possible that the rapid change in colour may distract an attacker and allow time for escape.

## Breeding Colour ("Nuptial Dress")

The development of the nuptial dress is a more complicated phenomenon involving the eye, the brain, the pituitary gland and the sex organs (gonads), in addition to the pigment cells. The stimulus for the development of the nuptial dress lies largely in the rapidly increasing day length of early spring, though other factors such as increasing temperature and a greater abundance of food also probably play some part. The increase in day length in some way stimulates the pituitary gland, through the hypothalamic region of the brain, and there results a steadily increasing production of gonadotrophic hormone.

The function of this hormone is the stimulation of the ripening of the gonads, whether the fish be male or female. Blinding the fish, removal of the connection between the hypothalamus and the pituitary gland and removal of the pituitary will all prevent the ripening of the gonads. Injections of gonadotrophic hormone into a fish treated in this way, or into normal fish in midwinter, stimulate

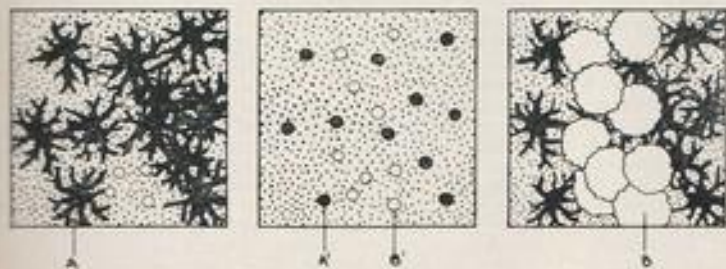


Fig. 1. Effect of chromatophore contraction and expansion on the appearance of the magnified skin. A and A' are typically shaped chromatophores in expanded and contracted condition respectively. B and B' are like the expanded and contracted condition of the erythrophores in *Holocentrus*.



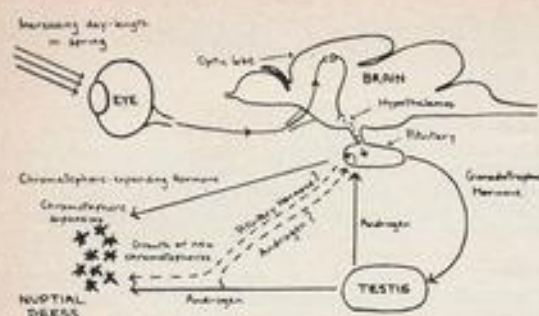


Fig. 2. Factors controlling the development of the nuptial dress

gonad development. As the gonads ripen they produce increasing amounts of sex hormones, androgens in the male and oestrogens in the female. The oestrogens appear to have little effect on the colour of the fish, but the androgens have a striking effect. It seems likely that these androgens act in two ways to develop the nuptial dress, on the one hand by initiating the development of new chromatophores of an appropriate type and on the other by stimulating the pituitary gland to produce a hormone or hormones causing expansion of the chromatophores specifically concerned with the display. Figure 2 summarises the factors involved.

#### Mechanisms of Colour Change

The response to changes in the background colour involves, in many species of fishes, both secretions of the pituitary gland (hormonal control) and activity of the nervous system (nervous control). In either case the initial stimulus comes from the eyes. With simple white or black backgrounds it has been shown that the degree of expansion of the melanophores is dependent on the ratio of reflected light to direct light received by the eye. Thus on a white background the amount of light reflected from the background approximates to that received directly from the source of illumination. Both upper and lower halves of the retina of the eye are stimulated and by equal amounts. On a black background the amount of reflected light is negligible and the upper part of the retina receives no stimulus. When the ratio of reflected to direct light is 1:1 the melanophores are in a contracted state. As the ratio changes in favour of the direct light so the melanophores expand.

The impulses from the eye are transmitted along the optic nerve to the optic lobes of the brain and from there to either the medulla, which is the most posterior part of the brain, or the pituitary gland or to both. The nerve impulses reaching the medulla are integrated there in a colour-change centre from which nerve fibres pass to the chromatophores. The nerve fibres carrying impulses to the pituitary gland appear to terminate in the hypothalamus, where certain neuro-secretions are produced which pass down the pituitary stalk into the glandular portion of the pituitary.

The relative importance of the nervous and hormonal control of the background response varies from species to species. Most of the elasmobranch (cartilaginous) fishes such as the dogfish appear to have little nervous control of their chromatophores and their colour changes are relatively slow. The teleost (bony) fishes are more varied. Some, like the fresh-water catfish *Ameiurus nebulosus* resemble the dogfish, with slowish colour changes controlled largely by the secretions of the pituitary. The killifish, *Fundulus heteroclitus*, at the other extreme, shows extremely

rapid changes which are almost entirely under nervous control.

The minnow, *Phoxinus phoxinus*, is in an intermediate category with nervous control dominant to that from the pituitary gland, which nevertheless has a significant role. Much of the European work on colour change in fishes has been done on the minnow and it is perhaps better understood than any other. The normal minnow is very dark on a black background and a pale creamish grey on a white one. This change in colour is due to the expansion and contraction of its melanophores. Transfer of fish from one coloured background to another initiates a colour change which takes 1 to 2 hours to reach completion. If the spinal cord is cut in front of about the fifteenth vertebra the rapid changes cease.

It has been shown that the nerve fibres controlling the melanophores pass down the spinal cord from the medullary centre to the level of the fifteenth vertebra, from where they pass out into the sympathetic chain, a double chain of nerve ganglia lying below the spinal cord. The colour-change fibres run backwards and forwards in the sympathetic chain, passing out at intervals along its length to supply the melanophores of the skin. Cutting the sympathetic chain anterior to the level of the fifteenth vertebra results in a loss of the rapid responses from the front part of the body; section of the chain posterior to the level of this vertebra has the same effect on the posterior part of the body. Two types of nerve fibres appear to be involved, one causing the contraction, the other the expansion, of the melanophores.

Though section of the spinal cord destroys the rapid colour changes under the control of the nervous system, the fish is still able to respond to its background, but the change now takes 3 to 4 days to reach completion. This slower colour change is controlled by a hormone or hormones produced by the pituitary gland. Most workers are now agreed that there are in fact two hormones involved, though this has been a matter of dispute for a long while. Several facts point to the existence of two hormones. Fish in which the spinal cord has been cut reach an intermediate coloration if kept in total darkness. If only one hormone was concerned in the colour response we would expect that this intermediate coloration was due to an intermediate concentration of hormone, whereas the fully contracted and fully expanded states were due to high or low concentrations of hormone. If so the time taken to change from one extreme of coloration to the other should be longer than that taken to change from each extreme to darkness, involving as it does a greater production or excretion of hormone. In fact this does not hold when tested experimentally, and one must conclude that at least two hormones are involved.

Further evidence for the existence of two hormones comes from experiments involving injections of pituitary-gland extracts. If a minnow pituitary-gland extract is injected into a dark minnow it goes pale; the same extract has no effect on a pale minnow. If it is injected into a pale frog it causes a darkening, but has no effect on a dark frog. Injection of frog pituitary-gland extract darkens both the pale frog and the pale minnow. Apparently the minnow pituitary gland contains a pair of factors, one which will cause melanophore contraction, the other melanophore expansion.

Removal of the pituitary gland from a fish with an intact nervous system has the effect of making the background responses less efficient. Whereas the fish still changes colour rapidly it is unable to maintain its melanophores in the fully contracted or expanded state and the colour tends to fluctuate. Apparently the nervous control is adequate to make the initial rapid change in colour but is unable to maintain it for long in the absence of pituitary-gland hormones. Removal of the pituitary gland from a



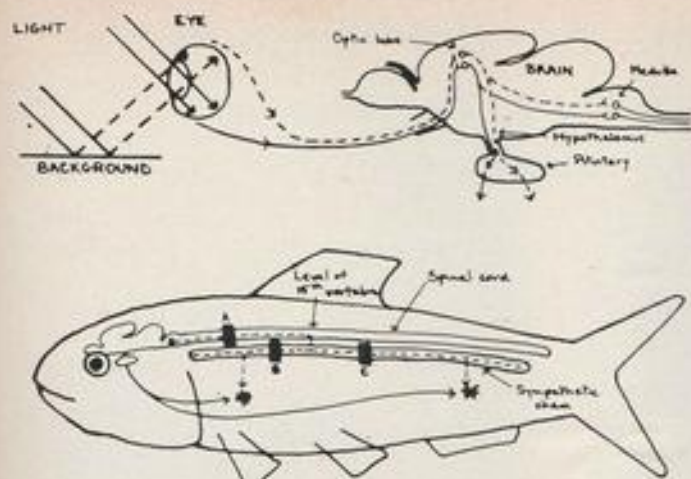


Fig. 3. Factors controlling the background response in the minnow. A cut across its spinal cord at A destroys the rapid colour response of the whole fish. Cuts at B and C in the sympathetic chain of nervous tissue destroy the rapid response of the anterior or posterior parts respectively of the fish. Arrows from the brain of the fish in the lower diagram represent the hormonal control over the pigment cells through the blood stream

fish in which the spinal cord has been cut anterior to the fifteenth vertebra abolishes any response to the background and the fish remains an intermediate colour, with its melanophores about half expanded, irrespective of its surroundings. Operations involving partial removal of the pituitary gland have shown that the melanophore-contracting hormone originates in the anterior portion of the glandular part of the pituitary. The melanophore-expanding hormone probably originates in the posterior glandular portion, though this has not to date been satisfactorily confirmed. Figure 3 summarises the factors controlling the melanophores in the minnow.

A number of suggestions have been made about the mechanism by which the chromatophores are able to alter the distribution of their pigment in response to the stimuli reaching them in the form of nerve impulses along nerves or

hormones in the blood stream. The most likely seems to be that the pigment granules migrate within already formed channels in the chromatophore under the influence of electrical potential differences between the centre of the cell and the ends of its branches. Reversal of the polarity alters the direction of migration of the charged pigment particles, and this can be observed in the living melanophore by the use of suitable micro-electrodes and amplifiers. Another possibility is that changes in hydrostatic pressure within the cell, brought about by contractions of the wall (which has been shown in one electron-microscope study to be fibrous and apparently contractile), are responsible for the migration of the granules. The old idea that the chromatophores were amoeboid cells in which the branched structure of the expanded melanophore was due to a pushing out of pseudopodia-like processes is now largely discredited.

## Herpetologist's Notebook

by ROBERT BUSTARD

**M**ANY species of European amphibians and reptiles are now available and the following are representative: (a) Suitable for the outdoor reptiliary: fire-bellied and yellow-bellied toads (*Bombina orientalis* and *B. variegata*); midwife toad (*Alytes obstetricans*); tortoises (common hardy varieties only); European terrapin (*Emys orbicularis*); Spanish terrapin (*Geomyza leprosa*); all of these can also be kept inside. (b) Unsuitable to the outdoor reptiliary because of their large size or preference for warmer conditions: eyed lizard (*Lacerta lepida*); Scheltopusik or glass "snake" (*Ophisaurus apodus*)—a legless lizard; aesculapian snake (*Elaphe longissima*); four-lined snake (*E. quatuorlineatus*).

This is a good month in which to purchase ordinary tortoises, and tips useful to the beginner are: (1) buy, if

possible, from a dealer who prefers quality to quantity—the few extra shillings are well worthwhile; (2) select a medium or large specimen, for they are much hardier (babies, although cute, are hard for the beginner to rear); (3) always select an active specimen with bright eyes, which withdraws into its shell when lifted up suddenly or sharply tapped.

Both the grass snake and the sand lizard lay their eggs in June and July and these can be hatched fairly easily. If the sand lizard lays its eggs in the outdoor reptiliary (suitable sandy areas should be provided), these will hatch in due course provided that the spot receives adequate sunshine. Alternately, they can be removed and incubated indoors at 70 to 80°F in slightly damp sand and earth mixture or in dampish moss. The latter procedure is followed when specimens lay eggs in indoor vivaria.

Grass snakes in nature lay their eggs in rotting vegetation. Manure heaps are a favourite resort. Here the heat of decomposition incubates the eggs and if this can be copied on a smaller scale the eggs can be safely hatched. In egg incubation the amount of moisture must be carefully controlled; too little causes the eggs to dry up and too much causes them to rot. Practical experience is essential and is best obtained with such simple species.

The period June to September is also ideal for adding to the tropical collection. The weather is warm enough for the more delicate species to travel with the minimum risk of catching a chill.

# Aquarium Plants for the Connoisseur

## STRAP-LEAFED FORMS OF *Echinodorus*

by W. L. MANDEVILLE

THE difference in viewpoint must be taken into account when planning the decor of a display tank. In nature, the plants in the water are viewed from the surface; the mass of attractive foliage is admired without regard to the very indifferent stems which carry that foliage. Tanks are viewed in section from the front panel; the viewer is much more concerned about the appearance of the bed of the tank and the foliage in mid-water. There is advantage in this, especially in tanks lighted artificially, for heavy-headed foliage denudes the lower levels of direct light, resulting in disintegration and decay, but also bringing into prominence the value of plants with spatulate leaves of erect habit, and in this respect the *Echinodorus* stands alone, especially when larger and deeper permanent display tanks are being considered.

### Aerial Runners

Species with aerial runners present one problem; the plantlets of more mature growth are nearest to the parent plant, graduating to immature plantlets forming towards the growing tip. To harvest the mature plantlets can lead to wastage of immature forms: the better method is to peg the runners down, and when rooted to separate the runner from the parent plant, eventually harvesting developed plantlets from the end opposite to the growing tip. In decorative tanks, runners should either be removed entirely, or if some reproduction is desired, the growing tip should be pinched out after two or three plantlets have formed.

The comment is often heard that Amazon sword plants do not associate well with other plants, the criticism being that the hungry roots of *Echinodorus* denude the planting medium of nutrients required by other plants. This is not a criticism of the plant, but of the culturist. If plant culture is the criteria, there is little point in associating other plants; and if decorative aquaria is the concern, when a genus such as *Echinodorus* is available with such a variety of leaf shape, plant conformation and size, why complicate

(Illustrations supplied by Shirley Aquatics Limited)



Pigma sword plant (*Echinodorus tenellus*)



A neat chain of the broad-leaved form of *Echinodorus intermedius*



A group display of the intermediate-leaved form of *Echinodorus intermedius*



the issue by associating it with plants having a less active root system?

We ask three things of an aquatic plant: that it be decorative; that it will persist; and that it serves some purpose. The main purpose of vigorous rooting plants in tanks for permanent display is the checking of certain matter developing within the planting medium that would otherwise "build up" and affect the quality of the water. The more they do this the sweeter the compost will be, and the longer they continue to do it, the more permanent the display.

All vigorous rooting plants will associate, and as tanks of any dimension can accommodate at least three species of *Echinodorus*, each of a different leaf shape and size, it only remains to get colour contrast to complete an attractive tank. This colour contrast can easily be found among the *Cryptocoryne* and then the entire plant life within the tank is active.

Having dealt with the broad ovate-leaved species of *Echinodorus* in a previous issue (*The Aquarist*, April), the following "strap-leaved" forms are arranged according to their maximum size, for easy reference.

#### Strap-leaved Forms

*Echinodorus tenellus* (pigmy sword plant). Size 2 to 3 in. Grass-like leaves springing from centre crown, about  $\frac{1}{2}$  in. in width. Plantlets develop on low-level runners from the crown. Often listed as *Sagittaria microfolia*, and although there is some confusion over the correct name of this plant it is certainly an *Echinodorus* and not a *Sagittaria*. It will flower when grown in water about  $\frac{1}{4}$  in. deep. In the larger tanks its value lies in using it to carpet areas of compost; in the smaller tank it can be used effectively to screen the line between rockwork and compost.

*Echinodorus intermedius* (chain sword plant). Size 6 to 8 in. This plant has been known under many names, and its correct name has been "borrowed" by other *Echinodorus* species, but if the size at maximum growth and the low-level runners from which plantlets develop are borne in mind, at least the confusion between this plant and *E. paniculatus* will be cleared up.

Variation of leaf form seems to be confined to width of leaf, graduating from narrow-leaved forms without any apparent stems, to the broad-leaved form carried on short firm stalks. When grown under bog conditions, in a water



*Echinodorus paniculatus* var. *rangeri*



Amazon sword plant (*Echinodorus paniculatus*). Compare its aerial runner with the low-level runners found in the chain sword plant (*E. intermedius*)



*Echinodorus brevipedicellatus*. The leaves of the plantlets on the aerial runner resemble in shape the parent-plant leaves

depth of about 2 in., the leaves of all forms of *E. intermedius* become more rounded, are carried on stems and are very brittle, but recover when submerged.

From the illustration it will be seen that *E. intermedius* (narrow-leaved form) would make a "focal" design for a small tank, as also would the intermediate form which is illustrated as a carpet for large tanks; the broad-leaved form of *E. intermedius* is the most attractive, and will form thickets of light-green foliage as the chief decorative feature in a medium-sized tank.

*Echinodorus brevipedicellatus*. Size 10 to 12 in. Ovate, light-green 6 in. leaves carried on stems of the same length. At all stages of growth leaf and stem appear equal; this should be remembered as this plant bears some resemblance to *E. paniculatus* var. *rangeri* at certain stages of growth, but the leaf of *rangeri* is always longer than the supporting stem, and ultimate size of *rangeri* is 18 in. against the 12 in. of *E. brevipedicellatus*. Aerial runners carry the developing plantlets, and even in the very early stages of growth these plantlets resemble the parent plant more closely than in any other species of *Echinodorus*.

*Echinodorus paniculatus* (Amazon sword plant). Size 12 to 16 in. When supplies were restricted to this one species, and it was referred to chiefly by its popular name, the fact that many manuals referred to it as *E. intermedius* did little harm, but now that both species are in good supply, *E. intermedius* will have to be confined to the 6 in. chain sword plant. In cultivation there should be no confusion; the aerial runners of *E. paniculatus* bear no positional resemblance to the low-level runners of *E. intermedius*.

The leaf width of *E. paniculatus* is so variable that no fixed width can be given, and any leaf-descriptive name such as broad-leaved Amazon sword, etc., may refer to different species. There are two other forms of *E. paniculatus*, but these have been classified and are not descriptive.

*E. paniculatus* var. *gracilis*. Size 12 to 16 in. Strap-like 10 in. leaves, up to 1 in. in width, carried on firm 6 in. stems. It is by no means in general supply.

*E. paniculatus* var. *rangeri*. Size 16 to 18 in. Rather difficult to differentiate from other forms when immature (a comparison of the developing plantlets in the various illustrations will indicate this), but as the plant grows on, the stalk lengthens and the leaf broadens. This is the boldest and largest variety of *E. paniculatus*. For decorative work, the aerial runners should be removed to encourage submerged-leaf formation, and then a thicket of bold foliage results.

*Echinodorus martii* (synonym *leopoldina*). Size 18 to 20 in. Some uncertainty exists about priority of name for this plant, but when available it is usually listed as *E. martii*. It is certainly the most spectacular of the strap-leaved *Echinodorus*, with its 10 in. ruffled leaves, 3 in. wide and carried on 6 in. stems, of a delicate green colour but quite tough in texture. An ideal plant for spawning angel fishes (*Pterophyllum*). The ruffled leaves not only form pockets for the adhesive eggs, but also accentuate the water currents as the parent fishes fan the eggs. Reproduction is by self-fertilising flowers, which appear at the apices of the leaves; there is also some production of plantlets after inflorescence.

#### General Notes and Cultivation

The species of *Echinodorus* propagating by low-level runners will continue to produce plantlets so long as adequate nutriment is available in the tank, but there is some eventual loss of virility, and this can only be replaced by harvesting seeds after inflorescence.

In decorative tanks, the low-level runners are confined to the desired compost area by pinching out the growing tip of the runner; this results in further runners forming and a close thicket of plants developing in the required area.



Narrow-leaved form of *Echinodorus intermedius*



*Echinodorus martii* (synonym *leopoldina*)





Photos:

Robert Bustard

The U.S. water snake (*Natrix erythrogaster transversa*) grows to about a yard in length and looks decidedly vicious

## Hardy Snakes by ROBERT BUSTARD

THE collector who is interested in snakes has, to all intents and purposes, but one native species which he can hope to keep in the vivarium, namely, the grass snake (*Natrix natrix*). There are three species of snakes found in the British Isles but the smooth snake (*Coronella austriaca*) is restricted to areas of Hampshire and Dorset, where it requires protection. No one with an interest in reptiles should capture native smooth snakes but should keep Continental specimens. The third British snake is the adder or viper (*Vipera berus*), which is poisonous and which refuses to feed in close confinement, but does well in the outdoor reptiliary. The viper is not mentioned further as I do not recommend the keeping of poisonous snakes, especially by beginners.

### Grass Snake

The grass snake is widely distributed in England and Wales but is absent from Scotland and Ireland. In Britain male specimens do not usually exceed 2 feet in length and females measure about 30 to 36 inches. Much larger specimens are on record for various parts of the country and in Southern Europe large specimens are quite common. The coloration is olive-brown or olive-grey with vertical black markings on the flanks. At the back of the head are two yellow patches which form an incomplete collar. They are bordered posteriorly by a dark region. The ventral surface is dull white with black markings.

The grass snake is a lover of water, from which it never strays far, and is an excellent swimmer. It is also a good climber. The vivarium for these snakes should, therefore, have an ample pool and also some branches for climbing. It is most important that it should be able to bask in the

sun on occasions and that the whole vivarium is not permanently damp. It is a strange fact that water snakes which in nature spend all their lives in and around water, frequently suffer from skin diseases and die in captivity unless they have access to dry surroundings for part of the time.

The main article of their diet is the common frog, but smooth and palmated newts and also minnows are acceptable. Baby grass snakes can be fed on tadpoles. Newly caught grass snakes will often emit an evil-smelling substance when handled but they do not persist with this habit and they become very tame. An indoor vivarium for them should not be less than 30 in. by 12 in. by 12 in. They do well in the outdoor reptiliary. Price is between 5 shillings and 7 shillings and sixpence, depending on size.

### Other *Natrix* Species

The dice or tessellated snake (*Natrix tessellata*), from South and Central Europe, requires very similar conditions to the grass snake. If kept out of doors it should have a sheltered position, owing to its more southerly natural distribution. Although this species will feed on the amphibians listed above it is particularly partial to fish. It is very fond of water.

The tessellated snake, which grows to about 30 inches, lives very well in captivity, where it is very docile. Many of the so-called grass snakes available in the summer months from Italy are actually dice snakes, and I have often found several specimens in a dozen "grass snakes" to belong to this species. Specimens cost between about 7 shillings and sixpence and 15 shillings. (Readers who would like to know more about *Natrix tessellata* are referred





Russian smooth snake

to an excellent article in the *British Journal of Herpetology*, vol. 2, no. 7, December, 1958.)

The third species belonging to the genus *Natrix* which occurs in Europe is the viperine snake (*Natrix maura*), so-called from its resemblance to the viper (*Vipera berus*). Although newly caught specimens are aggressive they become tame in captivity, where they require similar treatment to the grass and dice snakes. Unfortunately this species is seldom available. All the above-mentioned snakes are oviparous.

Several American snakes of this genus are sometimes available. They are suitable only for the indoor vivarium and if kept at room temperature do not require any additional heating, although a light bulb for basking is appreciated. They are more active at about 70° F. Food should consist of amphibians and fish. Typical of these snakes is the common U.S. water snake (*Natrix sipedon*), in which the brown body is transversed by reddish brown blotches above and is white or yellow below.

#### Smooth Snake

The smooth snake has a wide range in Europe and is frequently imported (the specimen illustrated was a Russian example sent to me from Czechoslovakia); it is a most attractive small snake. It grows to about 2 feet. The smooth snake is a lover of dry areas such as heaths where the lizards on which it feeds are abundant. The prey, although sometimes held in the coils so that it can obtain purchase for swallowing, is not constricted. The best food is the common lizard (*Lacerta vivipara*), in the absence of which slow-worms (*Anguis fragilis*) can be given. This species is ovoviviparous, giving birth to living young enclosed in a transparent membrane from which they

escape very soon after birth. The young, born in August or September, vary greatly in number. Its ground colour is brown, olive-brown, grey or even reddish with a series of dark brown or black spots. The under surface is very variable; some specimens are brown or grey whereas others have an orange tinge.

Smooth snakes may bite when wild (their tiny jaws cause little effect to man), but in captivity they quickly become tame and show considerable intelligence. They do well either indoors or in the reptiliary outside. I have on several occasions watched these snakes mating. A few years ago I received two pairs of these snakes and housed them overnight in a small indoor vivarium (20 in. cube) as I wished to remove some lizards from the reptiliary before adding the snakes. Later in the evening I saw the two males fighting for the possession of one of the females. They were tightly coiled round each other, and later one of the males was seen to be in copulation. The fighting between the rival males and the mating act were witnessed again the following day. The young at birth measure about 7 inches. The price is about 15 shillings.

## GNAT LARVAE

### A Valuable Live Food

**G**NAT and midge larvae make a valuable live food for coldwater and tropical fishes. And the larvae may be obtained quite easily without any expense or much trouble on the part of the aquarist. All that one needs are a few old, shallow tins or disused kitchen utensils sufficiently large to hold about a gallon or so of water.

Fill the containers with water and introduce into each one of them some pieces of lettuce stump, cabbage leaf, banana skin or similar vegetable matter, for the female gnat or midge prefers to deposit her eggs on water containing rotting vegetation. The eggs are bound together in the form of tiny rafts, dark brown or black. At a quick glance, they resemble flakes of soot or slivers of charcoal on the water surface.

The eggs hatch out very quickly after being laid, in about 24 hours, and the tiny larvae hang head-downward from the top of the water. The tail end of the body is furnished with a breathing tube. At the slightest disturbance of the water, the larvae, commonly called "wrigglers," go zig-zagging to the floor of the container, where they will remain for a minute or so until they feel the need for a fresh supply of oxygen. The "wrigglers" nourish themselves on decaying organic matter, bacteria and other minute forms of life always present in stagnant water, and in due course become pupae.

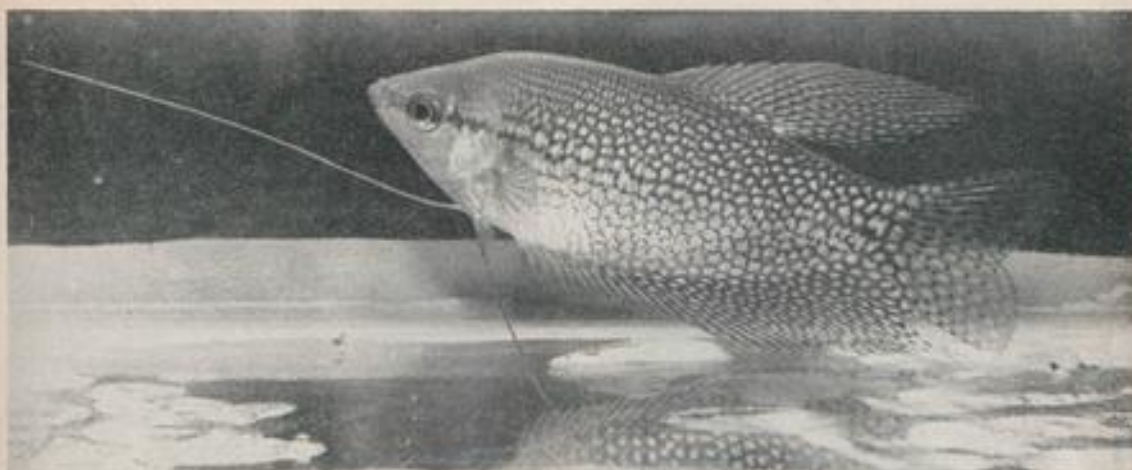
As pupae, they still "hang" from the surface of the water, but at this stage of their existence they will have developed antennae and other structures which are all bunched up at the head end of the body; when disturbed they shoot through the water like tiny comets, all head so it seems.

As this stage of their development is close to the time when they split down the back, and become fully fledged insects, it is wise to net them quickly and feed them to fishes. The pupae are a trifle large for guppies and similar-sized fishes, but barbs, the larger-sized characins and young cichlids go quite mad about them.

Better still, remove the egg rafts as soon as they are noticed, and float them in the aquarium. As the larvae hatch out they will keep all the fishes well supplied with

(Please turn to page 52)





Photos :

Pearl or lace gourami (*Trichogaster leeri*)

Laurence E. Perkins

## The Labyrinth Fishes of Asia

by JOHN S. VINDEN

**M**ANY unrelated species of fishes have accessory breathing organs of one sort or another that enable them to live in water with a low oxygen content. Many tropical catfish have this ability, but the squarist usually associates accessory breathing organs with the anabantids.

This small family provides us with some of the most popular and beautiful aquarium fishes. With the exception of a few species, such as *Ctenopoma ansorgii*, the family is confined to Asia, where a few of them provide valuable food fishes.

Most of the anabantids make ideal aquarium inhabitants, for nearly all of them are highly coloured, easy to keep, inexpensive and will breed in the aquarium.

### Labyrinth Organ

The labyrinth, or extra breathing organ, enables the fish to come to the surface occasionally, where it replenishes its supply of air. If unable to do this some species actually "drown." The air above the surface should be warm and humid, so all tanks of anabantids should be provided with a tightly fitting cover glass if the surrounding temperature is much lower than that of the tank. While this may not be of paramount importance when dealing with such relatively hardy species as paradise fish, it is essential if it is wished to keep the beautiful chocolate gourami (*Sphaerichthys ophromenoides*) healthy and comfortable.

Although the anabantids can exist in fairly foul water, and will stand more overcrowding than most fishes, all the species do better if they are allowed plenty of space in a well-planted tank of clear old water. Many of them come from swampy regions in which the water contains plenty of rotted vegetation. In captivity they appear in better health and colour when kept in softish acid water.

Adults will tolerate overcrowding, but the young fry require plenty of space if they are to grow normally. Crowding the fry leads to losses and the survivors are usually poor stunted specimens.

These fishes are not normally shy, but they do appreciate

thickets of plants in which to retire, and they also appear to enjoy lying amongst floating plants in which they frequently build their extraordinary bubble nests.

The common paradise fish, *Macropodus opercularis*, was the first tropical ever imported alive into Europe. For many years it enjoyed great popularity owing to the ease with which it could be kept and also to its undoubted beauty. Unfortunately it is not a good community fish in the small aquarium. If space permits, however, it is worth keeping in a tank of similar-sized fishes. An albino form of this fish, which appeared about a quarter of a century ago, is far less aggressive than its common relation. Other paradise fishes sometimes available are the black paradise fish, *Macropodus concolor*, the round-tailed paradise fish, *M. chinensis*, and Day's paradise fish, *M. cupanus dayi*. All these species are distinctive, and offer no difficulty in keeping or breeding.

*Betta splendens*, the Siamese fighting fish, is one of the most popular of all aquarium fishes and one that always attracts the public at aquarium shows. The brilliant specimens we have to-day are the result of patient breeding over many years, and they bear little resemblance to the ancestral wild fish. To-day there is a wide colour range, although cornflower blue is still the most popular of all. Apart from red, blue and green there are the beautiful orchid fighters, albinos and "black" ones. In addition to these are the delicate creamy-bodied Cambodia fighters, which never seem to enjoy the popularity they deserve.

There are about a dozen other species of *Betta* which come from S.E. Asia, but these seldom arrive in this country. On the whole they are rather a drab lot and have little of the colour seen in cultivated fighters. One point in their favour is that they are not "fighting" fish. Some of them are mouth-breeders and occasionally such species as *Betta picta* and *B. taeniata* arrive in small quantities.

A fish that is rarely seen these days is the croaking gourami (*Trichopsis vittatus*). It is not a very beautiful creature, but is interesting in that it is one of the few aquarium fishes that utters sounds. It does this by agitating





Giant gourami (*Osphronemus gourami*)

the air in its labyrinth during the breeding season. The sound produced by the male differs from that of the female.

#### Gouramies

The gouramies of various species remain some of the most consistently popular of all fishes. Most of them are highly coloured and exceptionally decorative. The male dwarf gourami, *Colisa lalia*, when in good condition is one of the most spectacular of all fishes. Given a well-planted tank and plenty of live food these fish soon colour up and provide a magnificent show. The newly hatched fry are very small and are difficult to rear in their early stages unless plenty of green water can be provided.

The true three-spot gourami, *Trichogaster trichopterus*, is not often seen for it has been replaced by the blue gourami, which is a more attractive colour variant of this species. Another colour variety of this species is the Crosby, moon-light or opaline gourami. This fish is a distinct improvement of the wild stock. Both these varieties breed true.

The thick-lipped gourami, *Colisa labiosa*, is larger than the dwarf and not so highly coloured. It is, however, an attractive fish, and well behaved in the community aquarium. The striped gourami, *Colisa fasciata*, is rarely seen but is worth acquiring should the opportunity occur. It is a poor nest-builder, but like its relatives, a good parent.

*Trichogaster leeri*, the pearl or lace gourami, is another species that improves in looks as soon as it is given suitable surroundings. In the unplanted tanks of the dealer this fish often looks pale and uninteresting, but in good conditions its beauty soon becomes apparent and its gentle manner makes it a very endearing species.

Like other members of the genus it is occasionally of practical use to the aquarist since, when hungry, it will search out and consume *Hydra*. The snakeskin gourami, *Trichogaster pectoralis*, is a beautiful species but grows too large for the average aquarist since its maximum size appears to be about 10 inches. A rare member of this genus is the silver gourami, *T. microlepis*.

Other gouramies that reach a large size are the kissing gourami, *Helostoma temminckii*, with its commoner pinkish variety *H. temminckii* var. *rudolfi*, and the "gourami"

*Osphronemus gourami*. The latter can reach a weight of over 20 lb., so is rarely seen even in public aquaria. In late Victorian times, however, it enjoyed a small measure of success, since it was one of the few species then available and one of the tropicals kept by that great pioneer aquarist Gregory Bateman. Small specimens can be kept in the home aquarium where it has been known to breed at a length of 5 inches.

The only other Asiatic anabantid that is kept in this country is the so-called Indian climbing perch. Although this fish undoubtedly can walk from pond to pond should the need arise, it definitely does not climb trees. It gained this reputation from an early description of the species, when it was stated that a specimen had been found in a tree. No reports of this nature have since come to hand and it is believed that the original fish was deposited in a tree by a bird. Apart from its interesting habits this fish has little to recommend it. It is dull-looking, sluggish and bad-tempered!

## GNAT LARVAE

(continued from page 50)

live food. An egg raft may comprise upward of a hundred eggs.

For fish fry past the Infusoria stage, the newly hatched larvae of gnats make a first-class food to supplement their normal diet of micro worms, screened *Daphnia* and dust-fine dried food.

The net used to catch the larvae and pupae in the containers should not be dipped into the aquarium, for it might be the means of introducing creatures and decaying matter best kept away from fishes. It is best to shake the "wrigglers" loose from the net into a jar of clean water, and from there to decant them, free of unwanted matter, into your tank.

J. H.

## Fishes—with care



Photo :

B.O.A.C.

This B.O.A.C. "Fishmuff" contains tropical fishes in polythene bags packed inside cardboard boxes. The boxes are protected from the outside world by the tough PVC-proofed nylon-fabric muff, which is also lined with a glass-wool layer to minimise effects of changes in temperature. The muff is light in weight and is collapsible, so that it occupies little space when being returned empty, advantages in cutting costs of air travel.



# AQUARIST'S Notebook

by

RAYMOND YATES



AQUARISTS should bear in mind the poison risks which the better weather will bring in the shape of fly-killers and insect sprays, either for indoor use or outside in the garden. So many handy "killers" are obtainable now at the local chemist's shop that the fact that many of these are highly dangerous to fishes may be overlooked. The two main insect killers are D.D.T. (dichlorodiphenyltrichloroethane) which is now well known, and the newer American discovery Chlordane, which is probably many times more effective. Generally these are used either as a powder or a spray, the former being roughly 5 per cent. and the latter 2 per cent. Sprays seem to be proving popular as they are so easy to manipulate and there is no waste. These mostly consist of oil or water base which quickly evaporates and leaves behind a thin film of the insecticide which will prove fatal to insects for many weeks afterwards.

Keep such sprays away from ponds and aquaria and from fish foods. It is better not to spray just anywhere but to confine this to where it is absolutely necessary. The hands should always be thoroughly washed after using a spray of this nature. Some sprays are graded according to their potency such as AA, A or B. Sprays which contain no D.D.T. or Chlordane often substitute a form of deodorised paraffin and pyrethrum and sometimes rotenone and lethane. Readers will be well aware of the dangers to fishes where rotenone is concerned. In the garden, ant-killers are sometimes used: I use boiling water whenever possible but commercial products may contain lead arsenate or sodium fluoride. Both are highly dangerous to pets.

As a disinfectant many chemicals are used by hobbyists for empty tanks and I am particularly fond of using strong solutions of Dettol, making sure that no traces remain afterwards. A first-class steriliser for all purposes is alcohol, and it is also an excellent solvent, which makes it useful for cleaning the outside glass of show tanks before judging takes place. It really makes glass sparkle. Ammonia is also a first-class disinfectant but it takes time to remove all traces and the odour remains; it also cleans glass remarkably well.

On a recent visit to Leeds I called in the local museum and was interested to see quite a number of stuffed specimens of really sizeable fishes on view and a notice intimating that live fishes were also on display. In this case anticipation proved better than realisation. The aquarium (for want of a better name) was situated on a landing and was made up of nine tanks of varied sizes. All the tanks were in a shocking condition and presented a filthy and neglected aspect. Four tanks had the front glasses almost completely overgrown with algae. Snails were everywhere and one tank seemed to have the front glass alive with planarians. A mere dozen fishes were on show: four white-cloud mountain minnows, one goldfish, one flame fish and a few tiny guppies. There were also two *Dytiscus* beetles. One tank even sported a plastic fish moored to a bottom weight.

It is depressing to see such a weak set-up, which is certainly no shop window for the hobby. Frankly, anyone unused to the hobby would be put off for life with this display. The sad part to me was that it looked as if it had been in this neglected state for months. Leeds has many hobbyists, a club and several dealers and deserves something better than this. Coldwater-fish enthusiasts would enjoy the glass-cased rudd, roach, salmon, carp, chub, pike, barbel, bream, trout and whiting (sea), and those interested in the mists of time have something to think about in the splendid fossils of *Ichthyosaurus*, *Platy-*



An unbreakable, rigid and corrosion-resistant container for liquids, recently introduced, is the Handykan. It is moulded in Rigidex polyethylene (British Resin Products Ltd.), and has a pouring spout which fits into the handle when not in use. This container could be specially useful for marine aquarists transporting sea water; its capacity is 1 gallon. Price 17s. 9d.

*somus*, *Megalichthys* and *M. hiberni*. Derby has had a similar-sized set-up in the Art Gallery for years, Liverpool had a fine show until the blitz and Bolton, of course, remains the one ace municipal effort. When are other authorities going to add an aquarium to their show galleries?

Anglers think nothing of handling maggots and worms, nor do I for that matter. However, I have always drawn the line at *Tubi-fex*. The other day I called in two shops, as I needed some *Tubi-fex*, and in both the girl assistant pulled out the quantity required with her fingers, one washing her hand thereafter in a goldfish tank. It left me with a very poor impression but, apart from the effect on the customer, it could be dangerous. I keep *Tubi-fex* in a large enamel bucket and transfer what I need to a small jug with the aid of a spoon used only for *Tubi-fex*. This supply can be washed and separated and fed to the fishes, all with the spoon. At the shop, having no container I asked if they would put the *Tubi-fex* in something for me. Objecting to newspaper, I was at last found a polythene bag (with four holes in it) plus newspaper. There are some wonderful dealers in the hobby but others certainly need to buck up their ideas.

At election times we get rather tired of the efforts of pollsters trying to prove this or that point. As far as I know nobody in a pollster organisation has yet deigned to ruffle the surface of the hobby. What a wealth of awkward questions could be asked on so many aspects of the hobby! Those for and against would register their views but the imponderable "don't knows" would no doubt make up a large proportion of the total. Apart from those few types

(Continued overpage)



# Basic Marine Aquarium Technique

by H. R. ROBINSON

**I**N the article in last month's issue details were given of some methods of constructing aquaria for use with salt water. This article contains suggestions for the stocking and maintenance of such an aquarium. Before stocking, the aquarium should have been "cured" by filling it with fresh water for a week and then emptying this out after a thorough scrubbing of the inside.

## Obtaining and Transporting Sea Water

Aquarists living in inland areas with no access to the sea can obtain sea water from the Marine Biological Association, Plymouth. Otherwise sea water can be collected from any nearby seashore, preferably from a rocky area. Care should be taken to avoid such obvious hazards as sewage outflows and river estuaries. Rock-pool water may have high salinity and should be avoided. Most authorities contend that metallic containers are unsuitable for the transport of sea water, and a glass carboy is the ideal thing. Carboys are unwieldy, expensive and difficult to stow in the average car. I have found that a metal can with a large polythene bag inside is ideal, as the polythene prevents contact between the metal and sea water. It should, of course, be tied at the top.

Sand and gravel may be obtained from a clean beach and the same rules apply about size as apply to normal aquarium compost.

## Suitable Inmates for Marine Aquaria

The variety of marine organisms which can be kept successfully far exceeds that available to the freshwater aquarist. Common littoral fishes, if small, live well and may become quite tame. I have successfully kept a wide variety of these including the following selection of "easy types": common blenny or shanny (*Blennius pholis*), black goby (*Goby niger*), fatherlasher or sea-scorpion (*Gottus scorpius*) and most small wrasses. The shanny soon becomes very tame and will leap several inches out of the water for worms.

Crustaceans are interesting and fairly easy to obtain. Prawns make useful scavengers and have the great merit of being transparent; it is thus quite easy to see when they need feeding as their intestines are visible. Small hermit crabs are fascinating subjects for observation. Crabs tend to be retiring creatures but may be included if small.

Sea anemones are very easily kept, are hardy and long-lived. They may be used as aquarium background in the same way as the freshwater-aquarium keeper uses plants. Most littoral species are colourful and easily obtained. The beadlet anemone (*Actinia equina*) and the parasitic anemone (*Calliactis parasitica*) are perhaps the best to start with. Many other creatures can be kept but cannot be mentioned in this article. Winkles and other herbivorous molluscs should be avoided because of the difficulty of feeding them. Few sea plants will flourish in a small marine aquarium but the bright-green sea lettuce (*Ulva* sp.) and *Enteromorpha* will do quite well.

## Feeding

All the creatures mentioned above will flourish on a diet of garden worms, raw fish, meat and the occasional meal of mussel and cockle. Feeding twice a week is quite ample and cooked shellfish prove a useful and cheap dietary supplement (provided that they are not preserved in vinegar!).

## General Maintenance

Despite all authoritative statements to the contrary I am convinced that elaborate filtration systems are not essential.



Hermit crab (*Calliactis parasitica*) with a sea anemone on its "borrowed" molluscan shell

Aeration helps, but is not needed more than occasionally provided that the aquarium is not over-stocked and has a reasonable surface area. Scrupulous care must be taken to remove significant quantities of uneaten food. It is useful to mark the water level on the side of the aquarium so that loss through evaporation can be made up by addition of fresh water.

I am sure that if more aquarists knew how little trouble a marine aquarium was to maintain they would soon broaden their activities and discover a new fascination in the wealth of animal life available almost anywhere on our coasts.

Books for the identification of marine specimens include: *Plants and Animals of the Seashore* by Van Reine (John Murray); *The Littoral Fauna of Great Britain* by N. B. Eales (Cambridge University Press).

## AQUARIST'S NOTEBOOK

(continued from the preceding page)

who constantly stand up at meetings and air their views most hobbyists are of the quiet type, who come and go rather in the fashion of Longfellow's Arabs. I have often wondered if fanciers have any other hobby besides fish-keeping. From general observation one gets the impression that most are quite content with the aquatic hobby and give it their undivided attention. Gardening and horticulture often goes hand in hand with aquarium-keeping, but few seem to breed other pets such as dogs or birds. Golfers don't seem to have time for fish-keeping and generally tend to lack that calm and poise which distinguishes the aquatic hobbyist. Anglers rarely seem to make real aquarists, although there are a few notable exceptions. Book lovers do—there must be a connection. Personally I think hobbyists tend to favour restful hobbies if they are fish-keepers; the two go together. Over the years I have been most interested in travel, books, chess, swimming, sailing and youth movements (scouts, cadets), and none of these has ever been allowed to interfere with my fish-keeping. If you are a real hobbyist you are a fish-keeper first and anything else takes a very obvious second place.

THE AQUARIST



## Breeding the Dwarf Gourami (*Colisa lalia*)

by E. WALLWORK

THIS beautiful little fish is not seen as often as it deserves, but in my opinion it is most attractive. Dealers, when they do stock it, have such small specimens that their customers usually buy something more colourful, especially if they are stocking a community tank. If they had seen the fully developed fish in a dealer's tank they would waste no time in adding it to their collection. For this reason, I have never been able to purchase adult fish, as they are not often available. So, as the best text-books advise, I bought half-a-dozen healthy-looking youngsters and I didn't see much in the jar, as they were only half an inch long and, of course, unsexable.

Left in a tank of their own, 12 in. by 8 in. by 8 in. in size, with water from the community tank, they were fed on white worms, fine dried food and *Daphnia*. Temperature of the water was 80°F and a few plants were thrown loosely into the water to make the fish more at home; the tank was intended to be a temporary home until they could put on a bit more weight. Three weeks later, when the six fish had shown themselves to be two males and four females, it was decided to separate the sexes. It was then that I first saw a neat little bubble nest with *Riccia* and strands of bladderwort woven into it. This nest was about half an inch high and contained a few eggs, which I removed and brought up in a shallow pie dish floating in the larger tank. The males at this time were approximately 1½ in. long and in wonderful colour, with their sloping bars and green-spangled areas on the gill plates, fins similarly barred and with a definite prolongation of the trailing edge of the dorsal fin. Females were a silvery mauve colour, and faint bars could be detected in certain lights, but all the females were distended with spawn.

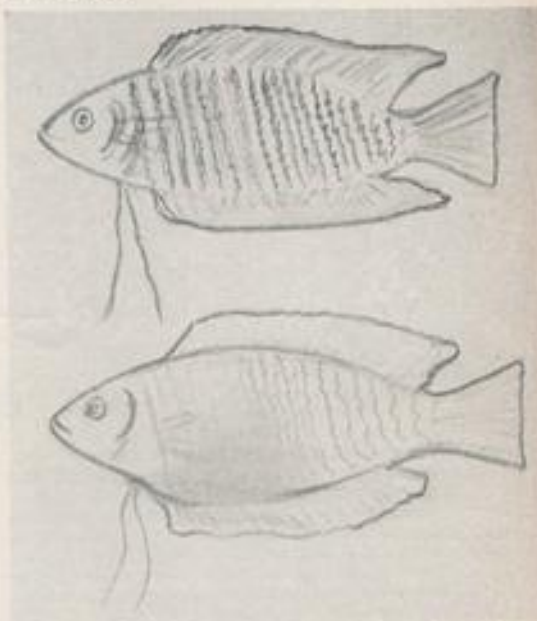
From previous experience, I find these fish to be somewhat shy in a community tank, but they are never absent at meal times and enjoy most foods if small enough for them, and they seem to relish fine floating foods or mid-water food such as *Daphnia*.

As you see, the size of the tank did not deter these little fish from breeding, but it was not ideal and a likely looking pair was taken out one week later and introduced into a 24 in. by 12 in. tank with a water depth of 6 in. Matured water was used as before and average temperature was 82°F; pH was noted as 6.8. Plants were arranged at each end (*Cabomba* mainly), with a half-inch layer of bladderwort and *Riccia* at the surface. This larger tank is almost a necessity, as will be explained.

Almost immediately, the pair of fish took stock of their surroundings and courtship started, with spreading of fins of both sexes and their finest display of colours. The male, who never seems to lose much of his pattern at any time, was really beautiful and even the female seemed to shine brighter. Before long, both of them were blowing bubbles in a disorganised fashion at the surface, fine bubbles such as often occur just above the heater. This was in the late evening.

Next morning, at about 7 o'clock, the pair were finishing a well-constructed nest of fine bubbles, bladderwort and *Riccia*. After an hour they started spawning, as the female approached the male, swimming by his side until he swam a little higher. Then he arched his body across the back of the female and it seemed that his head was actually touching his tail, as he squeezed steadily on the bulging sides of the female. Together the pair rolled over an inch or so below the nest in their embrace, and though it was not apparent to me at first, about 10 to 20 very minute eggs left the female.

At this point the pair separated and the female appeared



The male dwarf gourami is the upper fish of this pair.

lifeless and lost height in the water, but she recovered before touching the bottom of the tank and swam upwards, blowing a few fine bubbles at the same time. The eggs almost immediately floated up to the nest. This procedure was repeated over a period of 2 hours and at this time the nest was compact and most of the eggs were on its under surface. Afterwards both parent fish were removed.

The eggs were quite different from what was expected from my experience of other bubble-nest builders. These were pelagic, that is to say floating, unlike those of the fighting fish (*Betta*), which have an immediate tendency to sink. Most surprising, however, was their small size, about ½ mm. diameter, very clear and faintly amber. At first they were difficult to see with top light, but with a side light, they could be seen to be faint golden spheres of the same size as the bubbles, though not depending on them for support.

Removal of the parents is optional, as though some aquarists say that the male is liable to bully the female after spawning, I have never found it to be so; as the eggs float quite well, his presence does not seem so necessary as it is with the fighting fish.

Development of the eggs proceeds quite rapidly and in 12 hours some opacity is apparent. At 24 hours minute black specks can be seen and, after a further 24 hours, some of the fry can be seen upside down just below the surface; and soon they are making little circular tours in a manner reminiscent of tadpoles, though returning to the surface each time. On the third day they are only about 2½ mm. long, on an even keel and taking *Infusoria*. On the fourth day they swim at various levels with complete confidence, and as they are now scattered all over the tank



the squarist is liable to think his batch is lost. A good magnifying glass and a strong light will show that this is not so.

Feeding continues with Infusoria (or, as I prefer, a professionally made substitute), until the end of the week, and then they are graduated on to micro worms, brine shrimps, small *Daphnia*, shredded earthworm and dust-fine dried foods. Growth seems to me to be very slow at first, but it is here that the necessity for a fairly large tank becomes clear.

As most of the feeding is carried out at or near the surface, this area needs to be as large as practicable. Light aeration helps in bringing up the batch, which may be of as many as 120 fry, though at the end of the first week they seem to be reduced in numbers and this could be due to several factors. Infusorial feeding and fine dried foods in a small tank tend to produce contamination, both mechanical and also bacteriological.

Over a number of spawnings of average size, I have only ever averaged 45 to 50 fish brought to maturity. Full maturity for the dwarf gourami means about 2 in. long for

either sex. Seen with a front light when adult, the males are most attractively coloured and, as stated before, this may be the reason they are not often to be purchased in their adult condition. Another reason is their shyness in a community tank, in which they often find themselves. Most dealers have a few in a new consignment, and I would advise you to sort out these from their more colourful companions whilst they are young. Breeding them is a very pleasantly rewarding occupation and those in my tanks have always caught the eye of people who have never actually seen these fish in full colour, and are therefore not sure if this is the dwarf gourami or not.

In a large collection it seems to hold its own without being quarrelsome, and the males do not fight or become unduly aggressive to females. In my opinion, however, I feel that natural selection of the spawning fish is most important, as a single male will not always spawn with a female which is not of his own choice, and then bullying may occur; so a little vigilance is needed when the breeding pair are first introduced if they have not been allowed to select their own mates.

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## The Garden Pond in June—by ASTILBES

THE common goldfish, which was not included with the pond fishes discussed last month, is still the general favourite for the pond and will take a lot of displacing from public affection. Nowadays they are quite cheap to purchase and they can always be relied upon to make a good show and to remain fairly hardy in any district. Their bright colour makes them easily distinguishable among the water plants and during warm weather they frequent the upper sections of the water and are generally in evidence except if the water gets very green. When buying goldfish for the pond there is no need to buy large expensive fish. Small healthy ones will soon grow on well if the water is in good condition and if enough food is added. See that the fish are bright and active with the fins well extended. It is very rare to find a sick goldfish with the dorsal fin extended. Also, do not take those which appear very sluggish, either lying on the bottom or gasping at the surface of the water.

Do not have so many fish that there is never likely to be enough food for all in your pond. A well-run pond will need little attention in the way of extra food as long as the pond does not contain too many fish. Do not be misled by the swarms of goldfish sometimes seen in dealers' shop-windows. A few happy fish will be sure to thrive as long as they have plenty of swimming space and if there are not too many in the pond it is almost certain that for much of the year you will not have to give any extra food.

When you find that the pond is functioning well, the fish should swim about in an active manner and the water should look clear and sweet. Provided that the pond is large enough you can add one or two more kinds of the goldfish family. The shubunkin is a fancy goldfish which can be introduced into your pond with confidence. The blend of colours will make this fish very attractive and conspicuous. Even one which has not all the necessary colours for a show fish can still be very attractive. The true colours of the shubunkin should be a blue ground with red, brown, yellow and violet markings and the whole should be speckled with black. The shubunkin is active and hardy; the two distinct kinds are the Bristol and the London. The London is shaped like the common goldfish but is highly coloured and the Bristol is a more streamlined fish with rather longer finnage. Of the two the London is more hardy but in most parts of the country the Bristol will winter out of doors quite well.

For those who would like something a little more unusual than either of those already described the fantail should fill the need. The scaled fantail is a hardy fish with a double tail and a short thick body. The all-red type is especially handsome in a pond. Another fine fish, but alas one which appears to have been neglected lately, is the comet. This is a streamlined fish with a very long tail, at least as long as its body. Comets can be had in various colours and they are a particularly suitable fish for the pond as they are very active and fast swimmers. They are quite hardy and it is to be hoped that they soon return to popularity. The veiltail goldfish would be quite happy and thrive well in any pond from May to October, but owing to their very flowing finnage they are always more liable to contract fungus disease and fin congestion than those varieties with shorter finnage. Where severe frosts and icing conditions can be expected during the winter it is not wise to submit this type to the rigours of winter in an open pond.

Although all types of goldfish will breed among themselves there is no need to worry over this as it is not likely that many youngsters will reach maturity unless the pond is fairly large and very well planted. During the warmer months of the year there should be enough natural food in the pond but if the fish are very active or breeding they can be given a little food now and then, but try to imagine the amount they will find in the water so that you do not overfeed. A little food offered in the same place occasionally will soon show whether any more should be given as hungry fish are soon after the food.

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## Tropical Fishes go Home by Sea

Tropical fishes bred in Bristol were recently sent "home"—in an aquarium. The master of the new Saguenay line freighter, the 11,813 tons *Sunrhea*, Captain C. Sabinski, is a keen fish breeder, and has an aquarium in his cabin.

The Bristol Tropical Fish Club and the Bristol and Bath section of the Federation of Guppy Breeders have supplied him with some more fishes. When the *Sunrhea* sailed for the West Indies, these tropical fish started their journey home.



# Primley's New Look

by L. R. BRIGHTWELL

THE last time I was in Primley Botanical Gardens, the remarkable founder, the late Herbert Whitley, was in his glory pottering about the series of huge greenhouses that then adjoined the old Manor House. Since his lamented death in 1956, these have been converted into a home of rest for the aged. Nobody privileged to spend a day there with the extraordinary founder is likely to forget it. Clad in homely rags, of incredible weight owing to a mass of gardening tools bulging the remaining pockets, he ambled amongst his treasures displaying an encyclopaedic knowledge on a variety of subjects, animal, vegetable and mineral. Though having no use whatever for the ordinary trivial visitor, anyone genuinely sharing some of his many enthusiasms was assured of the warmest, if at times mildly eccentric, hospitality, and a feast of wondrous sights, sounds and odours in that nature-lover's paradise.

The heat averaged somewhere in the eighties, but could go far beyond. The walls were in places fairly encrusted with the lurid pink of *Ampullaria* snail egg-clusters, and from the many steaming tanks, their richly green water heavily coated with *Eichhornia* and all manner of tropical water mosses and unfamiliar plants, anything might emerge or be discovered by the owner plunging in an arm to the shoulder without the fussy formality of first removing his coat. After all it was only worn as a sort of garden-tool rack! One tank might contain a rare python, another a quite large enough anaconda or a third a happily married pair of the seldom seen *Pipa* toads.

But since the unforgettable "H.W." has gone, the place is now on a strictly business footing; its director is Mr. H. Dixon, who is also a managing director of Torquay's thriving Aquarium.

Under the care of Mr. H. M. Allies, already well known to aquarists as a lecturer, in Paignton Zoological Gardens, is a remarkable assemblage of reptiles, batrachians and fishes, all kept on the opposite side of the Totnes to Paignton road, where stands the gardens proper with their unique tropical houses all designed by the late Mr. Whitley as he designed many other of the Zoo's fine structures in characteristic fashion—on a half-sheet of notepaper!

Without indulging in any odious comparisons, no other Zoo in the United Kingdom has such simply but beautifully set-up tanks and reptiliaries, all being as they are well lit by daylight. Artificial lighting goes far to nullify the colours of fishes or reptiles, a fact not enough always realised.

It is difficult to pick out the high spots, but one indisputably unique exhibit is an 8 feet white python from East Bengal. It is not an albino, having brilliant blue eyes, but from nose to tail tip is a pure gleaming white, with no trace of the shadow markings so often seen in "albinos" of otherwise colourful creatures. In fact the reptile might be an animated ivory carving. At present on deposit, it has toured all Europe and U.S.A. and is valued at £5,000.

Nearby is a normally coloured python and an anaconda 8 feet 6 inches in length. Many of the reptiles and fishes were obtained by Mr. Durrell, of "Overcrowded Ark" fame, during his visit to British Guiana in 1956, when he returned with over four hundred specimens, the largest collection ever made in that region.

The largest Gaboon viper there I have ever seen has a head as large as a man's hand. There are eight fish tanks, 32 of reptiles. Notable are the brown leaf toads, the serrated tortoises, valued at £50 each, the blue acaras and a fine piranha that will tackle anything from a live frog to a fist-sized lump of raw beef. Though it has long been the



Hi-wei carp at Paignton Zoo Aquarium eat the ripe fruits of *Monstera deliciosa*

management's ambition to set up marine tanks, the present heating arrangements would make this difficult if not impossible.

Five powerful oil furnaces keep this and the other tropical houses at a steady and adequate heat throughout the brief Devon Riviera winter, for this favoured area does indeed enjoy, as Charles Kingsley wrote in *Glencoe* a century ago, practically Italian climate.

Surplus fishes bred in the greatest abundance add appreciably to the revenue. The great tropical house is just as Herbert Whitley originally designed it, and the huge central pond, its surface covered with vivid blue water lilies, holds some gigantic carp. Above them hangs a huge plant of *Monstera deliciosa*. In late summer its great cone-shaped fruits drop their rich golden and deliciously pineapple-flavoured pulp-covered seeds into the water, where they are neatly caught by the appreciative hi-wei that rise to them as they might to out-sized midges.

Altogether the New Primley is a place no aquarist or reptile enthusiast should miss, and one calculated to offer a wealth of valuable suggestions.



# News from AQUARISTS' SOCIETIES

Monthly reports from Secretaries of aquarists' societies for inclusion on this page should reach the Editor by the 12th of the month preceding the month of publication.

THE Catford Aquarist Society meets each Monday evening at 7.45 p.m. in the Evening Institute at Holbeach Road School, Catford, London. The number of entries in the club table shows have increased noticeably in the past few months, and often 70 or more fish have been staged. The standard of the fish also appears to be much higher recently, due, no doubt, to the excellent lectures delivered on Show Standards by resident lecturer, Mr. W. Iles. On 2nd June the Society are taking part in an inter-club table show with the Hendon Society at Hendon and no doubt they will do their best to equal the score with Catford A.S. who beat them some time ago. Any further information about the Society can be obtained by writing to the Secretary, Mr. P. Evans, 14, Tubbenden Drive, Orpington, Kent.

AN aquarium has been installed by the Sheppey A.S. in the children's ward at the Sheppey General Hospital. Members of the Society have contributed towards this effort by the provision of tank, fish, plants, etc.

An outing was arranged for members and friends to visit the Queensborough Fisheries at Wraybury on Sunday, 31st May. The hon. secretary is Mr. S. W. Bull, 27, Wheatstreat Gardens, Sheerness, Kent.

THE North Birmingham Pond and Aquarium Society recently held a Table Show for Livebearers, made a visit to the Trent River Board Hatcheries and also held their first social and dance, to which personalities of the hobby who had helped the Society in the past were invited, and which was a great success. Mr. Mark Welch, of Nottingham, was the speaker for the 27th May meeting.

The Society is desirous of borrowing or hiring aquatic films. The hon. secretary is L. W. Made, 880, Kingstanding Road, Kingstanding, Birmingham.

A SOCIAL meeting was held by Wirral Aquarists' Association for members, wives and friends at their first monthly meeting, followed later in the month by a lecture.

The lecturer, Mr. L. Connell, well-known Merseyside A.S. chairman, spoke on "Knowing Good Fish" and supplemented his talk with excellent colour slides, which helped to prove many of his points.

This meeting was well attended, but due to an unfortunate incident the headquarters were not available and members were invited to the home of Mr. Colin Davies, where the meeting took place. They wish to extend their thanks for this excellent substitute, provided at such short notice by Mr. Davies' family.

DURING a talk to the Bristol A.S. on "Electricity and the Aquarist," Mr. W. G. Ham emphasised three golden rules that underlie all installations: A good earth; all switches on the live wire and on the incoming side of the individual unit; do not overload the circuit.

The Open Show will be held on 30th and 31st October at the Bishopston Parish Hall, and particulars and schedules can be obtained from the show secretary, Mr. V. Capaldi, 18, Glen Park, St. George, Bristol, 5.

THE Wirral Aquarists' Association were entertained by Merseyside A.S. recently, and a competitive table show was the main feature of

the evening. Numerous entries for the five classes were ably judged to F.N.A.S. standards by Messrs. B. T. Roe and J. W. Tomlinson. "Best Fish in the Show" was awarded to Mr. J. C. Faulkner (Wirral), with his 92-point pencil fish (*N. trifasciatus*).

Final results on inter-club pointings was a win by Merseyside, 43 to 22. Individual results were as follows:

Livebearers: 1, Mrs. E. Jones (Black Mollie); 2, B. Rimmer (Red Wag Platy); 3, W. Kelly (Green Swordtail). Characins: 1, J. C. Faulkner (Pencil Fish); 2, W. Hayes (*H. rosaceus*) and A. Albiston (Bleeding Heart Tetra). Barbs: J. C. Faulkner (*B. tetrazona*); 2, J. Tomlinson (Cherry) and H. Stampfer (Nigger). Cichlid: 1 and 2, D. Jones (Firemouth); 3, L. Connell (Blue Acara). A.O.V.: 1, W. Kelly (Kissing Gourami); 2, J. C. Faulkner (Australian Rainbow); 3, A. Albiston (Flying Fox).

THE speaker at the April assembly of the Walsall Aquarium and Pool Society was Mr. W. L. Mandeville, the chairman of the Society. The speaker, who is well known as a writer and lecturer on aquatic subjects, recalled his early days as an aquarist and amused and stimulated the members with his original approach to fishkeeping problems. Mr. Mandeville stated that the use of all-glass tanks can present the aquarist with many unexpected



## The Aquarist's Badge

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

To obtain your badge send a postal order for 2s. 6d. together with the Aquarist's Badge Token cut from page xii, to Aquarist's Badge, *The Aquarist*, The Barns, Half Acre, Brentford, Middlesex, and please specify which type of fitting you require.

difficulties, probably caused by cross-reflections, and suggested that more use might be made of slate tanks. He recalled that in his youth he managed to obtain a large iron-bound slate tank which had been used for plating purposes. It was found that this tank gave a water quality rarely seen in the modern glass and angle-iron tanks.

A JUMBLE sale held by Dunstable and District Aquarists' Society was a great success. The June meeting will be a special one at which new rules will be discussed. Copies of these new rules have been distributed to members present at the last meeting, but any member not present requiring a copy may obtain one from the secretary. The hon. secretary of the Society is Mrs. M. L. Dixon, 24, Crowland Road, Luton.

RECENT events in the programme of the Bradford and District A.S. have been a cinema show and a table show for cichlids. The Table Show for Livebearers was won by Mr. C. R. Wilson, Mr. A. E. Thornley being second and Mr. K. Smith third. There is also a suggestion of an outing in the near future.

THE eighth annual exhibition of the Macclesfield A.S., in conjunction with the National Cactus and Succulent Branch, is to be held on the 10th-11th July in the Stanley Hall, Castle Street, Macclesfield. All enquiries should be made to Mr. H. F. Cox, hon. show secretary, 24, Beynton Road, Macclesfield.

ONCE again the British Aquarists' Festival is being promoted by the Federation of Northern Aquarist Societies and this year's event will take place on the 10th and 11th October. Classes will cover all tropical and coldwater fish. The hon. show secretary is Mr. Geo. W. Cooke, Spring Grove, Fieldhill, Bailey, Yorks.

AT the annual general meeting of the Inverness and District A.S., the following officers were re-elected: President, Mr. H. Bottom; vice-president, Mr. J. Rawlings; treasurer, Mr. J. Clark. The hon. secretary is Mr. John A. P. McBain, 52, Dunsan Road, Inverness.

AT recent meetings of the Hounslow and District A.S. among the speakers has been Mr. J. E. Edwards, who spoke on the various types of structures that can be used for fish houses. He also spoke on the feeding of fishes.

Mr. R. Luff has also given a talk on his breeding of lyretails and described his method for collecting rainwater. The secretary of the society is now Mr. M. Worms, 302, Ellerdine Road, Hounslow, Middlesex.

THE ninth meeting of the season of the Dundee A.S. was held recently and a very successful Quiz took place in which several questions resulted in lengthy discussions.

The Table Show Results were as follows:— Breeders Egglayers: 1, E. J. Seymour (*Aphyosemion biostatum*); 2, H. J. Seymour (*Coina labiosa*). Breeders Livebearers: 1, A. S. Ramsay (Double Sword Guppies); 2, A. Garland (Yellow Wagtail Platys); 3, J. L. Forbes (Red Platys). Novices Egglayers: 1, Miss Hazel Campbell (*Hyporhamphichromis scholzei*); 2, Miss Hazel Campbell (*Hyporhamphichromis inez*). Novices Livebearers: 1, Miss Hazel Campbell (Green Swordtail); 2, Miss Hazel Campbell (Red Swordtail).

A FRESH meeting place is announced by Willesden and District Aquarists Club, and the new premises are at Amson Hall, Cricklewood, London, N.W.2. The new secretary is Mr. R. D. Eison, 11, Boszke Road, Willesden, London, N.W.10. The Annual Show is to be held on the 12th and 13th September at Roundwood Park, Willesden, and the show secretary is Mr. E. F. Large, 115, Canterbury Road, Kilburn, N.W.6.

RECENT activities of the Bethnal Green A.S. have included a very enjoyable annual social and lectures by Mr. Cannon on fish anatomy, show fish pointings and glazing aquaria. Among the



future events is a show of furnished aquaria and individual fish on Saturday, 20th June.

THE following officers were elected at the annual general meeting of the **Independent A.S. Chairman**, Mr. F. C. Tomkins; secretary, Mr. L. Dare; treasurer, Mr. J. Morris; show secretary, Mr. H. Walters; P.R.O., Mrs. J. Joyce. Steady progress has been made by the Society during the past year, and an ambitious programme has been arranged for the coming year. The Society meet at the Montem School, Horseay Road, every Monday evening, and visitors can be assured of a warm welcome.

THE officers elected at the annual meeting of the **Association of Yorkshire A.S.** were as follows: Chairman, Mr. R. Grimshaw (Leeds); vice-chairman, Mr. C. Duckett (Skipton); secretary, Mr. R. Winterburn, 15, Woodhall Place, Thornbury, Bradford, 3; treasurer, Mr. D. Dunford (Dewsbury). The Castleford and District A.S. has been wound up owing to lack of support.

THE **Bristol Tropical Fish Club** at their March and April meetings held discussions amongst the members on "Water" and "Diseases" concerning tropical aquaria and fish. Many interesting points were raised and talked about. At the May meeting a talk on "Plants" was given by Mr. R. James, who is a well-known figure in Bristol and district aquarist circles. Any aquarists interested in attending are assured of a warm welcome and an interesting evening. Meetings are held monthly at the Old Duke Hotel, King Street, Bristol, on the third Thursday of each month. The secretary is Mr. L. Littleton, 9, Little Stoke Road, Stoke Bishop, Bristol 9, who will be pleased to receive enquiries for prospective membership.

A GROUP of aquarists have formed a new society to be known as the **Haden A.S.** Meetings are to be centred at the Cradley Labour Club, Colley Gate, Cradley, Staffs., and will generally be held on the first and third Tuesday of each month at 8 p.m. The following officers were elected at the first meeting of the Society: Chairman, Mr. A. T. Smith; secretary, Mr. F. H. Billings (90, Abbey Road, Cradley, Staffs., Telephone: Cradley Heath 69793); show secretary, Mr. G. Adams; treasurer, Mr. R. Cunningham; assistant-secretary, Mr. B. Layton; general committee members: Messrs. Sidaway, Morgan and Hinton. Fifteen members were present at this meeting.

The objects of forming the Society are mainly to provide educational and social activities for the many aquarists in the area. A full programme of lectures and shows, etc., for both tropical and coldwater fish, will be arranged as soon as possible. New members will be welcomed at any meeting, and full details can be obtained from the secretary on request.

THE annual show of the **Leeds and District A.S.** will be held on the 4th-10th October. Added features this year are separate tropical and coldwater aquaria classes for ladies only. The show secretary is Mr. F. Mowthorpe, 8, Chester Street, Leeds, 11.

THE show schedules for the **Southend, Leigh and District A.S.** are obtainable from Mr. J. Wylie, 64, Gainsborough Drive, Westcliff-on-Sea. The show is being held on Southend Pier from the 1st to 9th August.

THE main subject at the last meeting of the **Bristol Coldwater Fish Breeders' Group** was "Spawning." Reasonable success has attended the efforts of the members and as the main object has been to help each other even to the loan of envied fish it is hoped that the final result will be "just that little bit better." Some very good red scaled veiltails already of fair size were shown by one of the members and the Group has now come quite a long way with this particular variety.

AT a recent meeting of **Bath Aquarist Society**, members and friends from Bristol A.S.,

**Bristol Tropical Fish Club**, Keynsham, Cheltenham and Trowbridge, were privileged to hear a talk on Plants, illustrated by about 150 slides by Mr. Kestitzky of London. This was of interest to both tropical and coldwater members alike. Mr. Vic Capaldi of Bristol, kindly loaned his projector and screen, and was operator for Mr. Kestitzky.

AT the monthly meeting of the **Northampton and District Aquarists Society** a competition was held amongst members for setting up a tank which was won by Mrs. P. Upton.

Prize-winners in the table show for live-bearers were: 1. Mr. N. E. Lyon, 2. Mr. J. Wright, 3. Mr. J. A. Carterall. Judge was Mr. W. H. Smedker.

### BRAZILIAN AQUARIST AT KINGSTON

THE **Kingston and District Aquarist Society** were recently visited by Dr. Harold Schultz of Brazil. Dr. Schultz was visiting Europe with Mr. Herbert Axelrod, editor of *Tropical Fish Hobbyist*, the American periodical which has reported so many of Dr. Schultz's expeditions. Dr. Schultz is employed by a Brazilian Museum to study the South American Indians, and as he has been interested in fishes since he was a boy, he has been able to collect fishes from a great many regions of the Amazon Basin. Before he left New York he was presented with the award for "Outstanding Fish Collector" by The International Federation of Aquarium Societies for uncovering 36 species of Brazilian aquarium fishes, including the fabulous blue discus and many characins.

He showed the Society a number of colour slides of fishes and some of the localities where they were found. Many photographs had been enlarged to show teeth and head formations of fish. This had been done with the piranha, showing two distinct types. One has a short powerful jaw, this includes the black piranha and the common variety, the other has a longer snout with less powerful jaw and smaller teeth. Dr. Schultz said that the piranha is generally in this country considered a dangerous fish but that in Brazil many people swim where it is known to exist and they are not attacked. Apparently the piranha is attracted only by blood or dead meat. There are several varieties of this fish and the one known in this country (*Serrasalmo pirapora*) is not the most dangerous. The worst is the black piranha, which grows to a length of 18 inches. The Amazon, said Dr. Schultz, is a river subject to great seasonal changes, but temperature does not alter very quickly. During the rainy season the land surrounding the river is flooded to a depth of 20 feet or more and it is before this season that most spawning is done, thus the fry are hatching when there is an abundance of water and food. Fishes which live in backwaters spawn in tree

roots and plants and those which inhabit the main river spawn in large "islands" of floating grass, often a mile long and hundreds of yards wide. The neon tetra is found in the backwaters where the water is often a deep brown, temperature 80°F and pH 6.2. He has not yet, however, visited the habitat of the cardinal tetra.

### SECRETARY CHANGES

CHANGES of secretaries and addresses have been reported from the following societies: **Bristol Tropical Fish Club** (Mr. L. Littleton, 9, Little Stoke Road, Stoke Bishop, Bristol, 9.); **Merseyside Aquarist Society** (Mr. W. T. Kelly, 31, Siddley Street, Liverpool, 17.; Phone: LARK Lane 1299); **Willesden and District Aquarists Club** (R. D. Eison, 11, Bourke Road, Willesden, London, N.W.10.).

### DO YOU KNOW THE NAMES? (Solution)

From above downwards the popular names are: blind barb, albino swordtail, pygmy barb, half-striped barb, combtail, climbing perch and blue platy. Thus the sixth vertical column reads bobtail.



## BRITISH AQUARISTS' FESTIVAL

10th and 11th OCTOBER

Belle Vue Zoological Gardens,  
Manchester

Classes cover all tropical  
and coldwater fish

Hon. Show Secretary:

Mr. Geo. W. COOKE,

"Spring Grove," Fieldhill, Batley,  
Yorks.

### AQUARIST'S CALENDAR

**27th June:** British Aquarists Study Society Spring Lecture Programme, 2.30 p.m. "Finding Out" by W. L. Mandeville; "Spawning Adhesive Egg-layers" by D. McInerney. At the Lecture Hall of the Zoological Society of London, Regent's Park, London, N.W.1. Tickets (including tea) 5s. each, from Mr. J. E. Edwards, 42, Berrylands Road, Surbiton, Surrey (Elmbridge 1946).

**10th and 11th July:** Macclesfield Aquarium Society (in conjunction with the National Cactus and Succulent Branch) annual exhibition at Stanley Hall, Castle Street, Macclesfield.

**16th-18th July:** Merseyside Aquarist Society (in conjunction with the Liverpool Show) annual open show at Wavertree Playground, Liverpool, 15. Schedules may be obtained from Mr. B. T. Roe, 9, Wentway, Liverpool, 15.

**1st-9th August:** Southend, Leigh and District Society open show at Southend.

**20th-22nd August:** Walthamstow A.S. annual show at Hawthorne Road Halls, Walthamstow.

**26th-29th August:** Midland Aquarium Pool Society annual open show at Bingley Hall, Birmingham.

**2nd-5th September:** Coventry Pool and Aquarium Society open show at Old Grammar School, Hales Street, Coventry.

**4th-5th September:** Bethnal Green A.S. annual open show at 229, Bethnal Green Road, London, E.2.

**8th-12th September:** East London A. and P. Association annual show at Central Hall, Barking Road, East Ham, London, E.6.

**12th-13th September:** Willesden and District Aquarists Club annual show at Roundwood Park, Willesden.

**4th-10th October:** Leeds and District Aquarists Society annual show at Leeds.

**10th-11th October:** British Aquarists Festival at Belle Vue, Manchester.

**14th-17th October:** Bradford and District A.S. annual show at Mechanics Institute, Bradford.

**30th-31st October:** Bristol Aquarists' Society annual open show at the Bishopston Parish Hall, Bristol.