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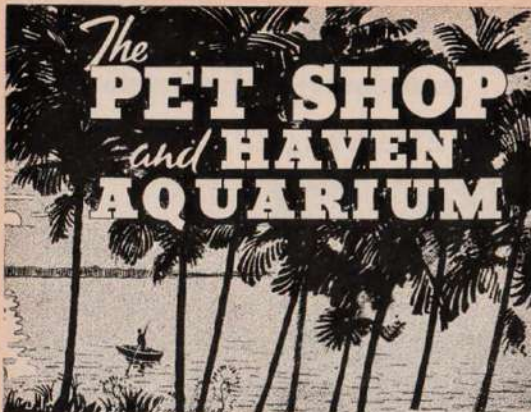
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VOL. 13 NO. 8
NEW ISSUE
JUNE 1958

FISHKEEPING

and Water Life

IN THE SWIM

Marine Feature • Questions Answered
Co-operation Afloat • Edible Pets • American
Specialist Group • Flourishing South
London • Change at Southsea

● Sea-horses breed, South Coast Aquatic Nurseries Ltd. are making a special display of tropical marine fishes at their Southend Aquarium. Among the fishes are Sea-horses from the Far East which released young two to three weeks after their arrival in this country. These Sea-horses are larger (up to 6 in.) than the Mediterranean species. They appear hardier and are more brightly coloured. Other tropical marine species at Southend include Trigger Fishes (*Balistes*), various *Danysyllus* and two species of *Hemichan*. All are flourishing.

● Advanced study. John E. Edwards, organising light of the highly successful British Aquarists' Study Society, is recovered after a recent spell in hospital. His club's informative bulletin is now produced in a larger size. An excellent programme has been worked out for the B.A.S.S. annual conference on October 4. It includes a Brains Trust session with Dr. F. N. Ghadially, Dr. Gwynne Vevers (curator of the London Zoo Aquarium) and Mr. D. B. McInerney among the panel members.

● Nautical rescue. When Roy Skipper and Bob Calrow visited Ghent in Belgium in April to give a showing of colour transparencies, with commentary, to the Nymphae A.S. a gift of tropical fishes came their way. The fish were packed in a plastic bag which midway on the sea journey from Ostend to Dover, sprang a leak. When the trouble was

noticed half the water had gone and the remainder was trickling away fast. "Fortunately our plight attracted the attention of a steward," says Mr. Skipper. "He came to our aid with a large can and an armful of newspapers. The fish were transferred successfully and travelled the rest of the journey without mishap. "The steward introduced himself as an aquarist from Ostend and a regular reader of FISHKEEPING."



Roy Skipper and Bob Calrow re-box tropicals while en route for England (see "Nautical rescue").

● A question of taste. Two items telling of unusual gastronomic ways have been published in the last few weeks. One, widely reported in the national press, told of two 15-month-old toddlers who, with considerable dexterity, climbed on to a table to investigate Goldfish in a glass bowl. One of the children, Joyce by

Published monthly by Fishkeeping and Water Life, Dorset House, Stamford Street, London, S.E.1. Telephone: Waterloo 3333. Telegrams: Poultonbir, Sedist, London. Annual Subscription: Home, £18.0. Overseas, £17.0. U.S.A. and Canada, \$4.00.

name, hooked out a fish and ate it, whilst Jacqueline apparently did not find another one quite to her liking and just took a bite from it.

The other story, referred to in the April 26 issue of "Nature", is considerably older in its origins and refers to small lizards of the *Dicrodon hoembergi* species eaten by natives of the North Peruvian coast. Some natives now hunt these reptiles on a commercial scale. There is a ready market for them in neighbouring cities. Commonly, we are told, they are prepared in seiches, soups, stews or omelets. Taken together, these stories are enough to make any vaguely squeamish aquarist or herpetologist turn vegetarian!

● **America leads.** Following fairly close on the founding of two Guppy specialist groups in the United States, comes news that *The Aquarist* (Philadelphia) is now encouraging the formation of the American Panchax Association which will cater for those interested in the culture of Killifishes, including species of the Genera *Aphyosemion*, *Epiplatys*, *Aplochelax*, *Pachypanchax*, *Rivulatus*, *Nothobranchius*, *Cynolebias*, *Pterolebias*, *Fundulus* and *Aphanius*.

These Egglaying Tooth-carps have a wide following in Britain as well, and it seems likely that the time will soon be here when the British specialists will decide that a comparable organisation should be formed here.



Treasurer of Friends A.S. (Kennington) collects the usual weekly subscription from a club member.

● "Friends by name . . ." Good-hearted fellowship and a willingness to help the hobby at large are hall-marks of a flourishing society. I was impressed by the enthusiastic assistance given by Friends A.S. (Kennington), along with other societies' members, at the 1958 Olympia Show.

Obviously this fine spirit of *esprit de corps* was no chance thing—the Friends club at-

phere must be responsible for it and on May 8 I went along to one of its meetings to try to find the secret. No single factor is responsible but, rather, a collection of circumstances.

Members are fortunate in having their own permanent meeting place behind one of the business premises of their President. The accommodation is modest enough, but maximum use is made of it. The small meeting room encourages a cosy atmosphere, but it also means that membership is never allowed to go above 30. The walls are freely lined with coloured pictures of fishes, charts showing club competitions, etc., and a large community tank is installed in one corner. In a second room is tank staging on which show aquariums, illuminated by low-voltage lighting, are permanently installed.

A few interesting points from the club procedure are: weekly meetings; a monthly members' show, plus frequent inter-club competitions; a weekly subscription of 1s. 6d. regardless of whether you attend or not; and an entirely informal atmosphere with enthusiastic officers in control.

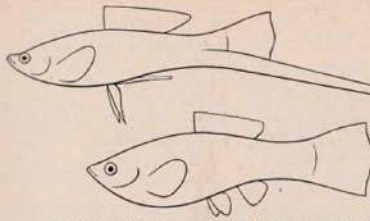
● **Private survey.** General secretary of the Corby A.S., David Jones, and N. L. Hodson (joint secretary of Corby Young Naturalists' Club) organised a survey of two local woods recently. The printed report which followed gave a full account of the flora and fauna in them. A hundred copies were distributed to various natural history societies, libraries, museums, etc., and were well received. One encouraging result of these naturalists' enterprise has been that the local council and park committees have decided to preserve as much as possible of the natural woodland.

● **Seaside displays.** By taking over the Southsea Aquarium this year Robert Jackson's firm of Zoological Exhibitions, of which George Cansdale is a director, becomes responsible for four seaside aquariums, including those at Margate, Rhyll and Swanage. A reception was held on May 15 to introduce the new-style Southsea display.

The collection already assembled at this popular south coast resort is comprehensive one and includes good Lionhead and Celestial Goldfish, Sea-horses, a representative marine section and a wide range of tropical fishes, among which are some exceptionally fine and coloured Black Angels.

Mr. Cansdale announced that it was hoped to introduce a marine tropical section with fishes from the Red Sea.—L.W.A.

CULTURE OF LIVEBEARING SWORDTAILS



A pair of Ideal Swordtails, drawn from the illustration appearing in the Federation of British Aquatic Societies' "Show Standards for Cultivated Fishes" booklet.

Hints on breeding and rearing these popular fishes

By L. LITTLETON

AMONG the best known and most attractive of the livebearing species of fish are the swordtails (*Xiphophorus helleri*) and, having had an opportunity of studying these fish in his or her community aquarium, the beginner to tropical fishkeeping may wish to start breeding them. Whilst there are no insuperable difficulties involved unless certain principles are observed it is likely that only poor quality fish will be produced, with resulting disappointment.

In giving details of the procedure I have adopted to breed and rear these fish, using only limited tank space, I hope that the novice may be able to follow it with advantageous results.

Keeping the Strain Pure

The several varieties of swordtails will readily interbreed and it is therefore only possible, if a community tank is used to house the parent stock, to breed one variety. Should two community tanks be available then more varieties can be kept by housing males in one tank and females in the other, but again it is extremely inadvisable to mix broods of young fish and a separate tank for each variety must be allocated for rearing purposes.

In order to ensure maximum development of the swordtail it is essential that ample tank space should be allocated, especially for rearing purposes, and I use aquariums of the

following dimensions: community, 24 x 12 x 15 in.; breeding, 16 x 10 x 10 in.; rearing, 24 x 12 x 12 in. If larger tanks can be allocated for rearing, so much the better.

The varieties of swordtail most often seen are the Green, Black, London, Red, Red-eyed, Red, Tuxedo, Wiesbaden, Green Wagtail, Red Wagtail and the Albino and, having decided on the variety it is desired to breed, stock fish should be obtained where there has been no possibility of males and females of different varieties having intermixed.

The fish should be young. If they are scabbe then obtain two or three pairs and, if not, get four or six fish. The main points to look for are body colours or colour which are intense and body shape as near as possible to the standard drawing reproduced here, the female being slightly deeper in the body than the male.

Finnage should be good; the pectorals, pelvic and anal in the female being well rounded. In the male the pectorals should be rounded, the pelvic pointed and the pointed gonopodium taking the place of the anal fin. The dorsal fins in both fish should be as illustrated, and the spread caudal fin should be equal in width to the depth of the body with the lower rays in the male extended to form a straight sword. Condition of the fishes should be excellent.

Provided there are no other fish of similar species in the community tank the stock fish

can, after isolation, be accommodated there and a watch kept on the females for signs of their being gravid, denoted by the area around the rear of the anal fin becoming darkened and a growing roundness of the body. When these signs are noticed the breeding tank can be made ready to receive the female before the birth of the brood.

This tank should be well cleaned and tap water added to the depth of between four to five inches. To provide cover for the fry immediately after birth clumps of Willow Moss or other fine-leaved plants can be weighted and placed on the floor of the tank, whilst surface cover can be given with floating plants such as *Riccia* or floating strands of *Cabomba* or similar subjects.

Heating must be provided to give a tempera-

ture of 75-78 deg. F., but need not be set into operation until shortly before the female is to be transferred to the tank.

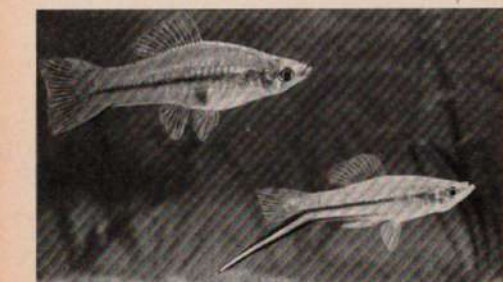
The gestation period of the female swordtail from time of first fertilisation by the male is about three weeks with, when kept in a temperature of 75 deg. F., a period of five to six weeks between broods. Removal of the gravid female should preferably be accomplished about two-thirds of the way through this period, care being taken that the temperature in the breeding tank is equal to that of the stock tank when transfer of the female takes place.

The female should be well fed in the breeding tank, although care must be taken that no excess, uneaten food is allowed to foul the water. Even when they are well fed swordtails

have a weakness for eating their young so that a careful watch must be kept on the tank to ascertain at the earliest moment when the brood has been dropped. In the majority of cases I have found that this takes place during the night or very early morning.

Immediately the young fry are noticed resting on the bottom of the tank, remove the female, placing her in another tank, where she can have a couple of days rest free from the attention of the males before returning her to the stock or community tank. I find that if plenty of cover is afforded by plants and a strict watch kept to ascertain when birth takes place losses among the fry can be kept to very small numbers.

I do not feed the young fish for the first 24 hours after birth, but after this period has



New York Aquarium photograph of a swordtail pair from a wild strain.

elapsed feeding can be commenced by using liquid fry food or similar preparations. Dip about an eggcupful of water from the tank, drop in three or four drops of the food, mix well and put the solution in the tank.

Feeding by this method alone is continued for three days after which it is supplemented by daily feeding of Mikro-worms. Cultures of Mikro-worms, Dwarf White Worms and White Worms should be prepared in anticipation of breeding operations.

At the end of 10 days the young fish should be able to cope with dust-fine dried food sieved through butter muslin, a nylon stocking or a fine wire strainer such as can be obtained at general stores.

An additional item can be small portions of strained creamed spinach which may be

purchased from a chemist in small sealed tins. At this point the feeding of Mikro-worms should be continued but the liquid fry food or similar preparation, discontinued. The water depth in the tank should be increased to double the existing level but, before topping up, the bottom of the tank can be cleaned by siphoning if it is thought necessary, care being taken not to siphon off any young fish.

After another seven days prepare the rearing tank by filling up with fresh water and, having brought up the temperature of the water equal to that in the breeding tank, transfer the young fish. I do not advise compost or plants in the rearing tank as they form a hindrance to siphoning off excess food and muck and also interfere with netting the fish.

If preferred, however, the glass base of the tank can be covered with slate or other thin, non-reflecting material. During transfer operations any fish which has swim-bladder trouble should be disposed of. The symptoms of swim-bladder trouble are energetic efforts on the part of the fish to reach the surface followed by rapid sinking to the tank bottom.

From then onwards, feeding must depend on the progress and size of the fish. As size develops, Dwarf White Worms can be substituted for Mikro-worms and later these can in turn be replaced by full-sized White Worms. If *Daphnia* is available it can also be fed but in the early stages of the fishes' development it should be avoided. The same applies to dried foods, the coarseness being progressively increased from the original dust-fine grade.

The continued increase in size of the fish depends greatly upon tank space provided and, if it is noticed that any fish are lagging behind the rest of the brood—and this invariably happens—catch them out for disposal and continue the process until only 12-18 of the best specimens remain.

Male swordtails cease to grow in size when their sexual characteristics commence development so that if these signs are noticed in any fish before reaching the minimum size required, such specimens should be removed. The reduction of the original number in the brood by the method given will afford more space and benefit the remainder by adding to their chances of development.

Feeding should be regular and adequate with the live and dried foods mentioned previously, the tank being kept clean and fresh by regular siphoning and maintenance.

The swordtail is a lively, colourful and adaptable fish and makes an ideal subject for study by the beginner and experienced aquarist. The existing varieties have been developed by man from the original wild swordtail and there are undoubtedly possibilities for further varieties to be produced.

Fish Philately



Red Mullet

WITH the fish shown in its vivid reds and golden yellows against a colourful background of marine vegetation and shellfish, this 35-dinar stamp is as accurate pictorially as it is pleasing in design. It is another in the set issued in 1956 by Yugoslavia to illustrate the varied forms of marine fauna found in Adriatic coastal waters.

The Red Mullet, *Mullus surmuletus*, of the Family *Mullidae*—more correctly called Surmulletts and Goatfishes—is not related to the Grey Mulletts, which belong in the *Magilidae*. Its normal range is from Ireland to the African coast and Mediterranean, though it sometimes enters the North Sea in hot summers.

Separately or in shoals, Red Mullet roam the vast areas covered by *Posidonia* seaweeds, on which they browse, using their two sensitive barbels to locate larvae, worms and crustaceans as they go.

M. surmuletus reach about 15 inches in length, rather larger than the more famous *M. barbatus*, which also occurs in the Adriatic. These fish were valued as food above all others by the Romans, who kept them in aquaria to delight their ladies with the changing colours of the mullet as they were removed from the water before cooking. Connoisseurs of seafood still regard grilled Red Mullet as a very special delicacy.

JOHN WAKEFIELD

COLOURS AND PIGMENTS IN GOLDFISH

How the colour effects in fishes are caused

by R. J. AFFLECK, M.Sc.

THE numerous colours seen in Fancy Goldfish are produced by reflecting tissue, orange, yellow and black pigments and the red pigment (haemoglobin) in the blood. These are responsible singly or in combination, for the colouring of Goldfish.

The distribution of reflecting tissue affecting the colour of Goldfish was described in the last issue. In the absence of pigments, reflecting tissue appears silver but, when pigments are present with it, the colours have a Metallic or Nacreous shine as described previously.

Orange and yellow pigments are found in two regions (R_2 and R_3 in the diagram), one above and the other below the scales; but the colours seen are only very slightly affected by the position of the pigments.

Reason for Pink Colouring

Haemoglobin is responsible for the pink colour seen in the body of some Matt and Nacreous fish and also for the red colour of opercula in some Matt and Nacreous specimens. This red is due to the concentration of blood in the gills showing through the translucent bones of the opercula.

The black pigment which affects the colours of an adult fish, is found in four regions (R_1 , R_2 , R_3 and R_4 in the sketch). In the first region the pigment appears black, in the second a slate-blue (slate) while in the third and fourth regions it shows as a brilliant blue.

Most young Matt and Nacreous fish (about an inch long) are blue but as they become older

the blue colour fades. The original blue is due to black pigment very deep beneath the surface being seen through the outer translucent layers.

As the fish grows these black pigments become progressively deeper in the body and eventually are too far down to be seen. It is almost impossible to form an opinion of the final blue colour of a Matt or Nacreous fish until it is at least 2 in. long.

Fading with Age

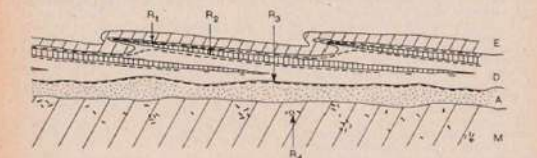
As a fish becomes older (six to seven years under typical British outdoor conditions) the pigments decrease and the fish becomes paler in colour. Livefood feeding and pond conditions encourage more brilliant colouring.

The actual colours seen in Goldfish are reddish-orange, yellow, black, slate-blue (slate), blue, silver and pink, occurring singly or in combination. Some examples of these combinations are as follows:—

- (a) Olive-grey (uncoloured Goldfish)—orange-yellow, black, silver.
- (b) Brown—black, orange.
- (c) Lilac—pink, pale blue.

More Brilliant in Some Groups

The orange colour in Nacreous and Matt fish is often more brilliant and redder than that in Metallic fish. Pigment in the second as well as in the first layer causes the greater intensity and the blood is responsible for the additional red intensity.



Horizontal section through scales and surrounding tissues of a Goldfish. E=epidermis. D=dermis. A=adipose tissue. M=myotomes. Vertical shading=scales. The four regions of the chromatophores are shown as R_1 , R_2 , R_3 , and R_4 .

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Fishkeeping, June 1958

Two Corydoras Catfishes

By R. W. ANDREWS



The diminutive tropical Catfish species, *Corydoras hastatus*. Its maximum size is less than 1 1/2 in.

CORYDORAS hastatus not only has the distinction of being the smallest species in the *Corydoras* Genus of tropical Catfishes (a fully grown specimen does not usually greatly exceed one inch in body length) but it also differs considerably in its general behaviour.

Almost all the *Corydoras* are bottom dwellers and confine most of their active periods to working over the bottom compost in search of anything edible, with an occasional rapid dash to the surface for a gulp of air.

Favours Midwater

C. hastatus is an exception to this typical behaviour, for it spends much of its time swimming about in midwater or hovering in one spot for several moments at a time. Even when resting, *C. hastatus* appears to prefer to lay upon a plant leaf, well above the tank bottom, and when moving to the surface to take air it does so at a far slower speed than other *Corydoras* species. In fact, it is almost only to take food that this species goes down to the bottom, for its typical *Corydoras* down-turned mouth does not enable it to take food at the surface or dropping through the water. Nevertheless, I have often observed *C. hastatus* actively working over the surface of horizontal plant leaves for oddments of food which had lodged there.

This *Corydoras* is not what might be termed a colourful fish, the overall body tone being a light brown with a silvery belly area. A black band extends from the tip of the snout back along the lateral line to the base of the caudal fin, where the band terminates in an arrowhead formation edged with white. A faint gold line also runs along the top of the black band.

It has been my experience that *C. hastatus* makes an ideal addition to a community tank of the smaller-sized shoal fishes, such as the various Tetras, Minnows and Rasboras. In such company, it will often display a gregarious

inclination by joining in the activities of the other inmates, this trait being especially noticeable when livefood, such as *Daphnia*, is placed in the tank; the general swirling of the shoal fishes appears to arouse a similar reaction in the Catfish and it will join in the mêlée, excitedly endeavouring to catch the *Daphnia* and never apparently realizing that its down-turned mouth is not suited for taking food as its companion fishes are doing.

My reason for combining *C. melanistius* with *C. hastatus* is that in some ways both species display a marked similarity of behaviour. *C. melanistius* is, however, a much larger fish, which attains a size of 2 1/2 in. It also has the more bulky body shape, so characteristic of the Genus *Corydoras*.

It may be classed as a colourful species, the overall shade being pale gold, flushed with a pink hue. In addition, the whole of the body is heavily sprinkled with jet black spots. A wide black blotch extends from the top of the head down to the eye and a similar marking covers the front edge of the dorsal fin.

This species' activities are apparently about equally divided between the bottom compost and midwater areas but *C. melanistius* does not appear to possess the buoyancy of *C. hastatus* in its midwater activity and only swims around

Corydoras melanistius, a peaceful Catfish growing to 2 1/2 in. Photographs, G. J. M. Timmerman



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for quite short periods before returning to rest on a convenient plant leaf where it takes an apparently intelligent interest in the general shoal activities of other species without showing any obvious inclination to join in.

C. melanistius does display the shoal instincts, however, but it is contented to be king of its own kind. It is interesting to observe that invariably when one *C. melanistius* decides to become active, others of its species in the same aquarium will immediately follow its example and, conversely, when one fish decides to rest, either on a plant leaf or on the bottom compost, all will settle in near proximity.

This "follow-my-leader" behaviour does not

appear to be connected with either sex particularly; in fact, rather it seems to be a purely normal reaction linked to the shoaling instinct. Incidentally the described shoal behaviour of the *C. melanistius* may also be applied to other *Corydoras* species.

In conclusion, may I add that both the species reviewed have shown themselves to be peaceful, hardy fishes with identical requirements for their welfare. They are not fussy as to diet though their favourite food is *Tubifex* or White Worms. The tank set-up should, of course, include some fairly strong-leaved plants such as *Cryptocorynes* and finally, a not-too-bright tank light should be provided.

FISH ENEMIES

Fish Lice

by JOHN CLEGG, F.R.M.S.

Illustration by the author

THE Fish Lice (*Argulidae*) are undoubtedly the worst parasites that freshwater fish have to contend with and they are by no means as uncommon as is popularly supposed. They are not true lice, for a louse is an insect, but are, in fact, crustaceans (related to the common *Cyclops* of our ponds) which have adopted a completely parasitic existence.

To this end they are wonderfully adapted for remaining firmly attached to their host as it swims about. Their bodies are extremely flat so that they offer no resistance to the water.

The two most noticeable structures, well shown in the illustration, are the huge suckers on the underside of the body which enable a firm grip to be taken of the fish and in addition there are backward-pointing spines which also help to grasp the victim. Just behind the suckers is a sharp beak through which the blood of the fish is taken.

Fish Lice are quite capable of moving about freely in the water when necessary, for which purpose they have four pairs of feathery swimming legs. They leave their host when it dies and search out another victim.

At breeding time, which spreads over a good part of the Summer, the females swim round until they find a suitable stone or other solid object on which to deposit their eggs, numbering up to about 200. The larvae, which



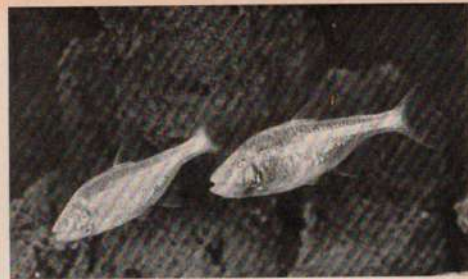
Fish Louse *Argulus*. Its actual length is 1/4 in.

resemble their parents except in size, hatch in about a month.

Argulus foliaceus is the commoner of our two species and adults measure about 1/4 in. in length. Usually they are of a greenish-brown colour but apparently vary somewhat in hue. They have been reported from a wide range of freshwater fish and may be attached to almost any part of the body.

Many may be found on a single fish and sometimes the victim will be seen dashing itself repeatedly against a stone in an effort, usually unavailing, to rid itself of its unwelcome guests.

It is difficult to kill off the parasites once they are on the fish, and so the greatest care should be taken when introducing new coldwater fish to aquarium or garden pool to ensure that no lice are on the body, or, if they are, to remove them with forceps. This applies particularly, of course, to native fish introduced from natural ponds.



The Blind Cave Fish (*Anoptichthys jordani*), which is native to Mexico.

Strange and Lovely Fishes

among the New Imports

by P. MILLET

THOUGH the majority of aquarists look for fish with beauty and colour, a not inconsiderable number have a liking for the strange, quaint and sometimes ugly fish whose habits make them interesting inhabitants of the aquarium.

Both types of aquarists are catered for in recent imports and a fish of the latter category, though far from new, is interesting enough to be mentioned here. This fish, the Mexican Blind Cave Fish (*Anoptichthys jordani*), is found in caves in the Potosi district of Mexico and also in similar situations in some of the Southern states of the U.S.A., being one of the few Tetras found so far north.

Pale in Colour and Blind

Like most cave-dwelling animals it is pallid in colour and blind, for though it has vestigial eyes, they are completely useless. The most interesting thing about this species is that, though sightless, it swims around the aquarium and finds its food as easily as any other fish. It does not bump its nose on rocks or the glass and appears to have some sixth sense.

One wonders whether, like bats, it emits

some very high pitched sound which is reflected by solid objects in front of it or whether, like some fishes that live in very turbid waters, it sets up electrical impulses and possesses natural radar!

Effective Scavenger

The Blind Cave Fish grows to a length of around 3 in. and makes a good scavenger though it is not to be trusted with very small fish of other species. Females have deeper bodies than the males and will spawn at around 80 deg.F.

Blind fishes, of which there are several species in Africa, Trinidad, Cuba, and the U.S.A., pose several problems to the zoologist. It is generally agreed that most of them are descendants of normally sighted species that in the past, either voluntarily or involuntarily, took to a subterranean life.

The Blind Cave Fish of Trinidad, *Cecorhamdia urichi*, apart from being pale and eyesless, resembles in every other respect a river fish of Brazil, *Rhamdia quelen* and our Mexican Cave Fish is believed by many to be a specialised form of an old aquarium favourite, *Arymanax*

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mexicanus, a silvery Tetra which was very popular before more showy species made their appearance.

Forms intermediate between these two species have been found in Nature and any aquarist with a scientific bent might be able to cross *Aplocheilichthys* with *Auratus* if the latter species is ever available these days.

Two New Characins

Two new and attractive *Hyphessobrycon* species have been seen in the Midlands. So far the names of these fishes are unknown, but it is better to have a nameless fish than a fish with a "home-made" scientific name that might creep into aquarium literature and eventually cause confusion.

Both these fish, when viewed, were about the size of a Neon but, of course, they need not have been fully grown. Both species have distinctive features that make them attractive aquarium fish. One fish is a silvery green colour and has a greenish lateral line, but its outstanding feature is its tail which is horizontally barred with brilliant yellow, orange and black. The tip of the dorsal fin is white.

The other species resembles the Beacon in some respects having the same "head-and-tail" light, but just behind the operculum is a distinctive black and gold ocellus or "eye". Though means of sexing these two Tetras is not yet known some of the latter species appear to be brighter than the others and may, possibly, be males.

Should these two fish become established they will undoubtedly be favourites for the community tank, as they are both lively and brightly coloured and appear to be as easy to keep as any of the smaller Tetras.

Amongst other fish that have arrived recently have been several species of young Cichlids which are popular with the aquarist who has large tanks and likes large, showy fish. There are few fishes that excel the larger Cichlids when in their full breeding colours and their size alone demands respect.

The species on offer includes such fish as the Firemouth (*Cichlasoma meeki*) and Festivus Cichlid (*Cichlasoma festivum*). While both these are old favourites they are not seen every day, and Cichlid fanciers should snap up such fish when available.

Improvement in Colour

Black Angels have come to stay, and since I first saw them some three years ago they seem to have improved in colour considerably, for those in a recent import were the blackest I have ever seen in spite of the fact that they were a fifth of the price of those originally imported!

The Veiltailed Angels mentioned last year have been followed by no further imports, so those lucky enough to own pairs should spare no pains in attempting to breed them. One successful Angel Fish breeder has spawned these fishes more than once but has great difficulty in rearing any of the fry so those able to bring them up should reap a good harvest.

The little Catfish, *Corydoras hastatus*, is never so plentiful as some others of its Genus but has been seen again recently and makes an admirable scavenger for the tank of the smaller fishes. Unlike most of its relatives it swims in midwater without a lot of effort.

I have mentioned the confusion that is caused by the wrong naming of fish and the same applies, of course, to aquarium plants—possibly to an even greater extent. Recently a consignment of the true *Apogonion silvaceum* arrived at a Midland nursery direct from Madagascar. Though they arrived as dried "bulbs" they have grown amazingly and differ considerably from the other *Apogonion* species cultivated here.

The leaves are a translucent pea green, very broad and long with a feature that is unusual to say the least, for the leaves twist in a similar manner to *Fallisneria spiralis* var. *fortis*.

It is an exceptionally graceful plant that makes an outstanding centre-piece for a large tank. Its flower has two horns like its relative, the Madagascar Lace-leaf Plant which arrived at the same time. If the flowers set seed as easily as the other species the patient aquarist should be able to propagate it. Algae does not seem to infest its smooth leaves.

Floating Water Chestnut

A London plant specialist is at present offering a plant that though well-known by repute has probably never been seen by one aquarist in a thousand. This plant is the Floating Water Chestnut, *Trapa natans*. It is an interesting and distinctive species with triangular floating leaves, small white flowers and large black seeds resembling chestnuts. The species in question is a rare European plant but other members of the Genus are found in India, China, Russia, Japan and elsewhere.

In many parts of the world the seeds are eaten and tinned. Chinese water chestnuts can be bought in London shops specialising in exotic foods.

Should the aquarist be lucky enough to have seeds produced (and he resists the temptation to eat them!) it should be remembered that they must be kept moist if they are to be preserved for sowing during the following season.

IDEAS FOR THE HOLIDAY SEASON



Temporary outdoor accommodation for coldwater fishes using a plastic-lined pond.

Care of tropical and coldwater fishes during your absence from home

by W. L. MANDEVILLE

IT is surprising how many people deny themselves the pleasures of keeping livestock because they might interfere with their annual holidays. At fish shows, as at dog shows, one hears the remark, "I should love to keep them, but what does one do with them at holiday time?"

To balance a year's pleasurable activity against a fortnight's recreation seems rather extreme reasoning, but even worse is the recklessness that leads some aquarists to forgo their annual break because of the fishes. Neither course is necessary.

Some years ago correspondence appeared in a Sunday newspaper concerning the length of time that children had kept "fiddlers" alive. A questionnaire was sent to each correspondent asking for more precise details, such as "How and where caught?" "Feeding and care?" "Type of accommodation?", etc. All the youngsters replied and one little girl of 12 years of age, who had kept a Stickleback for two years, added, "I took him with me on my holidays—in a bucket!"

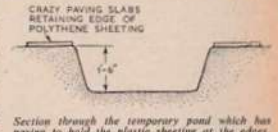
Visions of a sedate Goldfish specialist, proceeding Devonward, with his wife on the opposite handle of a zinc bath—and the even more complicated procedure if a tropical fish fancier tried the same idea—seem to suggest that some pre-holiday advice might not come amiss.

Persuading a non-fishkeeping friend to accept the responsibility in one's absence is an obvious but rarely satisfactory solution. No matter how carefully basic instructions are

given, or how precisely preparations made—even to providing those little daily food packets—grenlins will take over, and the untrained eyes of friendship may miss the early signs of impending trouble, resulting in the loss of fishes first, and friend afterwards!

The greatest hazard to coldwater fishes is the possible sudden overheating of a fishhouse or tank during a warm spell. This can be avoided by using outside accommodation, situated where only early morning sunlight falls, protected from sudden temperature changes by earth contact, and using a greater gallonage of water and surface area than obtains in the average tank, with the additional advantage of natural food coming in from insect sources.

Such temporary accommodation is easily arranged in the garden, a useful size being 6' x 11' ft. deep. This rectangle is excavated in a suitable spot. The base and sides are then compacted by careful beating and the hole lined with polythene sheeting which should



Section through the temporary pond which has paving to hold the plastic sheeting at the edges.

overlap the edges of the excavation. The polythene lining is chemically inert and it is allowed to "air" for 24 hours. A little Duckweed is put on the water surface, to provide shade and green food, and a wire netting cover is placed over the top to keep out cats. It is doubtful whether 150 gallons of water can be contained more cheaply.

In tropical tanks the absence of adequate light to activate the plants, and the partial dormancy of the fishes which follows, can result in unsatisfactory results in the water, partial disintegration of the plants, and progressive pollution.

Resist the temptation to "feed well" before leaving for your holiday, unless by "well" you have quality in mind and not quantity. It is not hibernation that is being prepared for, but a cooperatively short period of fasting which is common in Nature and beneficial rather than harmful to fishes, other than growing fry.

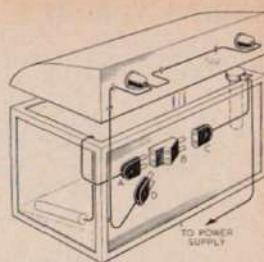
Modern heating and temperature control equipment is very reliable and, having worked satisfactorily during your presence, it should continue to operate well in your absence. After checking the immersed types of thermostat for water penetration, and the heater cable for good insulation, these pieces of equipment can be left to do their work.

Some arrangement is necessary, however, to continue the provision of the illumination where tanks are wholly or partially dependent on artificial light. A very satisfactory method consists of connecting a two-way adaptor into the output socket of the thermostat. One side of this adaptor will carry the heater and the other side will accommodate the tank lights.

With this arrangement, light and heat will be controlled by the thermostat, resulting in about eight hours of light out of every 24 hours. There is the additional advantage that, should the heater fail whilst you are away, the lights will stay on longer and continue to maintain the water temperature at a reasonable level.

Obviously the lights will come on at hours differing from normal and will operate in "spells" but this will not worry the fishes. If the lights can be seen from the outside of the house, it may cause concern to a passing policeman, however! Brown paper, set around the tank, will obscure this.

It is at holiday time that the value of society membership is most realised. Mutual arrangements are possible between members with large-scale outfits and friends within societies know where competent "caretakers" are to be found. Some societies arrange boarding-house accommodation at a member's premises in the tanks reserved for the annual show, but, unless these alternatives are available to you, do not assume that a watchful eye of a disinterested acquaintance will keep you clear of trouble.



Connecting up aquarium lights for thermostatic control. A=heater plug, B=adaptor, C=thermostatic socket, D=plug leading to the cover lights.

Success with Veiltailed Angel Fish

AFTER some effort I have at last succeeded in breeding Veiltailed Angel Fish. The facts are as follows. I went to a Midland trader in October of last year and purchased six of these fish. I was informed that they were approximately 14 weeks old and was able to choose the fish I wanted. My choice was a good one; they turned out to be three males and three females. However, I lost a male so now have two breeding pairs and one female.

On January 5 this year one pair spawned when approximately six months of age, which I believe is something of a record in itself for Angel Fish. About 200 young hatched but all died before they became free-swimming.

I had a further spawning from the same pair at the end of January. These also died before they became free-swimming. Then I had a spawning from the other pair but all the eggs went white and were obviously infertile.

Spawning followed spawning but the longest I could keep the fry alive was 12 days. The fish would be swimming at all levels in the tank last thing at night—their bodies literally bulging with Brine Shrimp—but by the following morning all would be dead.

I began to despair of ever keeping a brood alive but, at last, after 11 spawnings I have 14 young fish now about three weeks old. I also have a spawning which hatched more recently—upwards of a 100 fish—so I am hoping for still better things.—L. JOYNER.

BREEDING TROPICAL EGGLAYERS

DWARF AND MEDIUM-SIZED CICHLIDS

by D. B. McINERNEY



Male Firemouth, a medium-sized species with vivid colouring.

HAVING dealt with large Cichlids in the last issue, we can now consider the medium-sized species. Few are peaceful enough for a community tank but most remain popular.

Among the mediums I include the Sheepshead Acara (*Aequidens curviceps*), the Firemouth (*Cichlasoma meeki*), the Black-banded Cichlid (*C. nigrofasciatum*), the Orange Chromide (*Etopia maculata*), the Silver Chromide (*E. varianii*) and the Mouthbreeder, *Pelmatochromis guthriei*.

Temperament Varies

Of these only the first one is, in my opinion, quiet and meek. The Orange Chromide prefers to choose its own mate and once paired, will rarely accept any other female. If in error a male is placed in a breeding tank with the wrong female, he will probably kill her in half-an-hour so obviously care should be taken to avoid this happening.

As for the rest of the listed species, generally after a period of separation, any male will accept any female of its own species. With the exception of *P. guthriei*, the breeding pattern is similar in each case.

The standard breeding tank of 24 x 8 x 8 in. dimensions, as recommended in earlier articles, is quite suitable. A 1 in. layer of clean 1/16 in. sand is spread over the bottom of the tank. The aquarium is filled to a depth of 5 in. using one quarter rainwater and three quarters tap water, giving a pH of 7.0-7.2 and a hardness of 120-150 p.p.m. A few Cryptocorynes are dotted here and there at each end of the tank but in the centre is placed a medium-sized,

clean flower-pot which has had its base chipped away. The pot is laid on its side with the larger end facing the viewer. The temperature is set at 80 deg. F.

Sexing is not difficult. Males usually have longer tips to the dorsal and anal fins, and any female worth attempting to breed will be noticeably round and deeper in the region of the lower front flanks. An imaginary isosceles triangle, with its base AB running from the beginning of the pectoral fins to the ventral fins, will have its apex C at approximately the place where the bulge should be obvious in the female (see the diagram).

If the female is ripe enough the pair will soon begin to show off to one another, waggling their bodies exaggeratedly. They may even grip each other's mouths and have a tussle. By the next day the pair will have uprooted some of the Cryptocorynes and dug pits in the sand, usually in each back corner of the tank.



The imaginary triangle referred to in the text. Point C is where the bulge occurs in the female.

These pits rarely become the spawning sites; they are probably prepared for shifting the babies to later on. Nine times out of ten the pair will clean the inside of the flower-pot, and eventually the female will lay her eggs inside it. As with the larger Cichlids, she lays a line of eggs, and moves away to allow the male to swim over and fertilise them. The female then returns to lay another row and the process continues until a patch of eggs adheres to the inner wall of the pot.

Parental Care

If left alone the pair may take turns in fanning the eggs and eventually raising the young: when this happens the family provides a sight not easily forgotten. However, if you have at least one batch of babies coming along nicely, leaving the parents in the tank is a risk. They may quarrel and one may kill the other, or they may devour the eggs or youngsters at some later stage.

I strongly recommend that you play safe with the first brood and remove both parents once the spawning is over. Put them into separate tanks where the female is unmolested and can fatten up again but be sure you can pick out the same pair again when they are needed for the next spawning.

Place an aerator in the pot in the breeding tank so that the rising bubbles create a circulation of water but do not actually play upon the eggs. Then add 5 drops of 5 per cent aqueous solution of methylene blue to the water so that it is quite bluish. This is most important as the dye will prevent most of the eggs from fungus-ing. If you have many plants in the tank these will absorb some of the blue so, in three days time if the tint is fading, add a few drops, otherwise leave well alone.

In three or four days' time the eggs start to hatch and wriggling tails may be seen. By the next day the young fry may be noticed hanging by the sticky thread that attaches them to the side of the flower-pot; some wriggle so strenuously that they break the thread and fall to the bottom.

Infertile Eggs

A few eggs may fungus, but do not attempt to remove them. You will do more harm than good; the fungus will not spread to the other eggs. It is only the infertile ones that will be affected.

In a further 72 hours the fry will become free-swimming and rise in the water like a cloud of gnats. Now is the time to give them their first feed, either newly-hatched Brine Shrimps or Mikro-worms. They do not require Infusoria.

Continue such feeding till the young are

nearly 1/3 in. long and then add a good fine-graded dried food to their diet. When the babies are just over 1/2 in. long move them into a larger tank to encourage good growth. Having secured a nice batch of youngsters you may like to breed the original pair again and risk allowing them to raise the brood.

Now we come to the Dwarf Cichlids, which include *Aptisogramma squaszi*, *A. ornatiplanis*, *A. perenne*, *A. castigi*, *Nannacara anomala*, *Nannacara nudipectus*, *Pelmatochromis kribbenis* and the small Mouthbreeder, *Haplochromis multicolor*.

These Dwarfs are perhaps the most popular group in the Cichlid Family. Few grow more than 3 in. long and they do well in community tanks as they are not generally aggressive and do not tear out plants. All are beautiful and breeding them is not too difficult.

Like most other Cichlids they prefer neutral



The commonest mouthbreeding Cichlid, *Haplochromis multicolor*. Photograph by Walter S. Pitt.

to slightly alkaline water with a pH of 7.0 to 7.2 and a hardness of 120-150 p.p.m. For breeding, the requirements are exactly the same as those given for the medium-sized Cichlids, with one small difference. If they are given a flower-pot laid on its side, most of the Dwarfs will dig a tunnel in the sand beneath the pot. They will then spawn on the underside of the pot in an upside-down position. This is awkward and necessitates lifting and inspecting the pot daily if we are going to see the eggs as soon as they are laid. Such continual disturbance is liable to put off the breeders.

To get over the difficulty I designed a sort of Stonehenge archway made of three pieces of slate. The two upright walls are cut 3 x 4 in. from 1 in. thick slate and they stand up on their ends. A roof, 6 x 3 in., is cut from 1/2 in. slate.

The upright walls are placed 5 in. apart and embedded into the sand until they stand firm on the bottom of the tank. Make sure that this is done or the fish will dig away the sand and undermine the archway which will collapse.

The roof is then laid across so that one can see through the arch.

Now introduce the pair of fish and very soon they will don their breeding colours and, shortly after, start digging pits in the sand. A few days later they are likely to spawn inside the archway, usually on the inner face of one of the upright walls, but, no matter if it is under the roof, careful observation will reveal the eggs, without your having to disturb the tank.

Taking Out the Parents

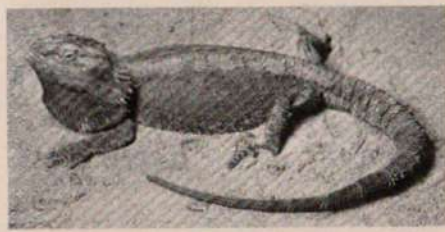
Once spawning is completed remove both parents. Then take away the two parts of the archway that are unwanted and turn the portion on which the eggs are adhering to face you. Place an aerator so that the rising bubbles

pass close to but not against the eggs. Add the five drops of methylene blue, as described earlier, and wait.

Do not feed the fry until they leave the sand and swim freely through the water; then give them newly-hatched Brine Shrimps, or Mikro-worms. Do not feed Infusoria.

With the Egyptian Mouthbreeder it is only necessary to keep a few fish of the species together in a community tank and, when a female is seen with enlarged jaws, to catch her gently and place her in a separate breeding tank. Do not feed her until she has hatched her eggs. She will not eat until then. Once she allows the fry to swim out of her mouth she may be caught and returned to her former home. The babies will take newly-hatched Brine Shrimps or Mikro-worms and small quantities of good, fine grade dried food.

AUSTRALIAN BEARDED DRAGON



A weird lizard species well suited to vivarium life

by ROBERT BUSTARD

AUSTRALIA has many fascinating forms of animal life which are found nowhere else in the world. This is because its continent was separated from the other land masses at a comparatively early stage in the development of animal life. Many reptiles are included in its unique fauna and the Bearded Dragon (*Anguillolacerta barbata*) is one of the more unusual.

This bulky lizard has a total length of about 18 in. of which the tail accounts for some

10 in. It has a very large head with a huge mouth and the throat region is covered with small spines from which it derives its common name.

When the lizard is angry or frightened its mouth is opened to its fullest gape and the beard is erected. At the same time the region of the beard tends to change to a blackish colour while the rest of the creature becomes a light brown shade. This contrast in coloration, combined with the orange interior of



Bearded Dragon in a threatening position with beard erected and mouth open. The tree-stump situation is typical. Photographs, R. Bustard.

the mouth, must make the Bearded Dragon appear very fearsome to any small adversary.

Such a display of anger is not entirely bluff, although the lizard doubtless appears much more fearsome than it really is. Wild specimens will hiss and jump for distances of foot or more and bite their foe.

The general colour of the Bearded Dragon, which is variable, is greyish or blackish brown, brownish or yellowish, with or without darker markings. Ventrally it is paler. The shape of the body is depressed and this is accentuated when the lizard is annoyed. At the edge of the body there is a row of spines and the spines on the back are hooked and variable in size. The limbs are well built and end in sharp claws which enable the animal to climb tree trunks. In a wild state it often ascends tree trunks and stumps where it likes to rest in safety several feet above the ground.

An Insectivorous Diet

Like most of the *Agamidae* Family, to which this lizard belongs, it is insectivorous and, being large, has a good, hearty appetite. I feed my specimens on as wide a variety of insect life as possible but, of course, the main standbys are mealworms, gentles and blue-bottles.

Bearded Dragons are not savage or fierce lizards in the vivarium. Their behaviour is largely pretence due to fear, and they very soon become tame and make good and unusual pets. In a short time they will enjoy climbing on their owner and will only show fear when they are placed on the ground. In fact they become so tame that it is often difficult to get them to raise their beard!

The vivarium for Bearded Dragons should be roomy and 30 x 18 x 18 in. is a suitably sized container for a single specimen. The vivarium should have a good layer of sand on the floor and stout branches should be provided for the lizard to climb and lie along.

A small water dish for drinking purposes should be provided and also a feeding dish, so that the food does not escape before it is eaten. The temperature should be kept at 75-80 deg. F. throughout the year by means of electric light bulbs. These can be suspended in reflectors from near the top of the vivarium and so arranged to beam the heat downwards. At night the temperature can safely fall to 55-60 deg. F.

Although rather expensive to buy, Bearded Dragons are well worth a place in the vivarium and they have always been one of my many lizard favourites.

They can be kept with other large lizards, and I have had specimens which "palled up" with Iguanas, and eventually were allowed to stay with them. Others have got on well with large Australian skinks like the Stump-tailed Skink and the Blue-tongued Skink.

Slow-growing Cryptocoryne Species

by Dr. H. C. D. de WIT

SO far as is known, only two species of *Cryptocoryne* occur in New Guinea. For this reason, that great island is considered to be the south-eastern boundary of the area of distribution of the whole *Cryptocoryne* Genus.

It must be realized, however, that there is a possibility that some more species of *Cryptocoryne* will be discovered in the dark and shadowy forest marshes of New Guinea although, on the other hand, it is evident that by far the largest number of species occur on the Asiatic Continent (Indo-China, Malay Peninsula, Thailand and S. China) and the adjacent islands of Ceylon, Sumatra and Borneo.

Cryptocoryne versteegii Engler is known only from New Guinea, where it was discovered by Mr. G. M. Versteeg, on Lorentz River, South New Guinea, in June 1907. It was subsequently described by A. Engler, the famous German systematist and director of the Botanic Gardens at Berlin in 1910.

Cryptocoryne versteegii is often seen in

aquaria as it is regularly imported and not difficult to keep. It is generally kept submerged and it forms a small plant which, if placed in the foreground of a tank, adds an interesting and pleasing feature to the low plant cover. Its stiffish, light-green, broadly triangular leaves always attract the attention of aquarists.

Nevertheless, it adopts a peculiar way of life when put in our tanks. It just stands motionless, sometimes for years, and never produces a runner or even a new leaf. But it does not die.

To be frank, it often seems a rather tedious plant, but is it really? Well, if it behaves in this manner there is little more to it than its somewhat aberrantly-shaped leaves. But some secrets remain to be solved.

Unexpected Growth

I have never found an explanation for the undeniable fact that it grew with surprising speed in a tank of one of my friends in Holland, rapidly producing leaves of such exceptional size and so brilliantly green that I could not be convinced that it was really *C. versteegii*. I had to take a young plant home, put it in my own aquarium and satisfy myself. It never made another leaf, thus assuming the well-known immobility of *C. versteegii*.

What was the reason? My friend used a thick layer of loam and peat to grow it on. He gave it fluorescent lighting and a water temperature of 68 deg. F. The water depth was 20 in. I wonder whether any other plant-lover has had similar experience when trying to grow this species?

If grown in moist tropical swamp conditions, on very wet loamy soils, *C. versteegii* produces subterranean stolons and, in November-February, its neat inflorescence appears.

This flower is a whitish tube, somewhat purplish tinged, 1-2 in. long, gaping widely at the top. The limb is deep yellow and the edge

of the limb is blackish-brown, purple and warty.

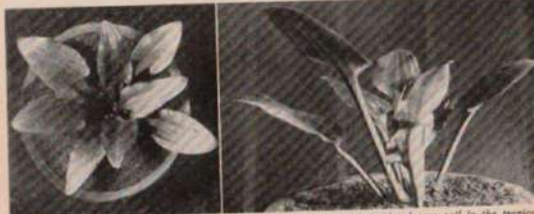
The leaves are triangular and the blade is glossy green above. They are also rigid, slightly wavy, never purple marked or shaded.



A *Cryptocoryne versteegii* plant in bloom showing the shape of its leaves and the pleasing flower.

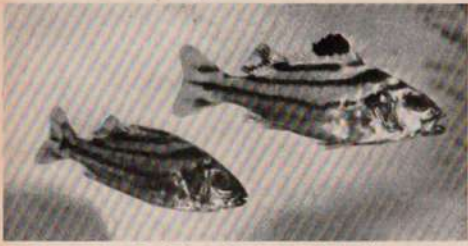
They are 5-6 cm. (2-2 1/2 in.) long and half as wide. The petiole is stout, dark green and about 5 cm. long.

With regard to other life habits of *C. versteegii*, I intend to discuss these in my next article, which will deal with *Cryptocoryne ciliata*.



Left: Overhead view of a *Cryptocoryne versteegii* plant growing in moist, loamy soil in the tropical greenhouse at Wageningen, Holland. Right: side view of the same, slow-growing *Cryptocoryne* species.

AQUARIUM FISHES FROM CEYLON



This-called Target Perch (*Therapon jarbau*), a distinctive brackish-water species.

No. 1. A selection of brackish-water creatures

by RODNEY JONKLAAS (Ceylon)

THE tropical, insular and rainy climate of Ceylon has made the country one of the chief sources of brackish-water fishes. In all her lagoons, estuaries, backwaters and mangrove swamps there abound many species of small, colourful fishes, a good few of which are among the most popular of aquarium fishes.

A list of them, as given below, contains several names which might be unfamiliar to the average aquarist in Britain and the Continent, but I have inserted them, as I believe they could find popularity among hobbyists.

Recommended Types

These, then, are the outstanding brackish-water fishes of Ceylon: Silver Monodactyl or Malayan Angels (*Monodactylus argenteus*), Tiger Scats (*Scatophagus argus* var. *rubifrons*), Green Scats (*Scatophagus argus*), Target Perch (*Therapon jarbau*), Pearl-spot Cichlids or Silver Chromides (*Eretmodus cyanostictus*), Mudskippers (*Periophthalmus barbarus* or *Kalouoteris*), Belled Gobies (*Vainosa balausta*), Green Puffers (*Tetraodon lineatilis*), Greater Glassfish (*Ambassis commersonii*), Archer Fish (*Toxotes jaculator*), Blue-eyed Medaka (*Oryzias latipes*), Upside-down Sleepers (*Betta batis*) and *Syngnathus* Pipefishes.

Of course, many more species live in brackish-waters, but they are either occasional intruders from freshwater which adapt themselves to brackish conditions, or immigrants from the sea during the drought when the high degree of salinity, especially below the 2-fathom mark, permits them to grow faster and, in greater safety than in the ocean to which they return during the rains. Then, too, there are the larger food fishes whose fry are, in a few cases, hardy and cute enough to be introduced temporarily to an aquarium.

In order that the average aquarist from outside Ceylon may arrive at some idea of the actual living conditions of the fishes listed, and thereby adapt his aquarium accordingly, I will classify the various factors which influence the life cycle of these fishes.

Brackish-water fishes are never cramped for space! They live in lagoons, river mouths, harbours with an influx of freshwater and mangrove swamps which may be many miles in extent. Thus they are, for the most part, accustomed to the wide open spaces and must be provided with reasonably sized aquariums. Perhaps the only ones which will live in more restricted space are the Belled Goby and Blue-eyed Medaka; both are quite small when adult and hardy, once acclimatized.

Seldom does any body of brackish water in Ceylon exceed a depth of four fathoms, and none of the fishes in the list, except, perhaps, *Eretmodus cyanostictus*, lives much deeper than a fathom or two. In fact most of them prefer water not deeper than a foot and, of course, the Mudskipper must have dry land or an exposed branch or rock on which to spend most of its time.

Brackish-water fishes like shallow water and, especially during the night, rest in sheltered shallows, safe from predators.

Any body of brackish water rarely has a temperature of less than 70 deg. F. The average is usually 80 deg. Often, fishes like *Therapon jarbau* and *Oryzias latipes* swim cheerfully in a sweltering 98 deg. Another point is that most of them can stand fairly drastic variations between 70 and 95 deg. F. due, in Nature, to tides, floods and sudden changes of water temperature caused by winds.

Rapid Change in Conditions

Often fishes like Scats have been observed to swim from a cool freshwater surface layer of about 3 ft. depth down to a hot, salty deeper layer about 15 deg. warmer.

Thus it is that, with some experience, it is possible for Scats and Monodactyls to be moved, when wild-caught or purchased, straight into a mixture of sea-water and 80 deg. F. tap-water in the proportion of 1:5 regardless of what water they were caught in, and at what temperature.

All the brackish water fishes can live in varying degrees of salinity and pH, but only a few can stand pure sea-water. The majority will thrive and do well in a standard mixture of one part natural sea-water to 20 parts freshwater of a neutral pH.

Scats, *Monodactylus* and Mud Skippers occur in Nature in pure sea-water and can spend all their lives in this, growing to full size and

although they can be trained to live in pure freshwater as well, they seem to prefer a saline medium. In Nature, they are never found in pure freshwater.

Therapon jarbau, on the other hand, although it prefers the saltier margins of tidal estuaries, is often caught in salty lagoons during droughts and so adapts itself to live in water that is even



Blue-eyed Medakas (*Oryzias latipes*), one of the less common of the Egg-laying Tooth-carp.

safter than sea-water, after evaporation by the sun.

Those fish that actually prefer less saline water and do occur in pure freshwater are the Pearl-spot Cichlid or Silver Chromide (*Eretmodus cyanostictus*) which are never found very close to the sea or in it. Preference for slightly saline, peaty, warm water is shown by the Archer Fish, Greater Glassfish, the Sleeper, the Belled Goby and the Blue-eyed Medaka.

Moderate Salinity Only

The Green Puffer and Pipefish occur only in rivers which are affected by tides and do not like much salinity although they can stand a fair amount of it.

In the wild state it is difficult to make actual observations on how brackish-water fishes feed, but dissections and the study of professional fishing methods have given valuable clues. The Scats and *E. cyanostictus* are essentially vegetarian although they can be trained to other diets in aquaria. The Scats live on diatoms and unicellular algae during their young stages with some zooplankton as well. Later they graduate to filamentous algae like *Oedogonium*.

When large they go in for correspondingly bigger and coarser marine algae but, oddly enough, they are caught on Earthworms, when adult. In aquaria the smaller ones do well if trained to take *Tubifex* worms which should

A Mudskipper resting on a branch above the water level in its aquarium. The water must be shallow.



not be thoroughly rinsed and so have some of algae (usually Blue-green type) still attached to them.

E. cyanostictus, in their young stages, are semi-vegetarian, but the fry should have animal plankton in order to grow. When larger they eat slime algae and supplement this diet with worms.

Essentially insect-eaters are the Mud Skippers and Archer Fish, the latter showing a well-known preference for red jungle ants which they "shoot" down expertly. In captivity they speedily learn to relish chopped or live shrimps. Glassfish, Gobies, Sleepers, Monodactyls, Pipefish, Medakas and Therapons are all carnivorous. Those with the smaller mouths feed often and rapidly on minute forms of animal life, plankton, prawn and crab larvae, fish fry, etc., while large-mouthed ones, like the Sleeper, are skulking gulpers of larger morsels of living food, mostly live shrimps or fishes. Although prepared foods are taken by aquarium specimens, the preference is for the living food. In aquaria, *Daphnia*, *Cyclops*, Mosquito larvae, Brine Shrimps, live Fresh-water Shrimps and baby Guppies will all be welcomed.

Only two of the mentioned fishes can be bred in captivity. One of them is the Blue-eyed Medaka, which is easily propagated; males have longer fins and slimmer bodies than the females. Fertilization is external and the eggs, carried in a bunch on the vent of the female, hatch into quite large fry which are unattended by her in the breeding tank if she is well fed. This can easily be done in pure freshwater and in a quite small tank. The other species is *E. cyanostictus*, which I have only bred in garden ponds, although there has been no real effort to breed them in aquariums because they are so common here in Ceylon.

Little is known of the breeding habits of the others. Certainly they are highly seasonal and stimulated by the influx of freshwater due to rains. Adult Scats and Monodactyls are usually found in the sea and enter estuaries and lagoons only when the salinity is high. After the rains they are no longer there but in their place are myriads of fry. With Scats and Monodactyls there appear to be two breeding seasons per year, but only one for Puffers.

Medakas breed throughout the year, as do *E. cyanostictus*. Glassfish seem to have two distinct seasons: after the rains, the Archer only one, steeped in mystery, for this is one of the most elusive and rare fishes in Ceylon.

Only marine filamentous algae grow in the more saline parts of the brackish water of Ceylon. Rooted plants, like *Zostera*, prefer very salty conditions and live even in more saline water than the sea during drought.

Where the water is fresher and the bottom is

Veiltailed White Clouds



LAST issue we referred to the veiltailed White Cloud Mountain Minnow developed by Len Lawson, vice-president of the Aquarium Society of Western Australia, and shown for the first time at his society's annual exhibition in March.

The upper fish in this W.A. Newspapers Ltd. photograph is the veiltailed form, whilst the lower specimen is of stock from which the veiltailed fish have been evolved. This veiltail development in White Clouds first occurred two years ago. Some of the fish now in Mr. Lawson's collection have even better finnage growth than that shown in the photograph.

The strain is breeding 25 per cent true in the veiltail form, and the fishes have been christened "Meteor Minnows".

maud-covered, there are some beautiful plants. *Amorpha canescens* flourishes in very slightly saline water affected by tides, but the "resting period" of this plant appears to coincide with the drought and increased salinity. Together with it lives the beautiful and spectacular Water-lily "Nubhar" with its enormous round underwater leaves of bright green or red with purple undersides. In my experience, this plant is not always easily grown indoors.

Other plants that grow in slightly brackish water are Bladderwort, *Salvinia* (a pest in natural waters), Water Hyacinths, *Cabomba* (introduced) and the pretty *Hydrilla verticillata*.



by DR. F. N. GHADIALLY

HOW many fish can be kept or reared in a 2-ft. long tank? The answer to that question and its infinite variations is of great importance to aquarists. Beginners expect a simple, straightforward answer, but there is no such easy solution available. There are so many factors involved, but I should say that the main factor is the knowledge and skill of the aquarist.

A novice is doing well if he can rear 20-30 tropicals to an inch size in a 2-ft. tank. The more advanced aquarist can handle 80 to 100 fish as a routine in such an aquarium, while I once reared 250 Nigger Barbs to 1 in. size in a 2-ft. tank using the circulating range system described later.

Perhaps the best way to understand the problem is to enquire what would go wrong if fish were crowded. Once we know this, we can devise means by which we can rear large numbers of fishes in apparently crowded conditions.

Effect of Overcrowding

If we were to place, say, 100 or 150 fishes in a 2-ft. tank we should find that in an hour or two all the fish would be swimming about with their mouths at the surface of the water. This is a sign of what is commonly termed "air hunger". The fishes would have used up oxygen at a rate faster than it could be picked up again at the water surface and diffused into the depths of the tank, and also the water would have become loaded with carbon dioxide.

Only the surface layer of water in immediate contact with air will rapidly give off the carbon dioxide and take up oxygen into solution. The deeper layers of water can do so only very slowly, as considerable time is needed for gases to diffuse through the entire depth of the water.

Hence the surface of the water is the only spot in the tank where a fish could survive under a grossly overcrowded condition. It is small wonder then that they would seek the surface and stay glued to the air-water inter-

face, for as soon as they tried to go lower down they would begin to suffer from asphyxiation and/or carbon dioxide poisoning. (I do not here wish to enter into the question of whether it is the excess carbon dioxide which is harmful or whether it is the lack of oxygen or whether there is an oxygen shortage at all. Suffice, for our purpose, to say that the gaseous cycle would be seriously taxed and thrown hopelessly out of gear in an overcrowded tank.) Besides seeking the water surface in a crowded tank it would also be noticed that a fish breathes faster.

The increased rate of breathing among crowded fishes is a valuable mechanism for helping the fish to survive. For, by moving greater volumes of water over its gills in a given period of time, the fish stands a better chance of seeking out the sparse oxygen and discharging carbon dioxide into water that already contains too much.

The mechanism is not dissimilar to a man breathing into a closed bag or a man locked up in a small airtight cupboard or trunk. As time goes on the amount of carbon dioxide increases and the amount of oxygen slowly declines. At first carbon dioxide stimulates the respiratory centre in the brain so that the rate of breathing goes up and hence a larger quantity of air is taken in and out per minute.

In this case, at least, it is the increasing carbon dioxide concentration which is the agent responsible for the more frequent breathing, for even if the oxygen is maintained at a normal level by addition to the atmosphere from an oxygen cylinder, the person still breathes faster.

Coming back to our hypothetical crowded tank, the first acute emergency which would arise is respiratory distress. If allowed to continue, death due to respiratory failure would follow among the inmates.

The remedy, however, is very simple indeed. If some means is found to really stir up the water, then the difference between the bottom

Daphnia, a form of livefood which can be used to keep the aquarium water organically clean.



and top layers of the water vanishes. The lower layers are brought to the surface where they rapidly give off carbon dioxide and take in oxygen.

This, of course, could be simply achieved by aeration. The greater the overcrowding the more forceful would the aeration have to be. Indeed it would appear there is no limit to the degree of overcrowding that fish could stand temporarily as long as the water is moved about so that satisfactory gaseous exchange is once more established.

With the fishes breathing happily once more and, provided the currents needed to bring this about were not so strong as to cause mounting muscular fatigue, the first problem would be satisfactorily solved. But no sooner would one difficulty be sorted out than we should be faced with a fresh one, which would slowly but surely come about.

Amount of Waste Products

The large number of fish would produce a large quantity of excreta. Needless to say, a greater quantity of food would have to be placed in the tank to feed the increased number of fishes. The large amount of waste products given off by the fish, with perhaps some uneaten food, would then produce a big population of bacteria and a build-up of organic and inorganic nitrogen compounds. Such a state of affairs is known as pollution.

The fishes would no longer be living in clean water. This, of course, could not continue for long without having marked toxic effects on the fish. The large number of bacteria would also use up oxygen and the aerator would be working really hard to keep the fish alive.

But no amount of aeration would cure the increasing unsuitability of the water to support fish life for long. At this stage the fish could be kept alive by frequent partial changes of water. In short, we draw off the toxic substances and top up with clean water; we could also arrange a slow drip of clean water.

There is, however, another method which does not need replacement with fresh water. *Daphnia* could be used to eat up the bacteria and the Infusoria which develop on the waste products of the fish. The inorganic nitrates could be got rid of by the use of higher plants and algae which thrive on them. Placing a few *Daphnia* in the tank would not be of much use as the fish would eat up the *Daphnia*. It would be preferable to use a small tank to hold the *Daphnia* out of harm's way.

Then, with an air lift, we could move water from the tank containing the fish to the tank containing the *Daphnia*; the water cleaned by the *Daphnia* would then be returned by a levelling siphon from the *Daphnia* tank to the tank containing the fish. This, in fact, is the

principle of what is known as the circulating range.

A number of tanks with a large population of fish can be connected up in this manner to a tank containing *Daphnia*. The fact that *Daphnia* are filter feeders and will remove bacteria and Infusoria is here used to dual advantage. Not only are the fish protected from the effects of pollution, but the *Daphnia* breed and multiply and can be netted out to feed to the fishes. Some form of plant life is essential to get rid of the nitrates. There is, of course, no difficulty in providing this.

The tanks in my fishhouse are connected up into two large circulating ranges. That, plus the fact that fairly strong and continuous aeration is employed, accounts for the large numbers of fishes I can keep in a space which would be too crowded under ordinary circumstances.

I do not think their growth is impaired or delayed; in fact, many people have commented on the very large size attained by my fishes. And that is what one would expect, for the water in which my fishes live is a far better medium for biological life than that could ever be provided in the usual "static" aquarium. Fishes removed from my circulating range have done well in the tanks of my aquarist friends. There is no evidence that they are less hardy than other fishes.

At the beginning of this article, we asked the question, how many fishes can I keep or rear in a tank? Well, you know the answer. It depends on how hard you want to work and how efficient you are. A single fish in a 6-ft. tank requires no effort or attention at all. You need not even bother to feed it, for enough natural food will be available to keep it going. On the other hand in the same tank you can keep 500 fishes in perfect health if you want to.

READERS' HINTS AND TIPS

FEEDING WHITE WORMS

TO remove White Worms from their culture medium quite easily I employ the following method.

Cut some pieces of the new sponge rubber (I used a strip from a bath mat), put a section of this material, about 3 x 2 in., on top of each piece of milk-soaked bread (or other food) in the worm culture. On the top, place a small sheet of glass to weigh down the sponge rubber and cover over the box to darken it completely.

In a few hours there are clean worms in the sponges, which, when dropped in the tank, floats, and is easily removed after the fishes have taken the food.—(Mst. J. I. Joyce, London, N.W.3.)

Rudd for the Pond and Aquarium

Native fishes that thrive indoors or outside

by WILLIAM J. HOWES



Common Rudd (*Scardinius erythrophthalmus*). It has clear lines and colourful finnage. Photograph, W. J. Howes.

THE Rudd is a well-suited and particularly attractive fish for the coldwater aquarium. It also makes an excellent occupant for the garden pool, being active, hardy and not at all fussy with regard to its diet.

A small shoal of Rudd will often be seen at the pool's surface, where they love to sport and play. But during very hot sunny weather this fish, in common with most others, may be found sheltering under the broad leaves of the Water-lilies.

Because of the dark protective coloration of the Common Rudd, it does not show up so well in the outdoor pool as the golden variety, but it is well suited to pond life, nevertheless.

Although, from outward appearance, the Rudd rather resembles the Roach, it is more stockily built, brilliantly coloured and handsomer than its relative. Furthermore, Rudd are not so susceptible to Fungus disease.

The back of a Rudd is usually a greenish brown which gradually merges with the metallic silver of the sides, and the bright scarlet tinge to the caudal and lower fins make it a pleasing fish for the coldwater enthusiast. It is a member of the Family Cyprinidae. In their wild state Rudd much prefer quiet waters and, therefore, usually found in ponds, lakes, brooks, sluggish rivers and canals. Yet strangely enough, although quite a common fish, the Rudd's distribution is rather local in England and Wales and it is rarely found in Scotland. But some of the lochs in Ireland hold really large Rudd in abundance.

This species feeds principally between mid-water and the surface. Its food is extremely varied, but consists mainly of flies and fly larvae, and also various insects, worms, tiny snails and vegetable matter.

Aquarium specimens will live quite well on a diet of *Tubifex*, *Daphnia*, dried Earthworms and proprietary brands of chopped foods. Normally Rudd spawn in shoals during early Summer (April to May) and the adhesive eggs become stuck on aquatic vegetation. The eggs hatch in about 7 to 12 days.

When conditions suit them, Rudd are very prolific and might well overstock their pool. They are known to hybridize with Bream and, less frequently, with Roach.

It has been estimated that, if properly cared for, and provided the living conditions are ideal, Rudd will live for about 10 years. They are very lively and active fish, so if two specimens, each with a body length of about 4 in., are to be kept the tank or container should not be less than 24 x 12 x 12 in. The aquarist, looking at his 3-4 in. Rudd may not realize that in its natural environment the species frequently reaches more than two pounds in weight.

The type of decorative garden pool where Rudd are easily accommodated and where they thrive.



Long Pond and the lower stretches of the rock garden at Wisley.

AQUATIC PLANTS IN A NATURAL SETTING

Royal Horticultural Society's Gardens give an insight into colour for the water garden

FOR the water gardening enthusiast June is an ideal time to visit the Royal Horticultural Society's Gardens at Wisley, Surrey. Here marsh and aquatic plants abound in and around the lake and many pools.

The weathered Laboratory building is at the entrance and, behind it are two immaculate lawns each set with a small square pool containing tame Goldfish. These ponds are stocked with Water-lily varieties and decorative marginal plants.

A wide expanse to the right of the Laboratory is given over to cultivation of recommended plants that have received the Society's Award of Merit. A main path here leads to the Round Pond where Willows, waterside Irises, Primulas, Bog Bean, Water-lilies and the huge *Gumera* form a green and colourful retreat.

Just beyond the Round Pond is the area known as Seven Acres where, over 30 years ago, a gravel pit was converted into a lake. Willows, Flowering Rush (*Botanus umbellata*), Arrowheads, Reedmace (*Typha*), *Gumera* and Water-lilies provide a cool and natural setting.

From Seven Acres a walk through the wild garden, ablaze in midsummer with the Blue Poppies (*Meconopsis betanifolia*) and Primulas, brings the visitor to perhaps the loveliest

spot of all—the rock garden (laid out in 1911) and Long Pond.

Water which runs through the rock garden is from a concealed tank and is supplemented by a natural supply. It feeds into the Long Pond alongside which are the lovely Clematis Iris (*I. lampyrifera*) and Candelabra Primulas. Each level of the rock garden brings fresh delights as small rock pools, surrounded with Mimulus, Sun Roses, Dianthus, etc., come into

One of the formal ponds beside the Laboratory buildings at Wisley. Photograph, I. F. Perkins.



view. Miniature and giant conifers give variety of form.

That completes the water garden representation at Wisley, but there is a great deal more to see; the herbaceous border, at its best, in July and August; the health gardens, which show to perfection in the Autumn, and the wooded slopes of Battleson Hill where rhododendrons flower to perfection in late Spring.

Wisley Gardens had comparatively small beginnings. The original 60-acre estate was given in trust to the Royal Horticultural Society in 1903 by Sir Thomas Hansbury. The actual area in cultivation one year after was not much greater than six acres, but later purchases now provide an estate of over 300 acres with a considerable proportion cultivated.

The Gardens are located just off the main London-Portsmouth road, 20 miles from London. An R.H.S. Fellow's ticket admits two persons free and the admission charge for others is 2s. 6d. Where party visits are planned, application has to be made to the Director at least 14 days in advance.



by H. O. MUNRO

ASPECTACULAR success with the breeding of Puffer Fishes is given by W. Geiser in the April issue of DATZ. The species on which Geiser reports is *Tetraodon lineatus brevipinnis* but he claims similar regular success with *T. caesioides* and *T. somphosus*. All three have been bred by him for several years in the Zurich Zoological Garden.

Five specimens of *Tetraodon lineatus brevipinnis*, which were obtained in September, 1955, were, after a short period in a quarantine tank, introduced to a roomy show aquarium (28 x 14 x 12 in.), furnished with fine gravel, some volcanic rock and well planted with *Cryptocorynes*, *Lamprolabea* and *Riccia*.

The temperature was kept at approx. 80 deg. F. The Puffer Fishes were 2 in. long at that time. After some four weeks one, and soon afterwards two, fish were observed to clean a stone near the back of the tank. This was achieved by the fishes brushing it with their anal fins and sucking it clean with the mouths, whilst standing on their heads above the stone.



Close-up view of a small pool in Wisley's extensive rock garden where such artistic ponds abound.

This procedure went on for a whole day. During that time the female fish appeared in rather vivid colours with the usual dark spots turning light and the normally light lines turning dark.

The eggs were ejected forcibly by the female without any preceding courtship. The male fertilised them immediately afterwards and then both parents swam closely over the eggs pressing them down on to the stone with their fins. From then on the care of the eggs was the father's business and he remained above the stone fanning furiously with his pectoral and anal fins.

The eggs, which were rather large and transparent, numbered between 300 and 500. They were transferred to a small breeding tank containing water from their own aquarium and the fry hatched out after four to five days at temperatures of 86 deg. F. The young fishes floated to the surface initially but soon sank to the bottom, where they remained during daylight. At night they all seemed to float to the surface.

On the third day, when they had consumed their yolk-sacs, the fry feeding started right away on the smallest *Hyale Shrimps* and finest *Cyclops*.

The water for these fishes has to be kept clean and the most successful method Geiser found was to change about 90 per cent of the water daily. The Puffers will blow themselves into little balls at the tender age of five days when they look like little glass beads, the size of a small pea. They grow fast, provided they are fed well, and they are regularly given bigger tanks, as they require them. When kept in too restricted quarters they start fighting and killing each other. At 1 in. long they are fully coloured and show the typical behaviour of the adult fish.

Geiser gives his breeding results as 200 in 1955, 1,000 in 1956 and 2,000 in 1957.

Readers Views

We like to have your views but please keep letters to a reasonable length. The Editor does not necessarily agree with the opinions expressed.

Coldwater Catfish

Sir,—I was interested to read your reader's query about his Catfish not eating (page 355, May issue). I have a similar Catfish in a community tank about the same size as his (3 in.) which I have had for over 12 months and which has doubled in size during that time.

Mine will come out from hiding at any time if he hears the other fish eating something and snatches the food away from them.

Although it prefers White Worms it will eat almost anything—bread, biscuit, raw liver or meat, and even cheese, which one of my Goldfish is very fond of.

I have found no trouble in feeding the Catfish. It is always waiting for something to be put into the tank. All the fish enjoy small white lice as well.

Mrs. D. A. HANNOG,
Devon.

Quiz Invitation

Sir,—I wish, on behalf of the Barrow & District Aquarist Society, to invite other societies to join in a postal quiz competition.

The competition would take the form of ten

quizzes held throughout the year. Each quiz would consist of thirty questions and would take about 40 minutes to complete.

I will be pleased to give full details to interested clubs.

11 Strathaven Avenue,
W. E. GALLIE,
Barrow-in-Furness,
Lancs.

Topping Up a Tank

Sir,—On page 280 of the April issue Mr. R. Adkinson suggested a method of topping up an aquarium with water. I have a tank in which I think is even simpler: I just take a large (3 in. x 2 1/2 in. x 2 1/2 in.) worm-feeder, stick it to the side of the tank, pour the water into it. The perforated bottom of the worm-feeder diffuses the water, so that it does not disturb the compost on the bottom of the tank. I find it best to have the water level (before topping up) about a quarter of the way up the worm-feeder.

Grimsby,
MASTER R. STOREY,
Lincs.

Long-duration Show

Sir,—In response to the article by C. W. G. Creed in the January issue of FISHKEEPING AND WATER LIFE, Southend society is extending the duration of its annual show this year to nine days.

It is hoped that as many aquarists as possible will support this event for it could well be the beginning of a new outlook on the fish-keeping side of the type of exhibition that has been so successful on the Continent.

We also hope that the various specialist societies will take part in the exhibition. Any society or individual who wishes to participate either competitively or non-competitively can be sure of every possible assistance from my society.

67 South Avenue,
Southend-on-Sea,
Essex.
G. W. HEDDER,
(Secretary, Southend,
Leigh A.S.)

For Your Bookshelf

Reptile Life*

REPTILES have always been maligned and persecuted creatures, and probably always will be. Fortunately, there is today a greater understanding and sympathy for them than ever before, and more and more people are realising what interest and fascination they can give.

There is an increasing thirst for knowledge about them, and when a book is written from first-hand experience every herpetologist, amateur or professional, will want to know about it. Reptile Life is no exception. The author founded a herpetological station near Prague in 1947, and in this book he tells of his experiences with the care and breeding of his charges.

Many of these creatures have never been seen alive in Europe before, coming from remote places such as Central Asia and the Far East.

The author in many cases describes the countryside from which the specimens were collected on expeditions, and this is valuable information indeed to the vivarium keeper who wishes to make a vivarium as natural as possible.

Some 150 photographs are included, some showing the habitat areas. The text is confined to snakes, lizards and crocodilians. The fact that tortoises and turtles are omitted need not detract from its value.

The tone and sincerity of this excellent book may be judged from the following sentiment expressed by the author, after he mentions the importation of reptiles in days gone by: "Today every effort is made to secure their longevity, since their lives are of interest not only to the general public, but also for the scientific knowledge which can be gained from them." This book is a translation in good, readable English.

A. LEITCHER, B.Sc.

* By Zdenek Vepel. 80 pp. plus 150 photographs. Spring Books, 15s.

Fishkeeping, June 1958

News from the North-West by "Aquaticus"

LOOKING through the 1958 programmes of the "field studies" centres at Preston Mountain (Shrochbury) and Maltham Tarn (Settle) I am again disappointed by the lack of subjects which would appeal to fishkeepers. Carnegie bursaries are available whereby members of societies receive a considerable reduction in fees, and anyone from an aquarist society attending courses at a centre should apply. There is still need for the professional biologist or student-biologist with a career or examination as his aim.

I feel our native fishes are sufficiently numerous and varied to provide the subject for a course. The nearest in this line is an anglers' entomology course at Maltham in the August/September week, but it is primarily for fly-fishermen who might want to know the biology of the flies upon which trout feed. Some parts of this course will include the scale-reading of trout and a study of their diet. The week's course costs seven guineas, but a bursary would reduce the amount by 21 guineas.

The annual meeting of the Merseyside Aquarist Society elected Mr. D. E. Hughes, 11 Deybrook Lane, Liverpool 12, as its new secretary. Mr. B. T. Roe, the previous secretary, remains a member of the committee. Mr. L. Connell was elected chairman and Mr. D. Jones, vice-president. Mr. W. Kelly is show secretary; Mr. A. Johns (librarian) and there is a good and growing collection of references books, while Mrs. D. Jones has been co-opted to assist her son as treasurer. It is a flourishing club; last year's accounts were balanced at £118.

In drawing up the programme for its annual sea-fishing festival on August 30-31, the New Brighton Pier and Sea Angling Club (Wallasey) has had to forgo the fishing trip out to the Zebra Flats of Liverpool Bay which it included as an experiment last year. It is not for lack of enthusiasm, but simply because the Flats only fish well on a low tide, and the shore and pier on a high tide. All events have to be fished the same weekend, so the boat trip had to be excluded.

Summer is the one season when the "old-fashioned" aquarist comes into his own by pond hunting along with the *Daphnia*-seekers, not only for food for his fish, but for some of the interesting and less-common denizens of our own country's waterways.

Although this is not a natural history column, I find teacher-readers, in particular, frequently request some guidance. I recently took a party of such pond-dippers on to our wet Lancashire dunes because, in the wet weather of May, the Natterjack Toads, characteristic of these Freshfield-Amadale dunes, were breeding over a much wider area than usual.

The smaller, darker, male Natterjack Toads arrive at the spawning pools or "slacks" first, given every chance, a healthy sign for the future of their chorus one mile distant in Ainsdale town—a sign of their return in strength—on the evening of March 30 and by May the larger, greyer female toads are there in plenty when mating and spawning take place.—"Aquaticus", 47 Woodseer Road, Liverpool 15.

Scottish Commentary by K. A. M. Robertson

GENERALLY, at this time of year, the reduced due to the approach of the holiday season, but it is not the case in Scotland this year. First and foremost a meeting was held in Perth, organised jointly by the Dundee and Perth aquarist clubs, whereby discussion took place with a view to forming a Scottish Federation. A report appears elsewhere in this journal.

An open meeting was held at Bannockburn School by the Strling A.S. last month and this included a film show and view of the School's interesting collection of tropical aquaria. The venture proved to be highly successful and very well supported. It was certainly a tonic to the organizers and proof that their tools were appreciated.

Summer Show

Rolls Royce (Glasgow) Aquarium Club, although still a young society, are going ahead strongly, and their next event is an open show for furnished aquaria, being held in conjunction with the firm's Children's Gala Day. Special prizes will be available for competing members and also for those entrants outside the society.

It is hoped that by holding such shows on this day members of the younger generation will be

attracted to the hobby. Possibly the ultimate view is to have a Junior Section of the society and this is, of course, a healthy sign for the future of any club. There is sometimes a tendency to neglect the younger aquarists; they should always be given every consideration however, so that their interest in fishkeeping is maintained. This can be difficult when so many counter-attractions are available in this season.

On a recent visit to Motherwell I found the local society, Motherwell & District A.S., full of very keen aquarists. The club was formed over 1955 and while the secretary, Mr. H. Lemno, would like to see an increase in membership, the society can certainly be described as thriving. In last year's Glasgow show it had the misfortune to lose all the fish in its club furnished tank, but came back at the Edinburgh show with more later and were placed third in the same class.

The secretary and President (Mr. R. Grierson), with other members, have travelled over the country to various events and can always be depended upon to support outside activities.

They are at present investigating the possibility of acquiring their own club rooms, and given support by aquarists in the neighbourhood, their aims should be achieved soon.—K. A. M. Robertson, 32 Edzell Drive, Newton Mearns, Renfrewshire.

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Midlands Miscellany by W. L. Mandeville

A S environment is such an important factor in biological study, one wonders to what extent societies are affected by their meeting places. Certainly great diversity exists. Accommodation is found in buildings reserved for every shade of political opinion and in rooms ranging from the lounge of the local public house to the decans' room of the Chapel.

Evolving Influence

The liveliness that pervades the meetings at Coventry may spring from the atmosphere of the Wheatley Street Schools, but Nottingham, meeting in the Church House, which is the control centre for the Diocese of Nottingham, have equally exhilarating meetings in a hall obviously intended for the Bishop and the Rural Deans, and furnished accordingly.

A brass plate at the entrance of the Birmingham and Midland Institute in Paradise Street, Birmingham, indicates the permanent home of the Midland Aquarium & Pool Society. Wolverhampton enjoy similar facilities at the Y.M.C.A. in Stafford Street, Wolverhampton, while Southwick rejoices in its own pavilion where frequent extraordinary general meetings are held, the extraordinary part of the agenda being "repairs and alterations to premises". The paper-hangers, painters, carpenters, electricians and gas-fitters among the

capable membership of Southwick, have the time of their lives.

Few societies can equal the amenities enjoyed by Leicester where, in the Museum and Art Gallery Lecture Room, every aid is available to speakers, including projection. There is also a beautifully arranged aquarium.

The Methodist Church provides the Walsall Society with accommodation in the Central Hall, Ablewell Street. The comfort of this assembly, and its well-managed tea break, spring from the interest shown by Mr. and Mrs. Michael, the resident caretakers. Similar concern is shown to the Stourbridge society by mine host of the "Three Crowns", High Street, Lye.

Geography

If this paragraph in "Midlands Miscellany" is printed in the *Journal*, it will indicate the geographical position of Cheltenham, which was the venue for this year's conference of judges of the Guppy Federation.

Participating were judges from a very wide area, under the chairmanship of Mr. H. S. White. As an invited guest to the function, I can say that this virile, cultural facet of our hobby is in good hands, from the executive officers right through to the keen membership.—W. L. Mandeville, 327 Queenlet Road, Gt. Barr, Birmingham.

South-West Viewpoint by H. C. B. Thomas

A S a result of a generous and thoughtful action by Bristol Coldwater Fish Breeders' Group the Bristol Aquarist Society became the possessors of another cup for competition at their open show. Hitherto only one cup has been available for the terms of fish entered by breeders, but now a trophy will be awarded to both the Singletail and Twinstail breeders' classes.

The presentation to the Bristol Society was made by Mr. H. J. Whitting, who is an active member of the breeders' club. I wonder if he will be the first owner of this cup—a big success make him a challenger to be watched?

Wholehearted Appreciation

I don't suppose many secretaries get 50 "thank you" letters all at once. This was the happy experience of Jack Savage, secretary of the Bristol A.S. He had paid a visit to Highbridge Infants' School to explain the elements of fishkeeping to a class and to help them set up a new aquarium. The 50 letters were the charming outcome of his trip across Bristol.

On May 10 the Bristol & Bath Section of the Guppy Federation held its annual show and, as a result of strong support from other Sections, 170 exhibits were accepted. This is the Section's best effort to date and was the more praiseworthy because the local group named a closing date and stuck to it, an action that was doomed to fail

according to some pessimists outside the group itself.

As a result, Mr. J. Wheeler was able to stage a textbook show because he knew how much room each class would take down to a matter of an inch!

I hope other Sections will have the courage to follow Bristol's lead.

At this show I was talking with Mr. R. S. Wigg from Ilanwit Major about his society's inter-club show at the local youth club on Saturday, July 5, commencing at 2.30 p.m. Their opponents are the club from Pontypool, who were defeated by Ilanwit Major in 1957 and, I hear, are anxious to try their revenge. The judges are coming from Cardiff. It should be an interesting afternoon!

Bath A.S. are now resolving the final details of their open show which was scheduled for August 28, 29 and 30 at the Abbey Church House. I understand they hope to have two London judges, Mr. C. W. Creed (tropical) and Mr. Boarder (coldwater). Details and entry forms of the Bath show can be obtained from Mr. J. Wheeler, 53 Camely Green, Twerton, Bath. Just as this issue goes to press I learn that the Bath show dates may be altered to avoid clashing with the Birmingham exhibition.

The new address of the Taunton A.S. secretary, Mr. A. Saunders, is 38 Wordsworth Park, Taunton.—H. C. B. Thomas, 2 Grove Park, Bristol 6.

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Problems Answered

A Setting for Salamanders

Could you tell me if any of the following plants are suitable for a vivarium to contain salamanders; *Asplenium*, *Primula*, *Geum* and *Ferns*. How many *Pleurodeles* could be kept in an indoor vivarium measuring 23 x 13 in.—(M.W., Birmingham, 20.)

The thing to bear in mind when preparing a vivarium for Salamanders is that these animals normally inhabit damp and shady places. They avoid dry, sunny spots and only show themselves after rain or at dusk. The plants which do best under the above conditions include various ferns, mosses, water-side primulas, also a number of woodland plants such as anemones, primroses and woodruff; in fact, anything of reasonable size which tolerates shade.

A number of rock plants, including the stone-crop and geums which you mention, could also be tried out. A good idea would be to consult a nurseryman's plant list, or a gardening book, and pick out the small plants listed under shade. There are any number. It is often a "trial and error" process to find which plants do best.

For a vivarium the size you mention, four Salamanders should be about right. They may even breed if you provide them with a miniature pond.

Australian Rainbows

Could you kindly give me some information on the breeding of Australian Rainbow Fish?—(T.C.G., Nr. Rotherham, Yorks.)

The Australian Rainbow Fish is a very beautiful fish which is quite easy to breed, and we would suggest the following method. A tank about 18 x 10 x 10 in. should be set up and heavily planted in one half with fine-leaved plants such as *Arisaema* or *Limnophila* (*Ambula*), whilst the other half is left clear.

The parents should be separated and conditioned on livefood such as White Worms, *Daphnia* and shredded Earthworms, until the female is really plump and the male is showing heightened colour.

The temperature of the breeding tank should be 78-80 deg. F. and the fish should be introduced in the evening. The female will usually spend the following day laying large quantities of adhesive eggs in the thicket of plants and the parents should be removed immediately spawning is completed.

The eggs normally hatch in about 48 hours

and the fry will be free-swimming in a further 24 hours when they can be fed on Infusoria. They grow fairly rapidly and, after a further two to three days, will take newly-hatched *Reine* Shrimps. From then they may be fed progressively on Mikarion, Daphnia, White Worms, etc., until about six weeks of age, when a little dried food can be introduced together with livefood.

Although good results can be obtained using fairly hard water, better results seem to occur with old water or tap water mixed with distilled or rainwater.

Stocking Details

I am shortly going to set up a 24 x 12 x 12 in. tropical aquarium and stock it with various *Corydoras* Catfish, *Piccostomus* Catfish and *Crown Loach*. *Cryptocorynes* will be the plants used and lighting will be from a strip-light. Can you tell me the best planting medium, the type of rockwork to use, the desired temperature, the number of fishes to include, the food they will need and the amount of light to be provided so that sufficient algae develops for the *Piccostomus*?—(H.R., Newton, Warwick.)

For planting medium either coarse sand or fine gravel, such as can be obtained at your local aquarist's shop, is quite suitable. Sub-soil should not generally be necessary with *Cryptocoryne* plants. Rockwork that would be suitable with these types of fish would be Westerland or Cumberland stone which can be obtained quite easily.

The best temperature for the types of fishes you list would be between 70-78 deg. F. *Corydoras* Catfish are not lovers of high temperatures. We doubt if you will be able to supply sufficient algae for the *Piccostomus*, but vegetable food can always be added in the form of boiled spinach or something similar, and we would suggest that this would be far more satisfactory than attempting to produce algae by artificial light.

For a 24 x 12 x 12 in. aquarium we would recommend about four pairs of Catfish, two *Piccostomus* and two *Crown Loach*. All these fish will exist on a good proprietary livefood, but will appreciate an occasional feed of livefood, such as chopped Earthworms, White Worms, etc., which should be given about twice a week.

Water Analysis

SAMPLES should be sent (NOT delivered by hand) in a clean pint bottle, well packed, to "Fishkeeping" Analyst, 12 Featherbed Lane, Addington, Surrey, together with a fee of 5s. per sample. Name and address of the sender and details of prevailing conditions should accompany each sample sent. Post-mortem examinations cannot be undertaken under this service and corpses must not be sent to our Analyst.

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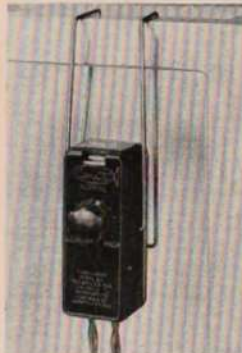
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BOW-FRONTED AQUARIUM WITH WROUGHT-IRON BOOKCASE STAND

36"	×	12"	×	15"	£17.10.0 complete
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