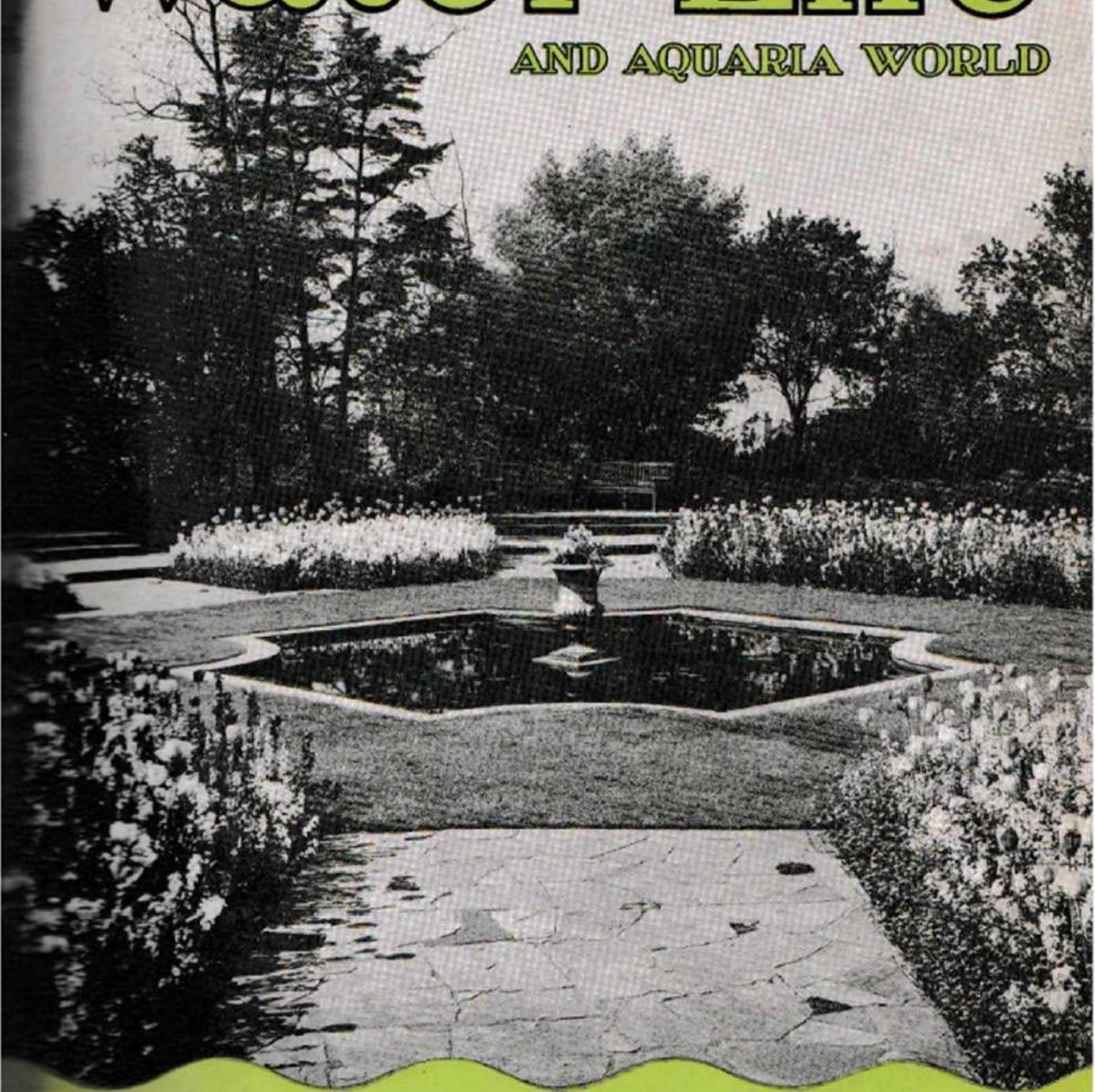


Joyce

Water Life

AND AQUARIA WORLD



APRIL—MAY, 1954

TWO SHILLINGS & SIXPENCE

Water Life

AND AQUARIA WORLD

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FRONT COVER: SPRING SYMMETRY.

The grassy surround emphasises the clean contour of this formal pond whilst beds of tulips serve as a colourful reminder of the season at Chalkwell Hall, Westcliff-on-Sea, Essex. Beneath the pads of Alba, Chromatella and Sunrise Water-lilies on the pool's surface, are large Golden Orfe, Carp and Tench, swimming among *Elodea* and *Myriophyllum*.

[L. E. Day

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EDITORIAL

Garden Beauty

WE are happy, those of us who are fortunate enough to have garden ponds, in that, possessing somewhere outdoors to keep and breed coldwater fishes under good conditions, we also have a focal point around which to create a place of beauty. Proper planning can give us continuous displays of colourful blooms of wide variety.

True, there are some garden-lovers who do not make the best of the ponds they have built, regarding them solely as an integral part of a landscape layout without putting them to their full use, just as there are some fishkeepers whose ponds are severe looking geometrical concrete constructions made to serve only a utilitarian purpose.

Most of us, however, who do have ponds like to believe we are good amateur gardeners and, within the limits that the size of the garden sets, try to make a brave show of the gifts of flowers, shrubs and trees which Nature offers us.

The established garden, with the pond or ponds presenting an ever-pleasing prospect, is not something that just happens: it is the reward for hard work, based on carefully thought-out design and backed up with proper maintenance. The pondkeeper to become the good gardener must be guided by the layout of the ground and the shape of the pool in the choice of the subjects to cultivate.

Example to Follow

Our front cover picture shows a formal pond, the symmetrical outline of which is improved by a paved and lawn surround, sympathetically shaped flower beds and the selection of plants which fall in naturally with the idea of simplicity and consequent degree of severity that has a form of beauty of its own. Similar effects can be obtained in miniature in the suburban or cottage garden.

For the informal pond, a grass surround, bordered with more irregularly shaped flower beds, is a happy arrangement. With a border that purposely avoids straight edges, the water surface can be made to blend with a marsh area in which subjects neither wanting to be largely or completely submerged nor, on the other hand, requiring very dry ground in which to flourish, can be planted to advantage. Coupled with the pool, marginal areas, lawn or paved stretches and the sitings for flowers that are changed according to the seasons, can be locations for rock and alpine plants.

Within the pond itself room can be made for Water-lilies or other aquatics which flower on the surface apart from the totally submerged subjects normally employed by the fishkeeper. With care, the pondkeeper can have a garden which at all seasons makes a colourful retreat. The design can be so conceived that the fish pool plays a prominent and decorative, as well as useful, part.

A garden without a pond deprives the owner of much scope in his horticultural pursuits. Where there is one, the pleasures of fishkeeping can be combined with those of the cultivation of plant forms deemed unusual since their growth demands the presence of conditions such as a marsh garden, adjacent to a pool, provides.

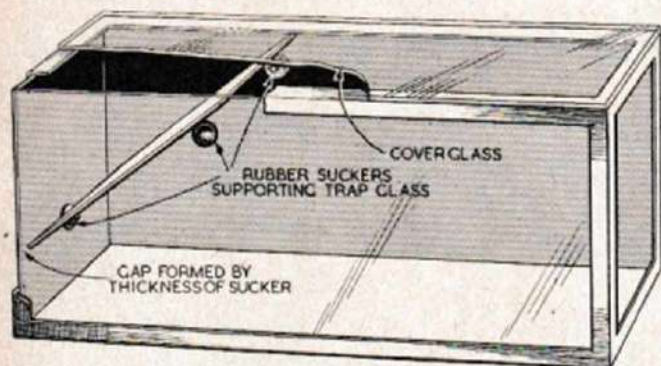
Saving Young Livebearers

Merits of Confining Gravid Females When Aiming for Show Specimens

IN an effort to defeat the cannibalistic tendencies of female livebearing fish towards their young most aquarists rely on plant cover and an adequate supply of livefood. For the hobbyist who simply wants the thrill of having bred a few fish, this method, generally speaking, will prove successful in saving a sufficient number to satisfy his or her purpose.

The professional breeder, however, must endeavour to save all the young fish possible from every brood. The answer to his problem is a breeding trap, and this applies to the specialist amateur breeder, too. Female livebearers use no discretion when disposing of what to them might be a tasty morsel but which, to the breeder, may be a future show champion.

Female livebearers vary in disposition depending on the species, prevailing conditions and age of the fish, but they are all more or less cannibals and it is not unusual for young mature females—Guppies in particular—to devour most, and sometimes all, of their first brood. This may account for the impression held by some aquarists that the



Aquarium fitted with breeding trap. Front left corner is cut away to show glass sheet resting on ball of a sucker and supported by two further suckers. Side and back panels are blacked out.

first brood is always small in number and that sometimes the eggs are absorbed whilst within the female.

I know many aquarists who have a prejudice against the employment of a breeding trap for livebearers, even though they may never have used one. They seem quite content to jog along and tell how many youngsters they have in a particular brood, little knowing how many they may have lost through their prejudice. In some cases it may not matter, but if the object is to improve stock and breed high quality fish by selection, then the breeder must do the selecting and the more fish from which he has to choose the greater will be his chances of success.

Unless livebearers are bred under control—and that means not merely pairing the parents selectively but also ensuring that all the young produced are saved—there is no guarantee that the best fish, or even all the good ones, will not be lost. Every young fish must be saved, if at all possible, until they reach the age when selection by the breeder is made possible. This can only be achieved by the employment of a suitable breeding trap.

Professional breeders use large traps in which a number of fertilised females are confined to deliver their young. Such large traps and procedure are not suitable for amateurs,

By W. G. Phillips

specialist or otherwise, if the object is improvement of the stock from the show point of view. This is because he must know the parentage of the offspring in each brood.

The form of trap illustrated admirably serves this purpose for the serious breeder. It is cheap and efficient and can, if necessary, be used as a dividing panel (by employing an extra sucker) to segregate fish when they are old enough for sexing. On one occasion I allowed a female to remain confined in such a trap until after she had dropped her second brood and she appeared unaffected.

Livelihood for Preference

When in this trap the female should be fed on livefood (*Daphnia*). If fed on dried foods these should be given with caution otherwise food dropping through the space reserved for the babies might cause trouble by fouling.

Before concluding I think it would be of interest to readers if I gave an account of an experiment I carried out last Summer with a number of young virgin female Guppies. I made the observations with the idea of recording the difference in the period of time (in days) taken from the day the fish were paired to the day of delivery of their first brood. I had previously known there were differences in the time taken to deliver a first brood between different females irrespective of the strain or age. These differences are probably due to variation in the degree of ripeness of the individual fish or to the differing times of conception. After their first brood, the fish could be relied upon to deliver their broods regularly at 28-day intervals with water temperature of 75 deg.F. I also wanted to know the average numbers of males to females born in a brood. This was something which could only be obtained with any degree of accuracy when the young fish were delivered under control.

For the purpose of this experiment eight virgin female 3½-month Guppies were each paired with males nearly twice their age. They were removed after 21 days. The females were then confined in separate tanks and in breeding traps as described.

Tanks used were four of 14×9×9 in. measurement and four, 18×9×9 in. Each had the side on which the trap was fixed and the back blacked out to give the fish a greater feeling of security. The results were as follows:—

Females Used	Days	Males	Females	Total
No. 1	29	25	37	62
No. 2	35	36	37	73
No. 3	31	30	27	57
No. 4	29	22	20	42
No. 5	29	22	33	55
No. 6	42	20	29	49
No. 7	34	30	32	62
No. 8	30	25	27	52
	259	210	242	452

From these figures it will be seen that the average time taken for a brood to be delivered was 32.4 days. The average number of males produced over the eight broods was 26.2 and of females, 30.2, making an aggregate total for each brood of 56.4. The average excess of females over males was four for each brood.

Moisture-loving Insectivorous Plants

Their Inviting Leaves Spell
Death for Any Unwary Insect

By Roger Perry

UNIQUE in their field, and a never-failing source of interest to the naturalist, is a curious group of meat-eating subjects known as insectivorous plants. Indeed it may come as a revelation to some to find that certain plants obtain their nourishment by catching flies and other insects. A few tropical species are even accredited with the habit of trapping small birds.

Like everything in Nature there is a purpose behind such power and these plants have adopted the habit in order to obtain nitrogen. This is an essential element for the synthesis of protoplasm and the ultimate production of plant growth. As may be expected, the various kinds are almost invariably found in wet, boggy situations, where the soil is poor and the supply of nitrogen insufficient for normal growth requirements.

Ingenuous devices are adopted for the capture of prey. In some species the leaves are cylindrical to entrap and ensnare unsuspecting victims. In others, hairs or tentacles gradually enclose the unwary, whilst viscous secretions all too quickly put an end to a fly's meditations on further aerial movement.

North American Pitcher Plants

Among the most interesting of insectivorous subjects are the Pitcher Plants (*Sarracenia*) from the swamps of N. America. There are about forty different types of these—the largest with pitchers up to seven or eight inches in diameter.

Structurally the pitcher is a specialisation of a normal leaf and varies in form according to the species. It may be tall and thin, or funnel shaped, or even bear a foliaceous outgrowth, which forms a lid and protects the interior from rain. One of the most noteworthy characteristics of pitchers is their bright colouring, which serves as a source of attraction to insects. They may be in shades of yellow or green,



Venus Fly Trap with leaves adapted for catching insects.



Butterwort (Pinguicula), a plant with adhesive yellow-green leaves and violet-shaped flowers of a blue shade.

or veined and scarred with differing hues of purple and blue, but always culminating in the most vivid colouring at the lip of the pitcher.

A fly is tempted inside by deposits of nectar. The inner surface, however, is waxy and slippery so that the insect loses its footing and rapidly falls to the base. Towards the bottom of the pitcher are numerous bristles. These point downwards and so allow the victim to pass through but prevent its escape. The unfortunate fly finds itself imprisoned and eventually dies of exhaustion or suffocation. The plant secretes digestive juices and the softer parts of the fly's body are absorbed by the plant as food.

One type of Pitcher Plant (*Darlingtonia*) has a pair of long purple "tongues" as an additional attraction, with the top of the tube translucent and curved to form a roof. Insects fly against this colourless roof in much the same way as a butterfly flutters against a window pane. They ultimately tire and fall exhausted to the bottom of the pitcher where they are digested by the plant.

Native Sundews

Native to Britain, and found growing in many mountainous and swampy districts in England and Wales, are curious insectivorous plants called Sundews (*Drosera*). The leaves form a squat rosette up to three inches in width, the upper surfaces of which are covered with numerous glandular hairs. Each of these terminates in a red knob which secretes a sticky fluid. The resultant effect sparkles like dew in the sunlight and must look a most attractive sight to a tired and thirsty insect. But—alas—the dew is a trap! By some telepathic communication beyond our understanding, the rest of the tentacles are aware of fresh "meat". They bend over towards the centre of the leaf, digestive juices are poured on to the victim, and the softer parts of its body are later absorbed by the plant. After a few days the leaf reopens and the withered remains of the fly's corpse are carried away by the wind.

Not the least curious thing about the Sundews are their powers of selection. The tentacles will not react to any non-nutrient material such as a piece of wood or grains of pollen, but the plant responds immediately if a small piece of white of egg or shredded meat is placed on the leaf.

In this way *Drosera* can be grown indoors surrounded by moss in a saucer of water, but care must be taken not

Palmate Newt (*T. helveticus*). The first is often sold by dealers as a Continental sub-species. The second is too well known for description, and the third can be distinguished by the dark webs on the toes. The male has a curious thread-like extension to its tail.

Further species are the Alpine Newt (*T. alpestris*), about the size of our Smooth Newt, dark in colour and with an orange belly. Perhaps the most handsome species is the Marbled Newt. Some specimens are beautifully marked in dark and pale green. The largest species, from Spain, is the Pleurodele Newt. It can grow to eight inches or over, is particularly aquatic, and has no crest. Unlike the *Triturus* newts there is not much display on the part of the male—instead he pushes under the female's body and grips her forearms with his in a curious embrace.

Interesting Pets

A newt aquarium is always an object of interest and beauty. The inmates have graceful movements as they swim about or rise to the surface for air. The courtship antics of the males can be observed at close hand, and females will be seen to clamber among the plants to lay their eggs. Food consists of various aquatic animals, such as *Daphnia*, *Tubifex* and gnat larvae. Tadpoles are relished, but the toad tadpole should be avoided as it has poisonous qualities. Small Earthworms, White Worms and raw meat in tiny shreds are also eaten.

Eggs of newts should be removed to a separate dish of shallow, mature water, as they may otherwise be eaten by the parents. The baby newts are reared on animal life, given according to size, along similar lines to the "diet sheet" of fish fry, that is, Infusoria and Mikro-worms, White Worms, *Tubifex* and *Daphnia*, and finally insect larvae and small Earthworms. The babies should transform in 2½-3 months from hatching, and will then probably leave the water.

When keeping newts in an aquarium it is most important to use well-established water. I have often found that specimens collected from a pond may look big and healthy at the time of capture, with well-developed tails and crests, yet after only a few days of aquarium life in tap water, their beauty has gone and the crests almost disappeared. It is believed that natural water contains certain growth-promoting substances—missing in tap water—which are absorbed through the skin of newts and which keep them in their fine condition. Indeed, newts seem to thrive in the dirtiest situations, in water which has a high organic content.

Apart from the normal vivarium for their land existence, newts may be kept in a sort of double home, such as the one illustrated. We call this the "Bell-jar" House. The cage has a false bottom into which is fitted an inverted bell jar or similar glass container. The newts breed in this and spend the rest of the year in the little garden which is grown on the shell. Ferns, mosses and other shade-loving plants do best



Underwater picture of a female Common or Smooth Newt (*Triturus vulgaris*). The male is distinguished by a crest along its back. Colour varies considerably in this species.

planted in some loamy soil. Ventilation is avoided in order to give the house a humid atmosphere, but a door can be fitted to the roof.

Newts make interesting pets and can be long lived. There is a record of a Crested Newt having lived for 28 years. Readers wishing to breed from these animals can either catch new stock each Spring and release it after the breeding period, or keep the same animals year by year. In the latter case it is important to remember that they should pass each Winter in hibernation, especially if they are to breed. Newts which are kept warm and active throughout the winter will come to no harm, provided they are fed regularly. The following Spring, however, it will probably be found that they show no desire to enter water or lay eggs. Lack of hibernation seems to have something to do with this.

How to Induce Hibernation

The method for hibernation in captivity is to remove the whole cage to a cool place in a shed, greenhouse or conservatory, away from draughts and frost. As an alternative the newts may be put into a perforated tin, packed with damp moss, and left the whole Winter in a similar draught- and frost-free situation. An occasional inspection and further damping of the moss is all that is necessary. This treatment will bring them into breeding condition for the next Season.



The striking European Marbled Newt (*Triturus marmoratus*). Female is to the left and crested male to the right.

[L. E. Day

Further Notes on Japanese Goldfish

Distinct Methods of Culture with Three and Four Year Specimens Used for Breeding By R. J. Affleck, M.Sc., M.R.S.T.

WRITING in 1908, Dr. S. Matsubara, Director of the Imperial Fisheries Institute, stated that the Wakin, Ryukin, Ranchu and Oranda Shishigashira had been known in Japan from remote times. This opinion is in agreement with that expressed by Dr. Kishinouye and quoted in the December 1953 issue of WATER LIFE. The Demekin (Globe-eye or Telescopic) and Deme Ranchu (Globe-eyed Egg Fish) were introduced at the end of the Sino-Japanese war (1894-95). Four other varieties, Watonai, Shukin, Shubunkin and Kinranshi, are said to have originated from crossings and one gains the impression that fanciers had no great regard for them.

Although the first four varieties mentioned were bred in large numbers at the time Matsubara was writing, it was the Ranchu which was considered to be the ultimate in Goldfish varieties.

Spawning and Rearing Details

We are all familiar with the fact that many hundreds of superior Fancy Goldfish are produced in Japan every year and I have no doubt that most of us have wondered if the Japanese have any secrets in connection with selecting, feeding, etc. In this connection the following extracts from Matsubara's paper may be of interest.

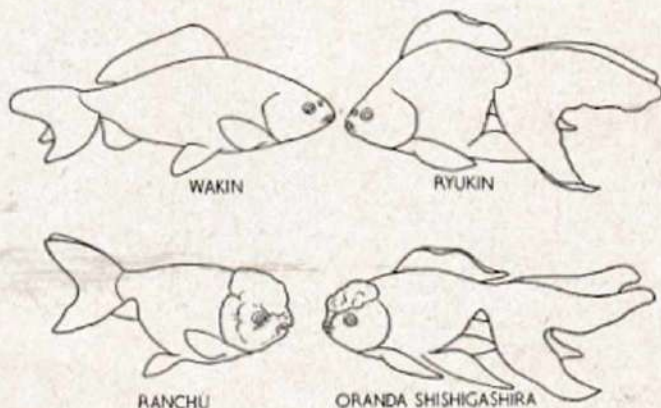
When small-scale breeding of Ranchu is considered three males and two females are used. On fish farms 50 males and 50 females are placed in a pond approximately 7 x 5 ft. and allowed to spawn. The eggs are laid in April and May. When the fry hatch they are fed on strained yolk of egg (chicken) for the first week, on *Daphnia* and other crustaceans for the second week and then on mosquito larvae, chopped Earthworms, etc. for the remainder of their life. The young are selected carefully at 20, 30, 40 and 50 days and the inferior ones sold. The fish are wintered in ponds covered with glass.

Progressive Selection

As the fish develop, selection and sale of the inferior specimens proceeds until, at the end of three or four years, the offspring from the 100 parents are themselves reduced to 100 and ready for breeding purposes.

The average sizes attained by the selected specimens at the time of writing were as follows:—

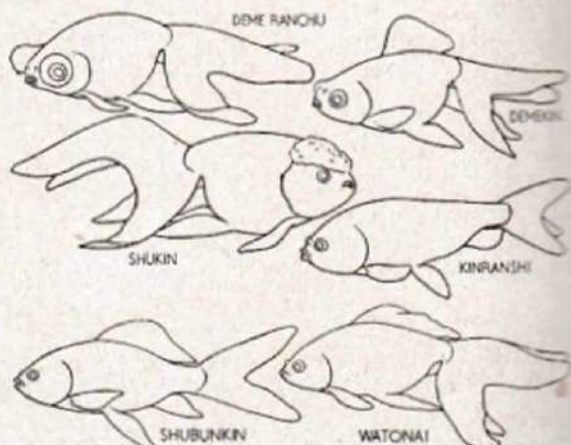
Years	1	2	3	4	5
In Tokyo	7.5	14	15	16.5	18 cms.
Koriyama	4.6	6	9	12	15 cms.



These are overall measurements and include the tail fin.

When breeding the Ryukin on a large scale 800 adult fish are placed in a pond with a surface of approximately 150 sq. ft. and a depth of about 30 in. At the end of March, when the temperature of the water rises to about 60 deg.F., the fish spawn. From the eggs about 200,000 young are produced. These are placed in ponds with an area of over 300 sq. yds., containing

Daphnia and other crustaceans. After 15 days the fish are sorted according to their caudal fins and, after 40 days, they are sorted for size. Sorting continues until at the end of a year, 4,000 are left. Further selection takes place every month until, at the end of three years, 800 remain.



Sketches on this page show the shape and other external characteristics of Japanese Goldfish mentioned by Dr. S. Matsubara. Most highly prized form was the Ranchu.

These Japanese breeders, therefore, appear to aim at a steady growth over a comparatively long period and to replace their breeding stock over a period of four years. This is very different from the aims of many British breeders who expect fish to spawn at the end of a year.

Modification to Breeders' Classes at Shows?

I am convinced that a steady growth rate is much more important than many people imagine and would like to see an upper limit for size imposed in all breeders' classes. A steady growth rate and ruthless selection at an early age has produced the desired results for the Japanese.

Systematic Study of Pond Life (5)

Adaptations in Aquatic Creatures

By John Clegg, F.R.M.S. (Photographs by the author)

IN the last article, as examples of adaptation for living in water, I reviewed some methods by which aquatic creatures obtain their air supplies. It would need numerous articles to touch, even briefly, upon the many other examples that could be given of adaptations for aquatic existence but it will suffice, perhaps, merely to suggest one or two others which are easily observable.

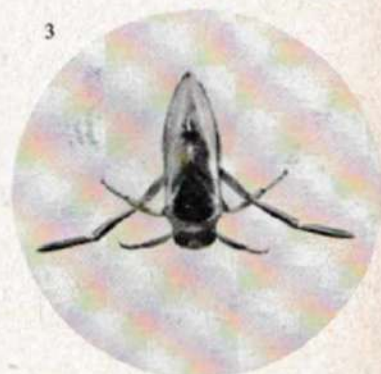
Take, for instance, the wonderful streamlining of the bodies of many water-beetles and bugs which enables them to move quickly through the water. The shape and smoothness of the body of a Great Diving Beetle (*Dytiscus marginalis*), or of a Water Boatman (*Notonecta*), could hardly be bettered for rapid motion through water, particularly when these are allied to powerful legs, well fringed with hairs to increase their surface area and coupled together for maximum power.

The Whirligig Beetles (*Gyrinus*), which are familiar insects on the surface of ponds and still streams in Summer, have the same streamlined shape but have an even more efficient propelling mechanism. The middle and hind pair of legs are curiously modified, each section being shortened and flattened into a kind of plate. On the backward swimming stroke these plates present their broad surface to the water first, on the return, fold up and offer little resistance in much the same way as an oarsman "feathers" his oar, or turns its edge to the water on the return stroke. The efficiency of this swimming mechanism is known to all who have watched the incredible speed at which Whirligig Beetles can swim.



Larva of the Black-fly (*Simulium*) on a submerged blade of grass. (Photographs enlarged to show characteristics.)

1. Gnat larva (*Culex*). 2. Gnat pupa. 3. Water Boatman specimen (*Notonecta*).



Whirligigs show another interesting modification to make them better fitted to their adopted environment. Their compound eyes are each divided into upper and lower parts, the first for viewing objects out of water and the lower ones for seeing below water—a modification which must be of great value to a creature which spends most of its time on the surface film.

The problem of escaping from the water, in those insects that spend only part of their life in it, is overcome in many different ways. The Common Gnat (*Culex*), a frail creature that could not survive wetting, lays her eggs in batches floating on the surface. The eggs have a "trap-door" at the bottom and through this the newly-hatched larvæ can drop into the water. In order to develop rapidly the larvæ must feed abundantly and yet must be in constant touch with atmospheric air for respiration. They achieve the latter by having a breathing tube at the rear end of the body by means of which they can hang suspended from the surface film. Thus they breathe without hindrance to food-gathering which is carried out by creating currents of water around the head, bringing minute forms of life to the mouth, through the medium of rotating mouth-brushes.

Preparing to Emerge

In the pupal stage the need for feeding has passed but it is essential for the pupa to breathe and also remain, back uppermost, at the surface, ready for emergence into the air. The breathing tubes, therefore, are transferred to the back of the head and when, in due course, the perfect, winged fly emerges it can do so without getting its delicate body or wings wet. Even the discarded pupal skin serves its purpose; it becomes a raft on which the newly-emerged fly can rest awhile before flying away.

An even more dramatic way of escaping into the air is

(Continued next page.)

Breeding Bubble-nest Builders

Mature Tanks Used for Fighters, Paradise Fish and Dwarf Gouramies — Fry Free-swimming at Early Stage

By J. W. Davies

IN May of last year I became interested in the Labyrinth species and their breeding habits, the reason being that I already had three types, a pair of Dwarf Gouramies (*Colisa lalia*), a male Siamese Fighting Fish (*Betta splendens*) and a female Paradise Fish (*Macropodus opercularis*). I had heard one or two enthusiasts state that this group of Labyrinths was



Photograph]

[Kathleen Cooke

A well developed male Fighting Fish (*Betta splendens*).

not easy to breed. A trip to a friend enabled me to borrow a male Paradise Fish, and I was able to buy a female Siamese Fighter from a London supplier.

The three pairs of fish were each placed in aquariums measuring 18 x 12 x 9 in., the sexes being separated by sheets of glass. Each tank was sparsely planted with *Hygrophila* and contained nine inches of water at a temperature of 80 deg.F. In each the compost was ordinary aquarium gravel, old and containing mulm. The temperature was never constant during the breeding period, and ranged from 78-88 deg.F. The Paradise Fish and Gouramies received light from an eastern aspect and the Fighters from the west.

On June 2 the male Fighter had blown a bubble-nest. It measured roughly 2½ in. square, was ½ in. thick in the centre and had been built around a floating Water Lettuce plant. The next morning I removed the partition before leaving for work. This was done about 8 a.m. without disturbing the nest at all, and whilst the two fish were sparring up to each other. Incidentally not the slightest notice was taken of the removal of the partition or of my hand in the water.

Conditioning the Parents

I would add that the female had been well fed during the previous week with plenty of *Tubifex*, *Daphnia*, garden worms and a little Bemax. Her body had assumed pale basic colouring with dark vertical bands prominent, always a sign of a female Fighting Fish in breeding condition. The diet of the male consisted of *Tubifex* and garden worm only, calculated to give him that little extra zest.

In the meantime the two other pairs of fish showed not the slightest interest in their intended mates.

Returning home that evening I was disappointed at not seeing any eggs in the Fighter's nest. The bedraggled female was hiding from the male, yet was still plump. The male, in between his search for his mate, kept the nest intact and enlarged it until it measured 3½ x 2½ in. He shifted it from the centre of the aquarium to the far right-hand corner.

The Paradise Fish now appeared to be trying to attack each other through the partition, but the Dwarf Gouramies still did not show any interest. Nevertheless, that night under cover of darkness, I removed both remaining partitions and hoped for the best.

Next morning the Fighters had spawned before I arose, and so many eggs were packed together in the thick centre of the nest that it appeared creamy in colour and distinct from the remainder. The female was removed at once, taking care not to disturb either the male or his nest.

By 7.45 a.m. on June 5 the eggs had hatched and many fry appeared to be actually free-swimming, so the male was removed and the feeding of the fry commenced. The feeding was simple and cheap, merely a two-pint jar of green pond water resting on the cover glass and dripping slowly through a 15 in. piece of rubber tubing (the tubing was the insulated covering from 5-amp electric wire—with the wire removed, of course). I always use this method of Infusoria feeding, it is slow, simple and effective. For ten days I fed nothing but

(Continued next page.)

Systematic Study of Pond Life (5)

(Continued from previous page.)

carried out by the Black-flies (*Simulium*). The pupæ, which live attached to submerged plants, can extract air from the water by respiratory filaments on the head. They take up more air than they need for breathing and this is stored inside the skin. When the time comes for the emergence of the winged fly, the pupa bounds up to the surface enveloped in a big air-bubble which bursts when it reaches the air and the fly is cast safely above the surface.

One other example of an adaptation for an aquatic environment must suffice. The very smoothness of the body of the



Front leg of a male Great Diving Beetle (*Dytiscus marginalis*) showing the sucker-pad which is present in male specimens.

Great Diving Beetle, mentioned earlier in this article, might be a disadvantage and prevent the male holding on to the female in pairing, were it not for a remarkable modification which the male of the species has. This takes the form of an elaborate sucker pad on the tarsi of the front legs. Some 150 cup-shaped suckers, when applied to the smooth prothorax of the female, hold her by suction of a power that experiments have shown will support more than thirteen times the weight of the beetle.

green water, but increased the amount from two pints to four. By this time the fry had doubled in size, and could be found in all parts of the aquarium, at the surface, mid-water, and among the mulm.

After ten days I commenced feeding with Mikro-worm. On the fourteenth day fine sifted Bemax and chopped White Worms were added to their diet. By now the fry seemed innumerable and varied in size from some just double that at hatching time whilst a few were a good $\frac{1}{2}$ in. long. The largest were removed to another aquarium, and fed with chopped Tubifex, White Worms and fine sifted *Daphnia*, the remainder being fed with their existing diet until they reached the size the others were, when their diet was changed.

Nature of the Paradise Fish Nest

On June 7, the Paradise Fish spawned, and the eggs were in a three-inch square nest, similar to that of the Fighters but not attached to any plant, and resting against the left side of the aquarium. It was flat, not thick in the centre like that of the Fighters. The eggs were similar in colour to those of the Fighters but they appeared to be smaller in size. I removed the female at once; she had been trying to reach the nest, intentions can only be assumed, for the male kept her at bay savagely and continued to attack her even while she was being netted. The eggs hatched the next day, exactly when I cannot say, but the fry were swimming freely by the evening. The feeding was the same as that of the Fighter fry, except that the Paradise grew faster and were on the second diet days ahead of the other species.

The Dwarf Gouramies spawned the same day as the



Photograph] [G. J. M. Timmerman
Pair of Dwarf Gouramies (*Colisa lalia*). Male is the lower fish.

clapsed. Even then the difference in the size of the fish was more imaginative than noticeable, and only at the end of this period did they appear to grow at any rate. Maybe I fed the green water too long, anyway it did not retard their growth in the end and I have since had breeding results with a pair of these youngsters.

With all three breeding successes, I removed the male fish



Photograph]

Left: Bubble-nest of *Betta splendens* viewed from above the water surface. Right: a brood of young Fighting Fish.



[G. J. M. Timmerman

Paradise Fish, but I could not see the eggs, in fact at first I could not find a nest, and it was only because the female was so noticeably thin that I knew they had spawned, so took greater care than before in searching for the nest. It was finally located at the surface behind some floating leaves of a *Hydrophilis* plant. It was built of bubbles as with the two other Labyrinth species, but mixed in with the bubbles were pieces of *Riccia* and a hair-like floating plant (similar in appearance to an extremely fine type of *Nitella*).

Even though I had discovered the nest, I still could not see the eggs, and only surmised that they were there and this proved to be right. The female was removed at once, but not without great difficulty.

On June 9, at 7.45 a.m., a few Dwarf Gourami fry could be seen clinging to the front of the aquarium, and occasionally one or two could be seen darting about the surface. Feeding was exactly the same as for the Paradise Fish and Fighters, but the rate of growth was much slower, consequently the green water was fed to them until fourteen days had



Photograph] [G. J. M. Timmerman
Mature Male Paradise Fish (*Macropodus opercularis*).

as soon as the fry were free-swimming; I know these fish have a fairly good reputation as parents, but I believed in taking no chances.

Comparison of Methods

Since this episode I have tried spawning the fish in tanks with clean compost and the usual care advocated by some aquarists. True I have spawned them and raised some fry, but they have not grown as well as those did in the tanks containing mulm. I really believe that the fry obtained much food from amongst the mulm that their counterparts in cleaner tanks had not access to. After all, static pools in Nature do not get a clean out, until man interferes, and then they cease to be natural. Yet this is merely my opinion, based on my experiences, and I do not decry other methods which are always of interest to me. After all, both the humble beginner and the "voice of experience" have much to learn when they attempt to imitate Nature as we do in our hobby.

Innovations in a Cellar Fishroom

Adapting the Existing Area — Importance of a Predetermined Plan — Experiments to Attain Maximum Efficiency and Economy

By J. E. Edwards

DURING the years I have been associated with the hobby I have had the opportunity to travel around almost the whole of the British Isles. As a result, I have been able to compare, and to a certain extent analyse, a very large number of fishhouses and fishrooms. On many occasions I went to see and stayed to envy the number of tanks set up, the beauty or rarity of the fish or plants, or the natural water available compared with the hard and most unfriendly water of my home town.

Yet very rarely did I envy a fishhouse or fishroom in its own right. As I view the hobby, most of these establishments start in a small way and gradually build up month by month until, in the end, they are like an unplanned town, everything uneven and all over the place and by no means suitable for the job. I am of course referring to the aquarist who has from 20 to 40 tanks and not really big fellows, many of whom put up an excellent and efficient show.

Among the faults often seen are lack of planning for space heating, lighting, water supply, water disposal, tank cleaning, water heating and servicing. First of all one usually finds that whatever room, shed or small building is selected for fishkeeping, it has tanks all the way round its four walls. This means that efficient working space has been overlooked and when fellow-aquarists call there is usually a crash of broken glass and smell of overturned Mikro-worm culture, yells for the door to be shut to keep the heat in, or shouts for the assembled multitude to stop breathing for a while as the tanks are misting up! Also electrical installation often leaves much to be desired.

Another point is that the average man has tanks of many different sizes, as he picks them up at the right price, I suppose. It is hard to turn down what looks like a bargain, but in the long run one pays for taking it up. Again, each tank seems full of every known variety of fish and it does not appear to matter what temperature, lighting, plant life or depth of water the individual species prefers. It is very difficult to turn down an offer of half-a-dozen free fish from a friend but there are times when it is advisable to do so.

I admit that not everyone can tackle the problem in the way I have done, which is virtually to buy a house suitable for my fish to live in! I had to move and made plans nearly two years beforehand. When the time came to start looking around for the right house my wife and I had the fish well in mind as one of the major problems.

Accommodating the Fish

Therefore, as soon as we saw a house we liked, we said, "Where are the fish to go?" In our case the answer was an old Georgian house of very solid construction, in fact, 14 in. walls situated in Surbiton, Surrey. We decided that a very dark and dirty coal cellar and a wine cellar were the answer to the fish accommodation problem.

It has to be borne in mind that there was not unlimited cash available and, in fact, the maximum target we set was £50, which was no more than one would spend on an average fishhouse.

Suitable Location

We decided we could make what was wanted out of the two cellars and, all other items being suitable, we sold our original house and bought this one. My aquarist friends came and saw my cellars. They were either politely doubtful or openly sure that my wife and I wanted our brains tested.



Photographs]

[WATER LIFE

Main section of the cellar after it had been converted into a comfortable fishroom. To the left is the largest bank of tanks and, to the right, the Angel Fish aquarium.

There were times, I must admit, when we wondered whether we had been over-enthusiastic. Even the builders who came to carry out modernisation were doubtful. However, in the end all turned out very well indeed as those who have visited my fish-den will bear out.

Concrete Floor and New Windows

First of all a concrete floor had to be laid. The cellar was half above and half below ground level, so it was possible to put in three large windows at ceiling level. This gave excellent daylight, especially early in the morning which is what fish like when they are in a spawning mood. To make the arrangement more attractive, one cellar was adapted as a fishbreeding room and workshop and a large, secondhand old-fashioned sink was put in. The coal cellar had a french window and door fitted which, with suitable curtains, gave a very pleasant view from both inside and out and also made the room look larger and higher than it actually was. We were lucky in as much as there was a light meter, gas meter and water-main in the cellars. I was thus able to isolate the fish installation from the normal house supply.

The question of tanks and staging then arose. I did not

know of a cheap source of supply for angle-iron and so decided that that iron would do the trick. I phoned all the secondhand furniture dealers in my area and managed to pick up a supply of three-bed-rooms at 6d. each. I then got in touch with a very good amateur friend of mine, Mr. A. Lambert of Hook, Surrey, who recently had an electric drill and a large number of hacksaw blades, but also considerable energy. He drilled and sawed and, as a result, I had a nine-foot, three-tier platform, perfectly level and strong.

I had already decided that I would keep my fish tanks confined to two walls and not four. I also intended to standardise my tanks and throw out the odd sizes. For instance, on one side of the room, the top bank of tanks consists of five with 24 x 12 x 12 in. dimensions, the second bank, five, 24 x 12 x 12 in., and the bottom row two, 3 ft.-long rearing tanks for youngsters and one 24 x 12 x 12 in. and one 12 x 12 x 12 in. for use as livebearer breeding aquariums. One of these latter is partitioned half-way along and has a flooring of glass tubing. This tubing is held together with plastic bell wire as string rods in about four weeks. I put gravid female fish in the side floored with tubing (this tubing floor is suspended on compost, allowing a cavity in the centre for the fry to escape to the other side).

I have found that the fry tend to gravitate to heat and light and thus the light has been arranged over the side not containing the mother fish and the heating source is located inside the same section. I have left youngsters in this tank for a week or fortnight and, although several gravid females have been together on one side, I have had no noticeable losses, which is very helpful to an amateur like myself who is away from home a great deal.

On the opposite side of the room is a large tank with one 36 x 19 x 12 in. tank divided in



Mr. J. E. Edwards servicing his tanks. Note the "frieze" of Guppy standard outlines above the tanks.

half for my wife's male and female Barbs. Below this is a 36 x 15 x 15 in. tank for Cichlids. The only other tank in the room is an 18 x 24 x 12 in. one which is permanently occupied by my wife's Angel Fish.

Furnishings of the room include coconut matting with rugs on top. Under the main window is a desk and there are filing cabinets, an armchair and, along one side, a large settee. Besides this, there are half-a-dozen folding chairs, bookshelves, a midget radio and an internal ex-government telephone which is connected to kitchen. All these are very necessary when one gets the number of visitors I do these days.

The breeding room next door is very straightforward, one side having six, 18 x 10 x 10 in. tanks, for which my wife and daughter are responsible. On the other side is a row of what will all be 12 x 10 x 8 in. tanks for my Guppies. Below, are two 24 x 15 x 12 in. tanks which serve as

isolation wards for new and sick fish. At the moment these are unplanted and contain methylene blue solution.

By now you will be seeing at what we have aimed. Every tank in the fish den is fully furnished and very well planted. They may not be capable of taking first prize in a WATER LIFE show, but they are attractive underwater pictures and it is a pleasure to just sit back in the armchair or settee and smoke my pipe. In fact, I can honestly say I have never appreciated tropical fish as much as I do today in my cellar fishroom.

I believe that one of the reasons for the falling off of membership in many societies is the cost of the hobby today and by cost I mean that of heating and lighting. For quite a time now I have had light meters on both heating



Left: A close-up picture of the run of tanks shown in the photograph on page 70. Piping for the gas jets under the middle row can be seen on the extreme left. Right: Opposite side of the same room with space for study, work or leisure. On the right are two 3 ft. tanks containing Barbs and Cichlids.

and lighting circuits and have found that it is lighting which costs the most in a heavy consumption of units. After all, the heating is usually thermostatically controlled, which is some saving. I found that as far as heating is concerned, an economy measure advocated by many aquarists today is very successful. This consists of obtaining thick brown paper and pasting or gluing it to the frames of the tanks. When dry the paper shrinks and becomes like a drum and the space between it and the tank glass is a splendid insulator.

Gas Heating Adopted

All my tanks would have been treated this way if I had not decided, after considerable research, that for my inside fishroom the best form of heating was gas. It is very easy to install. All you need are lengths of gas piping about 4 in. below the base of each row of tanks, one nipple jet for each 2 ft. tank and two jets for each 3 ft. tank—and so on. Each row of up to five tanks should have a control tap. If you have more than five tanks on each tap, pressure of the end ones will drop below

that which you require. Midway between the gas pipes and base of the tanks are metal baffle plates which diffuse the heat.

I find that whatever the weather I maintain a room temperature of around 70 deg.F. and that tank temperatures between night and morning fluctuate by 8 to 10 deg.F., which is healthy for the fish. Plants respond well to base heating and the growth, even in the Winter, is really excellent. The heating can be finely controlled by making a metal or wooden long-arm which will fit over the normal gas tap. In the summer I expect to have the heating off completely during the day. One must, of course, have the actual fitting of this type of installation done by competent gas fitters. I do not seem to have any fume troubles but as a precaution I have drilled a number of holes in the top of a dividing door and this gives quite good ventilation.

In the next issue I shall give details of a method of lighting I have adopted. It is electrical but has the dual advantages of safety and economy. The system is one which should commend itself to those aquarists faced with providing adequate illumination to a range of tanks.

Current Research

Feeding Mechanism in a Cichlid Fish

By Alastair N. Worden, M.A., B.Sc., M.R.C.V.S., F.R.I.C.

THE mechanism whereby those fish that feed on minute particles are able to select or retain their food is not yet fully understood in all instances. Dr. P. H. Greenwood, of the East African Fisheries Research Organisation, Jinja, has recently published an interesting explanation of the means by which the Cichlid fish, *Tilapia esculenta*, is able to retain and swallow the plankton which form the bulk of its diet.

In *T. esculenta* the outer series of gill-rakers on the first branchial arch are relatively coarse, but those of the inner series on this first arch, and of both outer and inner series on the three succeeding arches, are finer. The interdigitations of the gill-rakers form a sieve between the arches which would be capable of retaining coarse particles, e.g., Copepods, but not the diatoms and other plankton organisms that are commonly found in the fish's stomach.

There must, therefore, be some other method of food collecting and, from a study of the gross and microscopic structure of the pharynx and buccal cavity, Greenwood (*Nature*, London, 1953, 172, 207-208) has postulated the following.

The lining or epithelium of the bucco-pharyngeal cavity is thrown into a number of low folds so that its total surface area is increased. Over all the epithelium, but especially that on the gill arches and along the upper mid-line of the mouth and pharynx, there are cells which are capable of secreting mucus.

Retention of Plankton

When the fish feeds, it would appear that the phytoplankton suspended in water are drawn into the buccal cavity, where the organisms become entangled in the copious secretion of which these numerous mucous cells are capable. This mixing would be assisted by the turbulence due to the intermittent nature of the inhalation current. The aggregates of food and mucus are presumably carried backwards, but are prevented from escaping with the outgoing current by the gill-rakers, which form a sieve sufficiently fine for this purpose.

The relationship and movements of the pharyngeal bones, which are provided with sets of fine teeth, are such that the mucus and its entangled plankton would be raked back towards the oesophagus or gullet. By passing between the

teeth on the pharyngeal bones, the larger elements would tend to be broken into smaller, and this is felt to be the explanation of the almost uniform length of the food particles that are recovered from the stomach of any one fish.

Greenwood believes that the mechanism he suggests would hold good even if the fish were to feed on the bottom deposits. His microscopic studies of the stomach-walls of *T. esculenta* show that they are well supplied with gastric glands similar to those found in other fish. It has been suggested previously that in this species the stomach acts merely as a storage organ for food prior to its digestion in the first part of the intestine or duodenum. There is no reason to suppose that this is the case and normal digestive processes can almost certainly begin in the stomach.

Spawning Behaviour of Plaice

The Plaice (*Pleuronecta platessa*) is an unusual subject for mention in these columns, but since no previous information on the spawning behaviour of pleuronectids appears to have been recorded, it is of interest to refer to the note just published by G. R. Foster in the *Journal of the Marine Biological Association of the United Kingdom*, 1953, 32, 319.

On the evening of February 20, 1953, two plaice in the largest tank at the Plymouth Laboratory were observed to be spawning. They were swimming in mid-water about 2 ft. 6 in. from the bottom, the female lying slightly diagonally across the back of the male with their vents close together. The female, considerably larger than the male, was quivering violently and emitting a rapid stream of eggs. A stream of milt was coming from the male. After about 20 seconds the fish separated and settled on the bottom.

The eggs were being eaten very rapidly by a shoal of Sea Bream (*Pagellus centrodontus*). The beginning of spawning was not observed but it is believed that it could not have occupied much longer than 45 seconds since the tank had been under observation some 30 seconds before the pairing was seen. When caught afterwards the female was found to be almost completely spent, but she may have spawned earlier. Fertilised eggs from other plaice were taken from the tank for the next three days, between 6 p.m. and 9 p.m., but the actual spawning was never observed again.

Fishkeeping in South-eastern Australia

State of the Hobby in the Sydney Area — Water Conditions Encourage Species to Spawn — Rosy Barbs and White Clouds Breed Outdoors

By C. W. Emmens, D.Sc., Ph.D.

(Professor of Veterinary Physiology, University of Sydney)

AUSTRALIA has been isolated from post-war aquarium activities to perhaps a greater extent than any other English-speaking country, in particular because the importation of fish by air was banned until a short time ago. Even in New Zealand this ban was lifted at a much earlier date. As a result, aquarists in Australia are now making acquaintance for the first time with some fish long familiar to European and American aquarists. Until 1953, no *Aphyosemion* species was obtainable in the country and very few Dwarf Cichlids, no Pencil Fish, no Hatchet Fish and only very few *Corydoras* had been seen.

Certain Species Readily Available

On the other hand, we were more familiar with other fish which still remain a rarity in the Northern Hemisphere—such as Scats, *Monodactylus*, and the many fish available from Malaya and the Far East. These were not cheap, however. Difficulties of importation by sea from any great distance and the absence of an organised effort to overcome them, meant that practically no new fish reached Australia before about 1950 or 1951, and then only in small numbers.

In view of this, it is not surprising that in the immediate post-war years, only some 30-40 varieties of tropical fish not native to the country were available. As all of these had been bred by enthusiasts without the importation of new stock for some 12 years, it is perhaps a creditable fact that not more species were lost, as many exotic types known abroad in the 1930's had never been imported anyway.

During the past five years, this total has mounted so that Sydney aquarists are now offered almost as full a range of the "ordinary" tropicals as is seen in London or New York, but often at much higher prices per fish as stocks are more limited. Rarities like *Symphysodon discus*, *Leporinus* species, *Metynnis* species, and many of the Cichlids are still only very occasionally seen.

Aquarium plants are also difficult to import and we lack some of the newer varieties. However, a few native to Australia, appear never to have been exported. These include *Blixia*, a very attractive light green grass-like plant which grows in bushy clumps, and a local giant *Valisneria*, which does very well in coldwater tanks but, oddly enough, not in tropical aquariums.

A number of curious results have followed this isolation. Until the resumption of importations in the last few years, White Spot was almost never seen, while some other diseases, like Velvet (*Oodinium*), were quite unknown. All that is now changed unfortunately, and the epidemics which have swept Sydney and other centres have been all the worse for the long period without exposure to them. Now, things

seem to have settled down somewhat; aquarists are more alert for trouble and educated in combating it, and fish stocks less susceptible, I rather think.

The Australian Angel Fish is almost certainly *Pterophyllum scalare*, not *eimekei*, and it breeds readily. Before the war, both species were available, but *P. eimekei* seems to have practically died out. Some quite individual strains of fish have also been developed, with differences from the usual run of the species that are apparent to their possessors now that other stocks are coming in. The local *Epiplatys chaperi* lacks the red under the jaw in the male, yet our *Hemigrammus caudovittatus* keeps bright red fins into old age, whereas the more typical strain does not. Some of our local male Fighting Fish can be raised together without damage, yet they are a gorgeous strain and ready breeders.

Perhaps because nobody thought about possible trouble, aquaria are regularly made with galvanised iron frames, the inside of which is usually not even painted over. Sydney and Melbourne water is so soft that lead piping cannot be used and dissolved zinc from the galvanising should be very poisonous in the absence of calcium, yet no trouble seems ever to be encountered. One successful breeder of many varieties of fish uses completely unpainted galvanised equipment throughout. Certainly, the avoidance of rust by using galvanised iron frames is a great boon, and we are rather surprised to read articles giving warning of its great dangers. Possibly the quality of the galvanising matters a lot, and we may be lucky in having good-class materials.

The Aquarium Society of New South Wales numbered less than 100 members in 1950, but it now has a membership of well over 300. Nevertheless it represents less than 1 per cent of aquarium keepers in Sydney, most of whom belong to no organisation which caters for the hobby. Sydney has some 26 retailers of coldwater and tropical fish. The majority cater only for aquarists and do not sell other pets. Some of these retailers have show-rooms equal to the finest I have seen in Britain or America, and are to be congratulated on the state of their tanks and stock.

They all complain of shortage of fish in relation to a growing demand, while local engineering firms who manufacture air pumps and other equipment are increasing their trade. All this is testimony to an expanding interest in fish, which is following rapidly in the pattern of Britain after the war. So far, this interest has been almost confined to New South Wales but some growth of the hobby is now apparent in the other States. New South Wales, which for the purpose of aquarists practically means the city of Sydney, with 1½ million inhabitants, is fortunate both



Here, in one of Professor Emmens' large community aquariums, are seen fine specimens of Angel and Pompadour Fish.

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climatically and in its water supply, since soft water is best for the breeding and maintenance of most popular species. It is also large enough for a healthy trade rivalry, which keeps prices down and accessories available to the consumer. We have yet to see, however, the fish tank in the hospital ward, and very few public places, such as restaurants and cinemas, have aquaria.

Incidentally, the usual Australian tank is larger than is seen almost anywhere else, with the possible exception of Holland. The typical home unit is a 16 to 40-gallon tank and stand, while 60- or 80-gallon tanks of four or five feet in length are not rare. Our tanks also tend to be deeper—a popular size is 36×16×18 in. deep, so that fine plants can be more pleasingly exhibited.

Local Fishes

Most of the freshwater aquarium fishes native to Australia belong to the Family of Atherine fish, with a double dorsal fin as seen in the well-known Rainbow Fish (*Melanotania nigrans*). We do not have a very imposing selection for a country extending well into the tropics, and such as we have are not always easy to obtain in the South. Perhaps the truth is more nearly that we do not know what we may have, as a number of exciting rumours are current about the fish in Northern Australia. *Rhadinocentrus ornatus* (Soft-spined Sunfish), *Pseudomugil signifer* (Blue-eye), *Carassius compressus* (Carp Gudgeon) and *C. gilli* (Fire-tailed Gudgeon) are examples of Australian fish of considerable beauty which seem never to have been exported, at any rate in quantity.

Greater interest attaches abroad to some of our estuarine fishes, in particular the Scats and Monodactyls. These occur in quantity, and of a small size, further up the coast in Queensland where they are caught soon after the spawning season. They are euryhaline types, able to adapt themselves to salt or to nearly fresh water, although they never do well in soft water without added lime or salt. The Tiger Scat (*Scatophagus ornatus*) has been accidentally bred by a Sydney aquarist in about 25 per cent marine water.

Some of the more strictly marine fishes, even south of the Barrier Reef, are gorgeous. The aquarium in Taronga Park Zoological Gardens usually has a good selection on display, from the little Anemone Fish of various types to large multi-coloured Parrot Fishes, Tangs, Butterfly Cod and Battfish. Amateurs like myself find that with care we can keep small specimens quite successfully for long periods if they are given plenty of room, but marine fishkeeping tends to be frustrating in that sooner or later (usually when one is away from home) disasters occur.

Breeding Results

Sydney aquarists are very fortunate in that it is nearly always quite safe to fill a tank with water straight from the tap, which even in Summer will be at about the right temperature of 75 deg. F., and put the fish in without waiting at all. The water is not usually chlorinated and varies from about 12 to 40 p.p.m. in hardness (as calcium carbonate) with a neutral to acid pH. Unfortunately there are sometimes sudden departures from this, due, for example, to cement-slurrying of the mains, which may turn the water alkaline and hard, and may kill fish accustomed to the usual soft, often acid, water. So the careful aquarist checks the pH, as a guide to general conditions, before using tap water.

This soft, acid water is excellent for breeding most fish which lay eggs. Even Neons have been hatched in untreated tap water, which at that time was presumably at its softest. Usually, at least a half-and-half mixture of rain water or distilled water and tap water is needed for a fertile Neon spawning, but these fish are not raised in any quantity despite the apparent suitability of the water. However, Glowlights, Head-and-tail Lights (*Hemigrammus ocellifer*), Black Tetras (*Gymnocorymbus ternetzi*), *Hyphessobrycon serpa* and other "hard-to-spawn" fish are readily bred.

(Continued on page 76.)

— Know Your Fishes —

No. 32 Hump-backed Limia (*Limia nigrofasciata*)



Photograph

[G. J. M. Timmerman]

Whilst most aquarium fishes have popular names that are descriptive and quite often colourful, a few have titles just as descriptive, but which are not likely to attract aquarists to the species initially. Such is the misfortune of *Limia nigrofasciata*, commonly known as the Hump-backed Limia. It is a fair description, for all that, as males older than one year develop a hump in front of the dorsal fin (the photograph shows a male where the "hump" has barely begun to develop). To compensate for this change, the dorsal fin enlarges and is carried with a suggestion of pride.

In spite of its name, the Hump-backed Limia is an attractive fish with "chunky" body shape. The basic body colour is generally an olive-brown with metallic blue highlights, most marked in the shoulder region. Dark bars, about ten in number but ranging from eight to 12 in individual specimens, adorn the sides. These account for the happier name of Black-banded Limia. Dorsal, and sometimes caudal, fins are flecked with black. In the mature male's enlarged dorsal fin, colouring can be quite striking with black tending to be confined to the outer edge and yellow running up from the base. At the time of the hump-backed and dorsal fin development the sides of the male's body become more yellowish and underparts and gonopodium become darker.

Apart from the obvious presence of a gonopodium in the male when it approaches maturity and the persistence of the fan-shaped anal fin in the female, sex is also indicated by the female being less colourful. Males grow to 2 in. long whilst females are generally a little larger.

Hump-backed Limias are peaceful and do best at a temperature ranging from 72-75 deg. F. with a slight increase when they are breeding. They are great eaters of soft Green algae but they also appreciate livefoods and will take prepared foods. The fish is not particular about type of water but matured water seems to be favoured and, in its country of origin, it is even found in the brackish water of sea inlets.

The species is quite prolific, broods of 10-40 being usual. Young fish are easily cared for but comparatively large aquariums are best. Hybridization is possible, *L. nigrofasciata* having been successfully crossed with *L. melanogaster* and *Xiphophorus helleri*.

The species is native to Haiti on the Island of Hispaniola in the West Indies. Class: Pisces. Order: Microcyprini. Family: Poeciliidae. Genus: *Limia*. Species: *L. nigrofasciata*.

Champion and Novice Exhibitors

Different Opinions on the Introduction of Two Categories

NUMEROUS further views have been received on the suggestion, first made in our October, 1953, issue, that the introduction of two categories of exhibitors ("Champion" and "Novice") should be considered.

Four expressions of opinion were published in the December issue and another seven in February. In the last issue, Capt. L. C. Betts summed up his arguments by saying that if there is a real demand for novice classes then they will be provided.

The views expressed by Capt. Betts will not be accepted by everyone and, in fact, some of those of the Keitering A.S. secretary, Mr. J. E. W. Sharp, are in distinct contrast. His opinions, submitted to the society were considered by the members, 27 voting in favour and 3 against. He states "The idea is a very good one. It would undoubtedly encourage more members to enter fish at shows. I have heard newcomers to the aquarist world ask, when invited to compete, 'Why should we enter?' giving as reasons for that comment, 'We do not stand a chance' and 'We are only beginners.'" Mr. Sharp partly lines up with Capt. Betts when he says, "I should like to see classes for juniors of 16 and under as well as those for champions and novices. It is the young people to whom we should give encouragement as they are the aquarists of the future. Having three classes of competitors may involve the judges and officials in more work but if their existence will improve the overall entry at shows and also hold the interest of members who have had no success in the past the extra trouble would be worth while. It is hoped that by taking the matter into their capable hands, the F.B.A.S. will be able to give us a workable scheme soon. They will get support from all interested in this important step towards the betterment of our hobby."

Mr. J. Rudkin, secretary, informs us that after a full discussion on the subject by the East Midlands Guppy Breeders' Society, the members present at the meeting were all in favour of leaving the position as it is.

Mr. and Mrs. Edwards (joint secretaries of Bath A.S.) tell us that their members have discussed the proposals and agree that novice classes should be introduced for national shows. The amateurs who keep fish in a very small way would be more encouraged to exhibit if they knew they were not expected to compete against champions who in some cases can not only afford better fish and more extensive equipment but probably have more time to study them. Mr. and Mrs. Edwards add that all fishkeepers know how the hobby grows on them. Those who start with one or two tanks are more likely to increase their interest if able to enter fish in classes supported by other newcomers and in which there would be a reasonable chance of gaining an award.

Mr. G. W. H. Cox (secretary of Suffolk Aquarists' Association), says that his show committee has drawn up plans for novice classes, it being decided that a novice should be one who had not been awarded a first, second or third prize ticket at any previous show. He is of the opinion that to encourage more aquarists to show fish, something on these lines must be done. The procedure adopted at many flower

shows is one that could be used. This would mean confining certain classes to those possessing a defined number of tanks or ponds, a novice being one who has not been in the first three cards before. The classes for champions will always be open to anyone who considers competing in them worth while whether or not they are debarred from participating in the novice section.

Mrs. G. Ferguson (secretary of Glasgow Northern A.S.), points out that in Scotland open shows such as are staged in other parts of Britain are not known. Nevertheless, the members of her society believe it would be a good plan to encourage the beginner to the hobby by introducing a novice section. They feel that those who are novices should only be allowed to participate in shows for a limited period, such a period to be determined by the show committee responsible for the events.

Mr. W. J. Humphries (secretary of Harrow A.C.), reports that his members feel that in principle the scheme will fill a long-felt want and goes on to suggest there is need for grading competitors on a league basis, with promotion and relegation. The members, however, query how this is to be achieved when although some standards do exist, the personal preference of individual judges has to be taken into account.

In places served by several clubs competition is keener and so points are more difficult to obtain. There would be a lower standard in less thickly populated areas. The Harrow members go so far as to say that to obtain uniformity, individual judges would have to show greater conformity in their opinions, the only alternative being the impracticable one of having but one team of judges. It is felt that the

A number of contributions to this debate have had to be left out through lack of space. It is intended to use them next time. Later, it is proposed to summarise the opinions expressed. It is hoped that the suggestions will be looked at by the Federation of British Aquatic Societies. The experience of members of its Judges' and Standards committee should make it possible for any tentative scheme to be examined and for the committee to put forward its own plan for revitalising the competitive exhibition side of the fishkeeping hobby.

scheme has good points but will have to be watertight to avoid further anomalies.

Mr. R. H. I. Read (member of the Goldfish Society of Great Britain), is opposed to the idea. The following are extracts from the letter sent to us outlining his views. "It is not my opinion that the scheme would prove satisfactory with the possible exception of its application to club table shows. There will always be one or two individuals who 'sweep the board' in particular classes but surely this is the reward for their labours? If the people not winning prizes are all that keen they should strive to breed better fish. They do not succeed at shows because they do not put their heart and soul into their efforts. Some offer the excuse that they cannot compete against aquarists known to have many tanks and fish because they have limited accommodation. Tank space is of trivial importance since if such an aquarist really knows his fish he should only keep the very best that he can procure or breed. It is not impossible for anyone to get hold of show fish from recognised breeders if he buys them young enough and is prepared to rear them up for himself. The moment that such an individual has acquired exhibition-type youngsters he is at an advantage rather than a disadvantage because he is able to concentrate his efforts on those fish whilst his rivals have got to find the necessary food and time to care for their multitudinous families. Many exhibitors are ignorant of the show standard required for the fish that they are exhibiting and there seems to be no reason why such exhibitors should have the way to success made easier for them. Since club table shows are the recruiting

grounds for potential open show exhibitors there would be no objection to a handicapping system as the novice is surely to be encouraged lest he may feel frustrated in being compelled to compete against a 'master' whilst he himself is still only a 'pupil'. Are not clubs in existence for the main purpose of teaching potential exhibitors how to keep, breed and know exhibition fish? Should not the open shows be regarded as a competition between the champions of club table shows?"

Mr. J. Lutton (secretary of Ulster A.S.), points out that a novice class for furnished aquaria competitors was included in the schedule of their last annual show. The society has been in existence for seven years and in its ranks are a number of aquarists who have steadily gained experience over that period. More recent members were found to be taking the attitude that it was pointless to participate in the competition when the winner was almost bound to be chosen from half-a-dozen exhibitors. This outlook forced the show committee to start a novice section with the result that there were more entrants for the furnished aquaria classes than there would have been otherwise. Mr. Lutton contends that the ordinary member of a club must be given the opportunity to gain successes since they help to maintain his keenness and enthusiasm. Ulster aquarists agree that novice classes should be instituted to give members a chance of winning the trophy at the annual club events. They also advocate novice classes at open events. Mr. Lutton concludes by observing that many a time the novice rears a better fish than the expert and the amateur better than the professional.

Mr. J. R. Shaw, F.R.H.S., F.N.C.S. (a successful exhibitor from Manchester), emphasises the need for would-be successful exhibitors to breed good exhibition stock. He writes:—"First let me compliment you on the editorial 'Higher Status' published in the October, 1953, issue. This, as Mr. H. J. Vosper writes, 'voices, I am sure, the unspoken thoughts of many exhibitors', a statement with which I entirely agree. It is a fact that at the nine shows which I attended as an exhibitor during 1953, I did come across this apathy for showing, due to the higher awards being won in most cases by the same group of exhibitors. This state of affairs, whilst not being encouraging to the beginner, could go a long way to being overcome if many of the grumblers were not so easily 'licked' and would set out to build up good show fish for themselves. I feel that the words 'champion class' is going to the extreme, at least for most club shows and it should be reserved for special open events of a national or, at least, regional standing. Rather let us use the terms used by many other livestock societies, i.e. 'novice' and 'open' classes. This could still leave the novice classes for exhibitors who were qualified by their number

of wins or points to show in this class and at the same time would mean that the higher class would be open to anyone; even the novice who thinks that he has a good enough fish to reach the required standards could then enter. If he gained a first prize, it would be counted against him in regard to his transfer to a higher grade. If he does not gain an award he has no grumble; he has shown in the higher grade of his own free will and is still eligible to go on showing as a novice until such time that his number of wins or points upgrade him automatically and permanently.

Mr. W. S. L. Mellish writes in his very constructive letter (December 1953 issue), 'Do you expect a champion to maintain top grade? Would he be demoted if he failed?' My answer to the first question is 'Yes'. An exhibitor, once that he has decided on his methods of preparing, conditioning, etc., fish for showing, and found that these methods are consistently successful, should expect to continue being able to do that, providing that he is still prepared to go to all the trouble and care involved, and does not start slacking off in his efforts. My answer to the second question is an emphatic 'No', once a person is upgraded let him stay there, otherwise we might well see already overworked show secretaries being involved in something that may well get out of hand if we do start to see-saw up and down from lower to higher grades and back again. As a past member of the Executive Council of the National Chrysanthemum Society, who has assisted in the organisation of many club and open shows up to national standard, I write with some authority in saying that for years we have had sections for different grades of competitions at shows. For example, a new member, joining a society as a complete beginner would be put into Section D. After attaining a set number of points in that section he is upgraded to Section C, and so on until reaching section A where he stops, whether he has any more wins or not. This system has always worked very well and is the general procedure in use throughout the country. I do not suggest that aquarist societies should have so many grades or sections; two should be ample for our requirements.

"The novice classes should attract the beginner to show his fish and the club would benefit by having larger entries and therefore a more attractive show. The question will also arise, especially from the smaller societies, regarding the extra number of prizes to be either begged or purchased, more tanks to be hired if the number of entries are higher and, yes, let's face it, 1953 attendances down with a resultant lessening of income. These types of problems are bound to arise, but I feel sure that they can be overcome by enthusiastic organisation on the part of the show committees who are backed by helpful members of their respective societies, and by them so doing can help to overcome what is well on its way to becoming a 'closed shop' for a certain number of successful exhibitors who do all the winning at present. The show committees who adopt the two grades may well put new life into our shows and societies as a whole".

Mr. D. A. Attewell (secretary to the Judges' Panel of the Midland Association of Aquarists Societies) reports that the subject was discussed by the entire panel at its last annual meeting. It was concluded that a need for champion classes exists and that their introduction would help show organisers to get bigger entries and to attract spectators from farther afield. It would make the high-grade fish breeder more keen to show his fishes amongst those entered by other aquarists of a similar category. Different systems were suggested and the panel was unanimous in the view that the onus for qualification to compete as a champion should be on the competitor and not the responsibility of the show organisers or the judges. The panel felt that the scheme should apply to all classes for fancy Goldfish. With regard to tropicals, all species could be covered but a division might be necessary to differentiate between cultivated and non-cultivated types. The hope was expressed that championship classes would soon be introduced by show promoters, an innovation which its members would be only too willing to encourage at any events they were asked to judge.

Fishkeeping in South-eastern Australia

(Continued from page 74.)

Some, such as the Neons and *Hyphessobrycon rosaceus*, remain touchy, so we do not have it all our own way. It is fortunate, however, that there is a good chance for the local breeding of a new fish once it is imported, as the Characins, for example, would always be expensive were it not for this fact. We have had no better luck with various *Rasbora* species than have aquarists the world over. *Rasbora heteromorpha* may be observed spawning merrily in a dealer's stock tank, while hundreds of others eat the spawn, but try the species in small numbers or single pairs and it never seems to perform.

Species such as *Barbus conchoniis*, *Tamichthys albonubes* and some of the livebearers may breed outdoors even in winter, when daytime temperatures will be up to 75 deg.F., but at night it may fall to just about freezing for a short period and so small tanks cannot be used as their temperature would drop too rapidly. In summer it tends to be too hot for tanks outdoors, but ponds are quite safe.

Factors Affecting Colour in Goldfish

Some Reasons for Colour Variation and Suggestions
for Improving Fish in the Three Scale Groups

By N. E. Perkins

THE eyes of a fish probably play a big part in its final coloration for by their agency the fish is made aware of its surroundings and it is then enabled to effect considerable changes both with regard to the intensity and pattern of the body colour. If you have any uncoloured Metallic Goldfish try placing them in a white bowl for twenty minutes. The reduction in colour is quite surprising. The change is, of course, merely temporary and is achieved by the contraction of the colour cells or chromatophores.

Many experiments have been carried out on a great variety of fish showing extensive variation in the ability of various types to produce different colour patterns, but most have been confined to marine species, especially the flat fish. The interesting point is that this will not occur if the fish be blind or temporarily prevented from seeing and the following account of an experiment which was made a short while ago will confirm my point.

Fish Placed in a Dark Receptacle

Two uncoloured Goldfish, which exhibited sufficient dark coloration to make reduction visible to those watching the experiment, were placed in a black receptacle filled with water. This, in turn, was put into a white bowl also filled. A small black bag was made of a closely woven fabric so as to exclude all light and of a size that would permit it to be slipped over a fish's head, covering it as far as the gill-covers. The two fish were left in the dark container for approximately fifteen minutes, after which one was removed, the bag being slipped over its head before it was transferred to the white bowl. Fifteen minutes later, the second fish was moved from the dark receptacle and put into the white bowl. Within five minutes, a distinct colour change took place, the colour of the fish paling as it adapted itself to surroundings that it could see. Comparison was made at this stage with the hooded fish, which manifested no reduction in colour intensity. The hood was then removed and it is reported that as soon as it became aware of its light surroundings its colour faded quickly until it was as pale as that of the other fish. When the two specimens were put back into the tanks they normally occupied they very quickly showed darker coloration once again.

Of course, there are many other factors which have an effect on the coloration of the individual fish and, in a



Photograph]

[Topical Press

Well-coloured Moor Goldfish. The author believes that outside conditions improve colour in this type of fish.

long-term view, on the species as a whole. Here I would like to point out the importance of time as a factor in the development of animal characteristics. What may be true with regard to specialised breeding over short periods may, over very long periods, be entirely false and, until we know all the factors involved, it is a fallacy to lay down hard and fast rules.

Use of Guanin Crystals

The presence of guanin crystals creates that silvery iridescence which is characteristic of many fish. It is thought to be derived by a waste product of the blood having been turned to advantage in achieving some measure of camouflage. Thus most wild species are lighter below, which protects them from enemies beneath them, and darker above, brought about by the presence of numerous pigment cells overlaying the iridocytes and consequently protecting the fish from aerial enemies. The chemical content of the water may also result in colour intensification and, of course, there is always the master factor of selection which, in the wild state, generally ensures that a condition of camouflage is achieved.

In attempting to produce fish of a given colour by selection it is as well to remember that many factors are concerned and selection alone may not be sufficient to achieve one's aim in a reasonable time. However it would probably prove decisive in the long run owing to the extreme versatility of living protoplasm.

Temperature also has a considerable effect upon colour. Metallic fish, for instance, certainly appear to colour (i.e. turn gold) very quickly if kept at 80 to 90 deg.F. while in the fry stage, though here again other factors are involved. Moors tend to lose their blackness and may become quite gold if kept too warm. This fish is, in fact, best kept at low temperatures and is very much more hardy than is generally recognised.

The treatment of young Goldfish must, therefore, vary with the type; Metallics should receive as much light and heat as possible, Nacreous and Matt specimens should be protected from strong



Photograph]

[L. E. Perkins

Transparent or Matt Shubunkin, a colour variety which Mr. N. E. Perkins thinks does not benefit from exposure to strong light.

light whilst Moors will produce greater intensity of black if transferred to water outdoors.

It has been suggested on several occasions that greater intensity of colour can be produced in Nacreous or Calico fish if they are obtained by crossing the Metallic type with Matt or Transparent, some people adding the proviso that both types must have come from good coloured Nacreous stock. Now in practice, this appears to work providing the Metallics are of a type which fail to colour (i.e. lose their black pigment). If they are of a quick-colouring type then the propensity for xanthochromism may be passed to the Nacreous

offspring which, though highly coloured when young, might lose all pigment by the time they have reached 18 months.

So it would appear that, whilst good quick-colouring Metallics might be produced in any of the varieties of Goldfish, it would probably be advisable to keep them separate from Nacreous stock. This is, of course, entirely my own view and is not, so far as I am aware, accepted by other aquarists. In support of this argument there is the fact that, where highly-coloured Nacreous fish have been produced by specialised breeding, the bronze offspring rarely colour.

Brazilian Giant Tortoise (*Testudo denticulata*)

By Mrs. A. Noël-Hume, B.A.

WHILE suppliers' lists generally include very few species of land tortoises, the attractive and intelligent Brazilian Giant Tortoise (*Testudo denticulata*) is often featured in them. Adults of this species are usually priced between £5-£8 but younger specimens may be purchased for as little as 30/- or £2. At the moment most *T. denticulata* reaching this country are being collected in the Guianas but the tortoise is common in the tropical forest areas of Brazil, Venezuela, Colombia and the north-east of Peru. In all these regions its flesh is considered a great delicacy by the native population and for this purpose they sometimes keep specimens in semi-captivity. This article is based on my experience with an adult male and a very young female of the species.

The Brazilian Giant Tortoise has two main identifying features, the first being the elongated shape of the shell and the second, the brilliant orange or red scales on the head and legs. I have also noticed another characteristic present in specimens of all ages. This is the method of moving the back legs when the tortoise is walking, for each in turn is lifted high into the air as if the reptile is stepping over some unpleasant object in its path. The leg is actually withdrawn inside the shell before being placed on the ground again. Experiments show that the nature of the ground has no effect on this behaviour and it is equally pronounced on flower-bed or carpet.

To return to the more easily observed of these features, the shape of the shell. The carapace is usually twice as long as it is broad and this effect is heightened by the rear marginal shields being almost vertical. Specimens with a carapace length of 30 in. have been recorded but the average length of those to be procured in this country is between

16 and 20 in., due, no doubt, to the high freight charges on the heavier specimens. The characteristic oblong shape develops only with age, young specimens being more circular in appearance. The shields of adult specimens are dark brown in colour with a deep yellow areola and the growth rings become almost obliterated. In young tortoises of this species the shields' centres tend to be a dull brown instead of yellow and there is a distinct concavity corresponding to the area not covered by the rings.

The brilliantly-coloured scales which make the adult *Testudo denticulata* such an attractive tortoise are not present in young specimens. In the latter the scales are a pale yellow in colour and would seem to darken very gradually, especially those on the forelegs. No young specimens possessing red coloration could be located by me but it seems likely that a similar deepening of the colouring occurs.

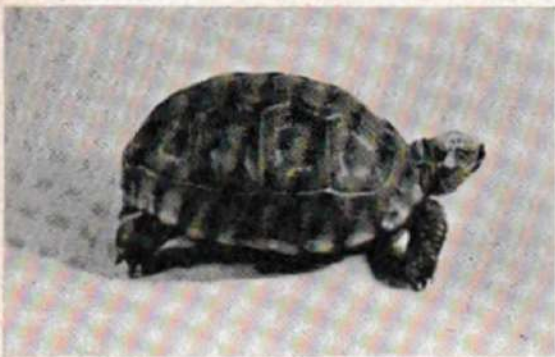
The head of *Testudo denticulata* is not sharply pointed but the serrated jaws are extremely powerful. The eyes are large and dark brown in colour except for a pale yellow outline. While the eyesight of this species is extremely good, its reaction to colour is below average for the land tortoises. There is a tendency for the eyes to water rather excessively at times but this appears to bear little relation to temperature, light or the health of the creature.

Differentiating the Sexes

As in most land tortoises, difference in sex is marked by a concavity in the plastron of the male (that of the female being flat) and by the former's larger tail. There is a marked increase in sexual activity during the months of October and November and the male, if not prevented, will make frequent attacks upon the young female I possess regardless of the difference in their sizes (carapace lengths of 18 and 4 in., respectively). He is able to pick her out at once from among a large group of tortoises of a similar size and coloration and will not attack any young specimens of other species. He will, however, assault one other tortoise in the collection, a fully grown *Cinixys erosa* with whom he had been for a year before coming in to his present home. During the period of sexual activity he refuses any food except bananas but would appear to drink more water.

The accommodation of this species presents few problems during the Summer. Whenever the temperature exceeds 65 deg.F. the tortoise can be given the freedom of the garden and, although some damage may be caused to tender blooms by its large feet, the owner may rest assured that they will not be eaten. However it is not wise to leave trusses of reddening tomatoes within range and small specimens may attack young lettuce when hungry.

Coming as it does from areas of dense forest, *Testudo denticulata* is not fond of sitting in the sun and should be allowed access to plenty of deep shade. It likes to hide



Photographs

[Mrs. A. Noël-Hume

Mrs. Noël-Hume's young female Brazilian Giant Tortoise (*Testudo denticulata*). Carapace length of this specimen is 4 in.

under low bushes and hedges and, if there is a greenhouse or shed in the garden, the door should, wherever possible, be left open for it to go inside. My adult specimen prefers to spend the hottest part of the day in a room opening on to the garden. When placed on the lawn in the early morning it will immediately come to the doors of the room. Should these not be open it will march up and down outside several times before walking round the house to the kitchen doorstep to gain admittance there. Only when the heat of the day has passed does it emerge and spend a couple of hours walking on the lawn and climbing on the rockeries and a flight of steps. The young female prefers to spend most of the day beneath a large catmint but emerges earlier in the day than the adult.

This species will drink water at very frequent intervals during the Summer and, if possible, the drinking vessel should be large enough to allow the tortoise to sit in it at the same time. A rectangular baking tin, of the type used for roasting poultry, set into a flower bed and with the surrounding area covered with cement or paving would serve admirably for this purpose. Care should be taken to see that the tin is kept full and that the water is always clean.

Summer nights in this country are frequently both cold and damp and for this reason it is extremely unwise to let *Testudo denticulata*, and for that matter any other tortoise from a tropical climate, sleep in the open. However, there is no reason why—during a heat-wave when the weather appears to be settled—this tortoise may not spend the night in a greenhouse or shed, provided that these have a well-fitting door. From the point of view of the owner's peace of mind and the tortoise's comfort, it is more satisfactory to have these delicate tortoises within the house at night or within a conservatory attached to the house. A suitable "bed" for a tortoise can be made from a wooden box which should be enclosed on three sides to minimise draughts and with a roof to give the tortoise a feeling of being hidden from possible enemies. The floor may be covered with layers of newspaper which can be removed when soiled.

Feeding Arrangements

In the Summer, I feed the tortoises twice a day, at 7 o'clock in the morning and at a similar time at night. Although the times are chosen to suit the author's domestic arrangements it also seems to be most satisfactory for the reptiles who both refuse to eat during the heat of the day. The food is given indoors as there are less distractions and, as a result, more is eaten. The adult specimen insists on eating from an enamel plate which is placed on a large plastic sheet to prevent the food being spread all over the floor. The young one feeds directly off the sheet as it is not yet large enough to reach on to a plate. Green vegetables are given every meal but are varied as much as possible. The most popular seem to be cabbage, lettuce and spinach. To these are added any two of the following fruits, according to which are available at the time, orange, tangerine, tomato, banana, water melon, fresh or tinned pineapple, any soft fruit, raw or cooked apple, grapes and pears. Both the adult and the young specimens are given the same diet but powdered cuttlefish or halibut oil is added to the latter's food at alternate meals.

By the middle of September the amount of time when the temperature exceeds 65 deg.F. decreases rapidly and



The author's large male Brazilian Giant Tortoise with carapace length of 18 in.

arrangements must be made to accommodate the species throughout the long Winter. A minimum day and night temperature of 70 deg.F. is needed but this in itself is not sufficient. The accommodation must be free from draughts and even in a well-heated house this is not always easy to arrange. The greatest possible amount of natural light must be provided for the tortoise which must also have adequate room for exercise. Very young specimens can, of course, be housed in a large vivarium and allowed to exercise in a warm room, whenever possible. With adult specimens the solution is not so easy but the best answer, and the only one for the tortoise enthusiast, is a room set aside for the reptiles. There are many ways of heating such accommodation but, whenever possible, the heating should be regulated by a thermostat. I manage to combine a large cupboard containing the hot water storage cylinder with another small room and this gives sufficient room for both *Testudo denticulata* and *Testudo pardalis* to exercise quite freely. Tortoises should never have access to a room with an open fire unless the latter is protected by a stout fire guard firmly attached to the floor and the fireplace.

During the cold weather there is usually a change in the feeding habits of these tortoises. At first it is only in the quantity eaten, which is less than half that accepted in the Summer, but then, as already mentioned, comes the period of great sexual activity when almost all food is refused. After this it becomes impossible to feed at regular times and the tortoises have to be coaxed with such things as bananas and pineapple. While on such a diet the tortoise sometimes feels the need for roughage which is satisfied by offering the tough outer leaves of cabbage and by keeping a plate of puppy meal within easy reach.

The amount of water drunk increases rapidly and this is generally given tepid, rather than cold as in the Summer. My younger specimen continues with the same diet but eats less and takes longer over it. The weight gained during a typical Winter was only 1½ ounces as against nearly 2½ ounces during the following Summer.

In common with all the other reptiles in this collection, these tortoises have been given a daily few minutes under an ultra-violet lamp, great care being taken that their eyes remained covered during the treatment. As the winter progresses there is a tendency for the skin to become dry and cracked but this can soon be cured by the application of a little olive oil to the affected areas at frequent intervals.

While *Testudo denticulata* is somewhat expensive to keep I believe it is the most interesting of the land tortoises.

Pondkeeper's Year

Water-lily Planting and Outdoor Spawning Arrangements

By J. Stott



Small pond suitable for breeding and rearing Goldfish. Shallows at the rear are planted with the popular Yellow Flag, Iris pseudacorus.

Photograph by J. Stott.

QUITE a number of aquatic plants, suitable for the pondkeeper's and water gardener's requirements, provide us with attractive flowers but I feel sure that, by popular opinion, it is the flowers of the Water-lilies which hold the supreme position with their colour, charm and beauty. April is generally accepted as the ideal time for planting and propagating these plants and it is undoubtedly the earliest time of the year when these tasks may be carried out with any feeling of security; this is particularly true of northern areas. I refer, of course, to outside conditions.

It is important to remember, when planting Water-lilies, that a water depth of 12 in. should be considered a safe minimum. Planting in water shallower than this is liable to subject them to damage by frost. The best results are obtained when particular attention is paid to the individual depth requirements of different varieties or species—information which can be obtained from suppliers.

Positioning the Lilies

Lilies like a position where full sunlight is available and, being heavy feeders, require a rich planting medium and plenty of room for root growth. Five parts clean, fibrous loam, two parts leaf mould and one part well-rotted cow dung seems to be ideal as a rooting compost. There is no doubt that Water-lilies establish themselves and develop more quickly when their roots are free to extend in the pond where the base is covered with a good, deep layer of planting medium. Nevertheless, wherever pondkeepers meet, discussion is liable to break out on this subject with arguments for and against the method.

Some are in favour of the control provided by containers either built in to the pond structure or portable, such as baskets, boxes or pots. It is obvious, however, that in the smaller type of garden pond, control is advisable for all plants, including the queenly Water-lily, if each species is to have its fair share of space and nourishment.

In this country the hardy Water-lilies are the best buy for outdoor ponds although it is possible to grow some of the

tropical species in the open during the Summer months. With these latter, however, it is usually advisable and, in certain circumstances absolutely necessary, to lift them in the Autumn and winter them under cover. It is my intention therefore, to confine my remarks to the hardy types.

Most of the hardy Nymphaeas fall within the depth requirement range of from one to three feet of water. For the best results some of the heavy growers demand a depth in excess of three feet but they also require a large area of water surface and are, therefore, not suitable for the average-sized garden pool. For this kind of pool there is a wide variety from which to choose but I can recommend the following types (planting depths are given in brackets):—

PINK: Pink Opal (12 to 14 in.); Rose Arey (24 in.); Somptuosa (18 to 24 in.).

WHITE: Albatross (14 to 18 in.); *N. odorata alba* (18 in.).

RED: Færbeli (18 in.); Gloriosa (18 to 24 in.).

YELLOW: *N. odorata sulphurea* (12 to 18 in.); Indiana (18 to 24 in.).

Adjusting the Water Depth

Loose containers are easily adjusted to the required depth by the use of bricks placed on the bottom of the pond to form a platform on which the container rests at the required depth. With the built-in container, particularly when this is in the form of a trough in the concrete base, the choice of varieties for planting in this position is governed by the fixed depth. Nevertheless the inclusion of troughs, receptacles and deep pockets when constructing the average-sized garden pond is to be strongly recommended, in my opinion, because they provide the best form of all-round control. If a little imagination is used in planning their position, delightful effects can be obtained when suitable plants are set and their foliage is in full display.

Where no trough or receptacle is available and control is desired, the loose container should provide adequate space for root development and, although controlling, must not cramp in any way. A width of 10 to 14 in. and depth of about eight inches will be found suitable for those varieties generally grown in the normal-sized pond.

For good results when growing under these conditions it is necessary to lift the Water-lilies every third year in Spring for division and replanting. Division of the rootstock must be done carefully. It should be cut into sections, each of



Photograph

Leaves and flowers of the Water Hawthorn (Aponogeton distachyum).

[E. E. Dennis]

Pondkeeper's Year

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By J. Stott



Small pond suitable for breeding and rearing Goldfish. Shallows at the rear are planted with the popular Yellow Flag, Iris pseudacorus. Photograph by J. Stott.

QUITE a number of aquatic plants, suitable for the pondkeeper's and water gardener's requirements, provide us with attractive flowers but I feel sure that, by popular opinion, it is the flowers of the Water-lilies which hold the supreme position with their colour, charm and beauty. April is generally accepted as the ideal time for planting and propagating these plants and it is undoubtedly the earliest time of the year when these tasks may be carried out with any feeling of security; this is particularly true of northern areas. I refer, of course, to outside conditions.

It is important to remember, when planting Water-lilies, that a water depth of 12 in. should be considered a safe minimum. Planting in water shallower than this is liable to subject them to damage by frost. The best results are obtained when particular attention is paid to the individual depth requirements of different varieties or species—information which can be obtained from suppliers.

Positioning the Lilies

Lilies like a position where full sunlight is available and, being heavy feeders, require a rich planting medium and plenty of room for root growth. Five parts clean, fibrous loam, two parts leaf mould and one part well-rotted cow dung seems to be ideal as a rooting compost. There is no doubt that Water-lilies establish themselves and develop more quickly when their roots are free to extend in the pond where the base is covered with a good, deep layer of planting medium. Nevertheless, wherever pondkeepers meet, discussion is liable to break out on this subject with arguments for and against the method.

Some are in favour of the control provided by containers either built in to the pond structure or portable, such as baskets, boxes or pots. It is obvious, however, that in the smaller type of garden pond, control is advisable for all plants, including the queenly Water-lily, if each species is to have its fair share of space and nourishment.

In this country the hardy Water-lilies are the best buy for outdoor ponds although it is possible to grow some of the

tropical species in the open during the Summer months. With these latter, however, it is usually advisable and, in certain circumstances absolutely necessary, to lift them in the Autumn and winter them under cover. It is my intention therefore, to confine my remarks to the hardy types.

Most of the hardy Nymphaeas fall within the depth requirement range of from one to three feet of water. For the best results some of the heavy growers demand a depth in excess of three feet but they also require a large area of water surface and are, therefore, not suitable for the average-sized garden pool. For this kind of pool there is a wide variety from which to choose but I can recommend the following types (planting depths are given in brackets):—

PINK: Pink Opal (12 to 14 in.); Rose Arey (24 in.); Somptuosa (18 to 24 in.).

WHITE: Albatross (14 to 18 in.); *N. odorata alba* (18 in.).

RED: Faerbeli (18 in.); Gloriosa (18 to 24 in.).

YELLOW: *N. odorata sulphurea* (12 to 18 in.); Indiana (18 to 24 in.).

Adjusting the Water Depth

Loose containers are easily adjusted to the required depth by the use of bricks placed on the bottom of the pond to form a platform on which the container rests at the required depth. With the built-in container, particularly when this is in the form of a trough in the concrete base, the choice of varieties for planting in this position is governed by the fixed depth. Nevertheless the inclusion of troughs, receptacles and deep pockets when constructing the average-sized garden pond is to be strongly recommended, in my opinion, because they provide the best form of all-round control. If a little imagination is used in planning their position, delightful effects can be obtained when suitable plants are set and their foliage is in full display.

Where no trough or receptacle is available and control is desired, the loose container should provide adequate space for root development and, although controlling, must not cramp in any way. A width of 10 to 14 in. and depth of about eight inches will be found suitable for those varieties generally grown in the normal-sized pond.

For good results when growing under these conditions it is necessary to lift the Water-lilies every third year in Spring for division and replanting. Division of the rootstock must be done carefully. It should be cut into sections, each of



Photograph

Leaves and flowers of the Water Hawthorn (Aponogeton distachyum).

[E. E. Dennis]

This sequence of pictures shows a bloom of a white Water-lily, fully open at midday, but gradually closing and sinking below the water surface as evening approaches. The particular type is the native *Nymphaea Alba*. Photographs by H. Bastin.

which must have a crown. The incision is made between the growth-producing points and root trimming is given when needed. Each section may then be replanted into a separate container using fresh compost.

This operation should be completed as quickly as possible and the replanted sections returned to their natural environment without delay. Keep the crowns just clear of the surface of the compost when planting and pack the compost firmly around the roots. A top dressing of fine gravel or coarse sand, an inch or two in depth, will help to hold down the loam in the containers. When loose containers are used, the potted sections should be thoroughly saturated with water before being placed in the pond. This will help to keep the compost in position as the container is lowered into the pond.

Propagating the Water Hawthorn

Water Hawthorn (*Aponogeton distachyum*) may be propagated by root division about this time of the year and even March is not too early for this plant if weather conditions are reasonable. It is a useful subject with a long flowering period. Water Violet (*Hottonia palustris*), *Pontederia cordata*, the Sagittarias and other water-loving plants of a similar nature can also be propagated by root division at the same time.

Weather conditions being normal, April will see a steady increase in the activity of the fish and, as the water temperature rises and more food is consumed, their condition improves and the desire to breed is stimulated. This is a good time for introducing stock to the new pond and a few words on this subject for the beginner may prove helpful.

Having constructed the pond in the Autumn and cleared the alkalinity during the Winter months we will assume that the pond, suitably planted, is now ready for the fish. In this respect, of course, it is necessary to consider the question of what is the main purpose of the pond and the principle interest of the owner. If the chief interest is centred around the fish the pond may well be an extension to existing facilities and intended to be used essentially as a breeding and/or development area. In such a case, not only the design of the pond will have been preconceived to provide the required features, but the species of fish will doubtless also have been decided upon. If, on the other hand, the interest lies in water gardening as a whole and the fish take their place to complete the scene, the ultimate aim is entirely different and display becomes all important. Those species which, by means of colour and habit, show themselves and can be seen, fulfil the desired requirements.

Hardier Goldfish Types

At the head of the list are the more hardy of the Goldfish varieties such as the Common Goldfish, the Comet, the Shubunkin and the Scaled or Japanese Fantail. These are possessed of all the qualities to make them ideal pond fish even to being ready breeders when provided with healthy conditions. The Golden and Silver Orfe, Golden Rudd, Hi-goi Carp and Golden Tench are species to be recommended in that order of popularity. They are all omnivorous feeders and may be safely put together in a pond. Twelve- to eighteen-month old fish are the best to commence with and will be thoroughly established by the following Winter if introduced to the pond at this time of the year. Remember not to overstock the pool. One piece of advice I should like to give beginners and that is to try and inspect the fish before purchase and, even when they can be inspected, only to obtain them from a reputable dealer or fancier.

Whereas frogs may be of interest to the vivarium enthusiast, they can be a nuisance to the pondkeeper and water



some of whom raise a good percentage of Moors, but I have yet to visit one who deliberately breeds the Fantail variety.

If the badly swallow-tailed Veiltail Moor is to be universally accepted in open shows then let us have classes for Fantailed Moors in addition to Fantail Moors. The former classes would probably not contain good specimens but we should at least know where we stand.

Birmingham, 28

T. L. DODGE,
Show Secretary, M.A.P.S.,
M.A.A.S. Judge

ALBINO CATFISH BRED

Sirs,—It may interest readers to know that I have managed to get a true albino *Corydoras aeneus* female possessing the characteristic pink eyes. It is now eight months old. Apart from appearing to be weak sighted it is quite vigorous. In due course it will be mated back to the father in an endeavour to fix the strain.

Have other readers had similar fish appear amongst their *Corydoras* stock and have they been successful in getting further albino specimens from them?

I regularly breed *C. aeneus* and *C. paleatus* by the hundred. My success with other species of the *Corydoras* Genus has, however, been limited to spawnings from which I have not been able to raise any fry. It would appear that the males are at fault. Can any readers help please?

Forest Gate,
London, E.7.

F. ARNOLD

PLANTS FOR COLDWATER AQUARIA

SIR,—Sometimes when I go to a pet shop for coldwater plants all I can buy are short stems of cultivated *Elodea* or some *Crowfoot* for which I have to pay more than I think they are worth.

Alternatively, if, in season, I care to visit ponds at Speke, half-an-hour's bus ride from the city centre, I can find ponds choked with water plants that no one seems to worry about. These ponds, including some on farmers' fields and railway-side ditches, all have their quota of aquatics waiting to be pulled up.

If farmers could be persuaded to collect *Elodea*, *Crowfoot* and *Starwort*, they could market supplies sufficient for everyone's needs and this should do much to bring the prices down from the present high level.

Aigburth,
Liverpool.

W. ROUGHSEDE

NAMING THE CŒLACANTH

SIR,—Mme. du Breuil of Hong Kong has sent me a copy of the October, 1953, edition of "The Royal Artillery Journal" which contains a most amusing article on the Cœlacanth from Mozambique and Bomba sources. It notes that in 1939 a British Gunners unit in Flanders added a *Latimeria* to its banner! The copy has been forwarded to Miss Courtenay Latimer.

Dr. J. Millot of L'Institut Recherche Scientifique, Tananarive-Tsimbazaza, Madagascar, is publishing a photo-album of the third Cœlacanth that has been caught. In a long letter from Paris, Dr. Millot insists that Professor Smith was wrong about the normal depth at which these fishes live, which he says is

very deep and Dr. Smith says is quite shallow. I think it a matter of relativity since 300-400 feet deep is rather far down to the average person but is very shallow compared with the Great Deep, where I bet these fish do not live.

If Dr. Millot can prove all specimens caught to date are, as he thinks, the same Genus if not the same species, I suggest that the generic name *Latimeria*, given to the first specimen, would have to stand, no matter how many the French catch, but that the specific name *chalumna* might be deemed too restrictive geographically. There has been no reaction to my observation that it might be altered to *smithii*!

Santa Ana,
California, U.S.A.

HENRY A. NICHOLS

(Mr. Nichols, one time member of the editorial staff of Wm. Innes' magazine "The Aquarium", and now living near the west coast of America, is in touch with aquarists all over the world. His references are to the Cœlacanth found in 1938 and named *Latimeria chalumna* after Miss Latimer of the Port Elizabeth Museum; that discovered by Professor J. B. L. Smith in 1952 who announced that he wanted to give the name *Malania anjouana* after Dr. Malan (Prime Minister of South Africa) and the island of Anjouan, and the further specimen to be caught now being examined by French scientists. The acceptable nomenclature may not be finally decided until the difference of opinion as to the identity of the fish between Professor Smith and Dr. Millot has been resolved.—Ed.)

FEEDING BABY SNAKES

SIR,—You replied in a recent issue to an Ilford reader on the hatching of snake eggs. May I add some information to the notes on feeding baby Grass Snakes?

I have found that small Sticklebacks, Minnows, Guppies and tiny Newts are all taken readily in addition to the tadpoles, small frogs and toads mentioned. Some will also accept small strips of raw beef. I offer the Sticklebacks dead and, as a precaution, remove their spines.

The little serpents are said by some to take Earthworms and insects. My own experience has shown that insects are completely ignored and, after a brief inspection with the tongue, Earthworms are rejected.

Unlike the *Natrix* species most of the Genus *Thamnophis* (the Garter Snakes) will accept Earthworms.

Edmonton,
London, N.9

G. J. DAYNES

(Mr. Daynes' letter was shown to Mr. A. Leutscher, B.Sc., who writes: "This is one of the few examples of successful feeding of baby Grass Snakes I have heard about. Your correspondent is to be congratulated. I have seldom had such luck, whereas the American Garter Snakes never seem to give any trouble."—Ed.)

PROMPT SERVICE FROM NEW YORK

SIR,—In your December 1953 issue, page 340, you publish a report from Mr. R. W. Andrews in connection with the Aquarists' Internationale. It brings the following story to mind.

One day last summer I dropped in to visit Dr. Myron Gordon at his laboratory at the Museum of Natural History, New York. We were discussing fishes and things in general when the telephone rang. It was the Cunard Steamship Company. They wanted to know if Dr. Gordon had any "Killies" (*Fundulus heteroclitus*) for Professor A. V. Hill of London University. He told them that there were many of this species of fish in this area but he had none on hand at the present time.

I overheard his conversation and volunteered to catch some for them if they would send a man along to help me. It turned out that three of the ship's officers came along and we headed out of New York City for Long Island. The "killie" (as it is affectionately called here in New York) is used primarily as a bait fish for crabs and fishermen. I have never seen it in an aquarium in this country.

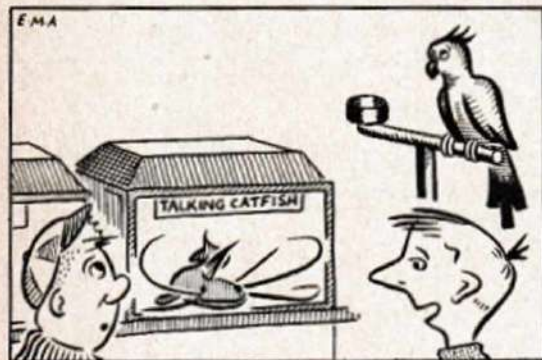
We drove out to a likely spot, took out our 100 foot seine net and in the first few hauls had hundreds of *Fundulus heteroclitus*, *Fundulus diaphanus*, *Cyprinodon variegatus*, toad fish, eels, crabs, some varied silversides, baby flounders and a few other odds and ends. Also included in the catch were some 10-spined Sticklebacks, *Pygosteus pungitius*. We selected only the finest specimens of fishes (we traded the soft-shelled crabs to a housewife for some tea and sandwiches), and returned to New York. I then had the boys set up a glass jar (about 10 gallon capacity) and the fish were ready for the trip to England.

This adventure got the ship's officers so excited about fishes that on their return trip there were four aquaria aboard. I managed to get them filled with other native American fishes including Black Mollies, *Jordanella floridae*, etc. They advised me later that most of the fishes arrived alive and were delivered to Professor Hill. I wonder now if these are the fishes mentioned by Bob Andrews?

New York, U.S.A.

HERBERT R. AXELROD

(Yes, Mr. Andrews confirms that they are the same fish.—Ed.)



"IT DOESN'T REALLY TALK—THE PARROT'S A VENTRILOQUIST!"

New Rendezvous for Aquarists

SINCE it opened a short while ago, the South Bank Aquarium has already become widely known as a new centre of attraction in London, both for lay visitors and for the experienced fishkeeper. The site is adjacent to the Festival Hall and is, in fact, one of the spacious covered areas under the approaches to Waterloo Bridge. A modern but unpretentious entrance belies the excellence of the interior layout, where large and small tanks are seen to advantage, recessed behind facias that surround a number of bays.

When inside, the visitor is struck by the space left between the entrance and the aquariums and cannot but be impressed by the pleasing initial effect, the good lighting arrangements and the adequate room between each tank, permitting the leisurely inspection of a remarkably comprehensive collection of tropical fishes. The open space in front of the tanks leads to a dais from where one successful public lecture on fishes has already been given, by Miss A. Moon, B.Sc. Other talks and demonstrations are planned for the future and it is also intended to use the space from time to time for special displays of topical interest. Flanking the dais, next to which is a refreshment buffet, are outline drawings of the standards based on those issued by the



Photographs]

[L. E. Perkins

A general view of the thoughtfully laid out and well-appointed Aquarium.

Behind the scenes are large areas where the necessary maintenance can be carried out easily and quickly and there are also banks of tanks, unseen by the visitors, in which it is hoped to breed large numbers of fishes, including species not before reproduced in this country. The one thing that impresses you during a visit is the care taken to set up the tanks in which shoals of fishes swim about. Some of the larger tanks, deliberately only half-filled with water, hold not only a complement of fishes, with accompanying submerged plants, but, in addition to well-chosen rockwork, large specimens of moisture-loving flora which flourish above the water-line.



Left: The quaint Wasp Goby.



Left: One of the larger loaches, *Botia botia*, a species which has attractive markings.



Hemiodus semitaeniatus, a slim Characin.

Federation of British Aquatic Societies.

The Aquarium was conceived and planned by South Coast Aquatics Ltd. who have opened a new retail branch in the nearby Tenison Way, and a member of the firm, Mr. Eric A. Bowler, has been appointed manager, a position he fills with efficiency and enthusiasm. He has a wide knowledge of the fishes for which the Aquarium caters, much of which has been gained by making trips abroad to collect specimens. The photographs on this page, taken by Mr. L. E. Perkins, give some idea of the extent of the collection which aims at showing in sequence different Genera from all parts of the world, with the prime emphasis on exotic freshwater species. There are hopes of extending the display of marine types and room is already provided for a selection of Goldfish and other coldwater fishes.

The Aquarium is a decided asset to the hobby, a place of interest for all visitors to London and a centre with great possibilities. Clubs would not find it a waste of time to organise visits to this new rendezvous.



Left: The popular Lemon Tetra, *Hyphessobrycon pulchripinnis*.



Left: One of the Colossooma species, which generally tend to be truculent. Below: The so-called Combtail, *Belontia signata*.



Raperomizus striata, one of the larger Characins.



Left: A mouthbreeding Cichlid, *Tilapia mossambica*, which grows up to 4 in. long.

Aquatic Press Topics

Reaction of Guppies to Insect Foods

LOWLY but lively *Lebistes reticulatus* seems to be getting appreciable attention from scientific workers and for the second time in half a year it was the subject of a paper in NATURE (G.B.). Observations this time come from J. J. Duyvener de Wit and Anna J. M. Verster of the University of the Orange Free State. After keeping the species in aquariums for two years the following three observations were made.

1. During the Guppies' sojourn for two years in aquaria they received meat and commercial fish food only. Then a freshly-killed domestic fly was introduced and in a short time the Guppies became very excited and tried to pull the fly below the water surface and eat it. Nothing unusual in that, I'll own, but next day another fly, this time covered with shellac, was put in and the reaction of the fish was very weak. A few days later some droplets of a colourless extract from about a hundred flies were introduced to the aquarium water and an intense reaction of the fish was noticed. So much, it seems, for the aquarists' idea that a fish gloats over a titbit of food for, in this instance at any rate, the observers suggest it is probable that a water-soluble substance dissolves from the fly into the water and is responsible for the fishes' reaction. Extracts from some other insects and larvae gave only a slight or negative reaction so the workers believe that the factor responsible for the excitement is specific to the particular insect. In the instance cited a water-soluble substance might have been responsible for the Guppies' excitement but it certainly does not apply to some game fish where there is an immediate reaction to the angler's artificial fly whether it is taken beneath the water or on the surface.

2. The second, less-happy, experience is one which the aquarist will well appreciate. The tank had become overstocked and *Saprolegnia* (Fungus) reared its ugly head. In three days 70 per cent of the fish were dead. The fish remaining were 86 sexually mature females and seven sexually mature males. Within twenty days of the infection 41 of the females were changing into males, the gonopodia and male colouring having almost fully developed in that time. It is significant that only the medium-sized (23-30 mm. long) females showed the change. The small (19-22 mm.) and large (31-34 mm.) females were not affected. The University workers suggest that the sudden change in sex was possibly due to toxins excreted by the Fungus. Is the sex reversion a particular reaction to the *Saprolegnia* toxins, they ask, or might it also occur after poisoning by other toxic agents? In conclusion they say that fish of the same strain in other aquaria also showed sex reversion but to a considerably less extent.

3. Finally the Orange Free State scientists found that their strain of Guppies repeatedly produced fish which had black pigmentation and that these fish swam with their bodies at an angle of 30 deg. from horizontal, the head being higher. The tail movement was rapid and, in fact, the fish usually remained just above the bottom of the aquarium or resting on it.

All fish of this type had failed to reach maturity up to the time of writing. The workers suggest that the fish are probably mutants in which the black pigment is intensified, together with an air bladder defect. Sometimes these fish also have a slight break in the vertebral column causing the head to be inclined slightly upwards.

ENVY the Indian fishkeeper who lives near the sea—Dr. Mrs. R. M. Captain, for instance. She collects a few Scats (*Scatophagus argus*) now and again to replenish her aquariums. Such a common fish in her locality might be pushed in the background but not by Dr. Captain—



Photograph [Associated Press] *Shoal of Scatophagus argus, a species found naturally in brackish or salt water.*

she says it is her favourite. For British aquarists, who have to buy Scats at prices ranging around £1 apiece, Dr. Captain's experiences with the species should prove of interest. When caught the fish are placed in very shallow fresh water which has been exposed to the sun for a few days to encourage a good growth of algae on the rocks and sides of the tank. The only salt water which finds its way in at this

For Your Bookshelf

Pondkeeper's Hints*

A FIRST glance at the outside of Mrs. Cecil G. Trew's book, "A Pond in Your Garden", gives the impression that it is a trifle expensive. There are but 64 pages of text and the type is large. A closer look shows coloured plates, beautifully executed by the author, in which a variety of plants (marsh, floating and submerged) and fish are depicted. These by themselves are of considerable value. On reading this book one's initial reaction is further modified for Mrs. Trew is obviously out to list all the practical experience she possesses. And she does it well with many useful tips put down for what we think is the first time. It is easy to imagine the author coming upon a snag and not being content until she has solved it to her own satisfaction.

This is an ideal book for the person building his first pond, an individual who

stage is that actually in the container where the fish are placed after being caught. Periodically during their life the Scats are gradually reacquainted to salt water and, after being in it for a few days, they are progressively brought back to fresh—or almost fresh—water. "This", says Dr. Captain, "keeps them fit", and she should know, having kept the same specimens for almost four years. A few Guppies in the tank initially help to overcome the species' inherent shyness and it is not long before the Scats are nibbling at the algae-covered rocks or coming up to investigate the latest introduction of food. The tank is gradually filled up with fresh matured water after introduction of the fish. Scats are largely vegetarian by inclination and can become a nuisance with their plant eating. However, Dr. Captain has largely satisfied their love of "veg." by dropping a handful of Duckweed in each day. Nevertheless they still show more than a passing interest in *Nitella* and *Hydrilla*, so both are best excluded. Whilst vegetation is a prime interest other foods must be offered. Dr. Captain has found that scraped raw beef, dried prawns, Earthworms and *Tubifex* are taken eagerly. Some of her Scats have grown to 6 in. and are so tame that they swim into her hand. There was one exciting moment when a pair became exceptionally boisterous, even when they were put either side of a glass partition. For fear of serious damage to the fish they were removed out of sight of each other. That was the nearest they came to breeding activity.

This information—and a number of other useful articles by Dr. C. W. Coates, Dr. Myron Gordon, Messrs. A. H. Marsack, M.B.E., G. Wolfshimer, R. W. Andrews, V. L. Navalker and H. A. Nichols, together with five pages of pictures of the last Fish Fantasy Exhibition, grace the printed August-September issue of THE INDIAN AQUARIST. It marks a new era in the Aquarist Society of India, which body is responsible for this publication, Editor-cum-secretary, M. Manal, and all others who work behind the scenes, deserve congratulations for a courageous step forward from cyclostyled sheets to this pocket-sized copiously-illustrated bulletin. Further editions have come to hand and they maintain the high standard set in this first number.

has no previous fishkeeping experience. The varying colouring and shape of the Shubunkin and Fantail, the Common Goldfish and the Comet, the Golden Rudd and Golden Tench are known to the aquarist of any standing but to the novice they are not. For the latter this book will prove invaluable. The experienced fishkeeper will discern some errors such as the transposing of the caption to a picture where *Lagarosiphon major* and *Sagittaria* are shown, the spelling in two places of *Tubifex* is given as *tubefix*, and the point that they can be bred in jars is made—surely something of an achievement. These and the few other ambiguities and mis-spellings can be rectified in a future edition, however, and they are not of sufficient import to mar a practical little manual delightfully illustrated with colour, wash and line drawings.

*"A Pond in Your Garden," by Mrs. Cecil G. Trew, 64 pp., plus 6 whole-page coloured plates, 4 whole-page wash drawings and eight line drawings. Price 10/6 net. Published by Seeley Service & Co., Ltd.

PROBLEMS ANSWERED

Queries are answered free of charge by a panel of experts. They should be sent to "Water Life," Dorset House, Stamford Street, London, S.E.1, together with a stamped, addressed envelope for the reply. All queries are answered direct but a small selection of general interest is published below.

Spotted Salamanders

I am interested in Salamanders and should like to have some details concerning their requirements and especially their breeding.—(W.K., Padham, Nr. Burnley, Lancs.)

By Salamander we expect you mean the black and yellow species from Europe, sometimes called the Spotted or Fire Salamander. This is a very hardy little animal and gives little trouble. It will live for many years in the vivarium (up to 25 years has been recorded) and often breeds. The female enters shallow water and produces living gilled young, which then grow up like water newts. Further information will be found in WATER LIFE booklet, "Hardy Reptiles and Amphibians", priced 1/6d. (1/8d., post paid).

Heating an Aquarium

I have an aquarium measuring 30 x 10 x 15 in. in which I wish to keep tropical fish. Can you give me guidance on what power of heater I should introduce?—(S.C.D. Davies, Cardiff)

The size of heater required to maintain your tank at a steady temperature is dependent upon the heat lost from the tank. This in turn is dependent upon the room temperature and will vary, of course, with the time of year, position of room and general heating arrangements. Any power heater above a certain size will do provided

The European, Spotted or Fire Salamander (*Salamandra atra*) a species which takes well to vivarium life. When given good conditions it will live many years.

Photograph] [WATER LIFE



of degrees below the tank temperature before the temperature of the tank began to fall, i.e., should the room temperature fall to 50 deg.F. the tank temperature would drop to 64 deg.F. with a 60 watt heater in use.

Leeri Gouramies

Can you furnish me with some information on the requirements and breeding habits of Leeri Gouramies (*Trichogaster leeri*)?—(J.L.M. Judge, Folkestone, Kent)

Trichogaster leeri is one of the Labyrinth fish which build bubble-nests. They have no special requirements and live quite happily in a community tank with fish of their own size. They are somewhat difficult to induce to spawn but it can be done. Condition the fish well on a diet which includes plenty of livefood. When in condition, place the fish in the breeding tank and separate with a glass partition. The male should start to construct a nest of bubbles. After this is complete, gently

free-swimming the male should be removed, although these fish are not usually inclined to eat their young. The breeding temperature can range from 85-88 deg.F. Raising the fry can be difficult since they require large quantities of the right kind of food. Plenty of Infusoria should be provided, followed by Brine Shrimps or sifted *Daphnia*. Some very fine dried food can be given at an early stage. The surface of the water should be kept very clean and free from scum or film, particularly when the labyrinth is developing which can be any time from two to six weeks. An old, well-established breeding tank is best for the breeding attempt.

Cracked Concrete

There has been a very small leak in my garden pond for some time but recently it has become very much more severe. I suppose that I shall have to empty the pond to effect a repair? What material should I use for filling in the crack?—(Miss M. J., Three Bridges, Sussex)

As the crack in your pond seems serious it will require making up. You will have to empty the pool and trace the crack. Once this is done, mix up a three parts of sharp sand to one part of cement and proceed to build up a thickened rib along the course of the crack. Overlap the crack about 3 in. either side and have a thickness of 3 in. Make sure the concrete is thoroughly dry and hardened before you fill with water again.

Pond Maturity

Last May we had a large round pond built. It has a diameter of 35 ft. and its depth varies between 1½-3 ft. All submerged plants set so far have been uprooted by the Goldfish but such plants as Water-lilies and irises have done extremely well. The water has not yet cleared. How many snails should be included?—(M.S., Lincoln)

Large concrete pools are generally difficult to stabilise after building, due to the large volume of concrete involved which requires neutralising before the water takes on that desirable limpid appearance. Further, large areas of relatively shallow water, receiving so much light in relation to the volume, tend to be very sensitive. You must therefore be patient for a few months yet and not be in too much of a hurry for the water to "mature". At least a half of the pond area should be covered with plant growth. Since Water-lilies with their broad leaves perform this function admirably, it is suggested that eight lilies would be required for the



Photograph]

[G. J. M. Timmerman
Pair of mature Leeri Gouramies (*Trichogaster leeri*). Male fish is to the left.

it is thermostatically controlled. However, should the heater be a powerful one and the thermostat stick in the "on" position the water would become too hot. The following list gives the approximate number of degrees above room temperature to which various heaters would raise the temperature of water in your tank in such an event:— 50 watts—12 deg.F.; 60 watts—14 deg.F.; 75 watts—18 deg.F.; 100 watts—24 deg. F. Alternatively, the room temperature could fall the stated number

remove the partition when the male should drive the female under the nest and wrap himself around her. At this moment a few eggs will be expelled and fertilised. These will be placed in the nest and the process repeated until spawning is completed. The male does not usually drive the female away very vigorously as is the case with most Labyrinths; nevertheless, she is better removed after spawning. The male will look after the eggs which hatch in under 24 hours. As soon as the fry are

pond. Between the lily plants bunches of *Elodea crispata* can be placed, say six cuttings to the bunch and 25 bunches in all. Do not cover the bottom of the pool with earth except around the roots of the lilies. The *Elodea* will not require a planting medium and the ends can be kept down with lead clips. These planting operations should be done in early April. Ten snails are ample for your pool; any more will only foul the water.

White Clouds

Can you give me a method of breeding White Cloud Mountain Minnows, please?—(W.P.T., Bedford).

White Cloud Mountain Minnows are quite easy to breed. A method often adopted is to place a number of adults of both sexes in a tank with some thickets of plants and some floating plants such as Floating Fern. If the adults are in good condition and well fed, it will not be long before some small fry will be seen swimming near the surface of the water. These can be carefully removed to another tank to be grown on. Further fry can be removed at intervals of a few days for quite long periods provided the breeders are kept in good condition. If the adults are well fed they may eat a few fry but large numbers will be saved. The fry are not difficult to raise in the usual way employed for egg-layers.

Puffers

I have obtained a Puffer Fish but am not sure of the exact species. Could I have some information on its care and whether such fish have been bred in aquaria? Will this fish blow itself up—it has not done so yet?—(C.W., Doncaster).

There are a number of species of Puffer Fishes; yours is probably *Tetraodon fluviatilis*, but we cannot be sure. This particular species lives in fresh or brackish water. In its natural state it is a scavenger and in captivity it is said to eat anything. With ordinary care it will live quite well in an aquarium but it has never been bred. It can blow itself up with either air or water. Sometimes the fish will do this when removed from the water, placed in the hand and gently tickled. They will hold the blown-out position for about half-a-minute when inflated with air and for much longer when inflated with water. They only blow themselves up when frightened.

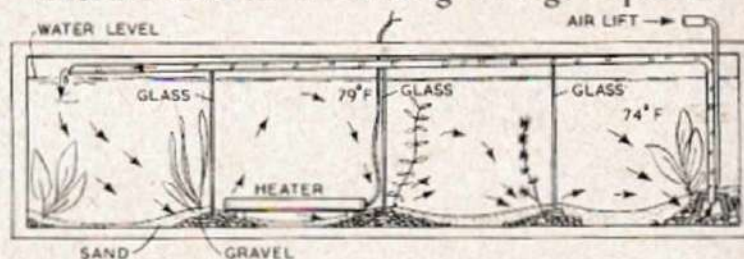


Photograph [New York Aquarium] *Tetraodon fluviatilis*, the Puffer species most frequently imported into this country. It is capable of inflating itself to a considerable extent as a protective measure.

From Continental Journals

By H. O. Munro

Effective Method of Dividing a Large Aquarium



A SIMPLE arrangement for dividing a large tank is shown and described by Mr. Oscar Bölt in an issue of *DIE AQUARIEN- UND TERRARIEN ZEITSCHRIFT (DATZ)*. The tank, in this case 5 ft. long, is partitioned into four compartments by three perfectly fitting glass panels which, however, leave a clearance of 2 in. at the bottom. This gap is filled with gravel and then covered over with sand which is slightly piled either side of each partition. In the fourth compartment a small air-lift is buried in the gravel and the outlet pipe from the air-lift leads right over the two middle compartments into the first one at the other end. The water will now flow back through the gravel underneath the partitions. In the second compartment there is a heater and the flowing water is warmed and heats all four compartments. The temperature in the four compartments differs quite considerably, the warmest, i.e. No. 2 (which contains the heater), being an average of 79 deg. F., the coolest, that which contains the air-lift, approximately 74 deg. F., with the temperatures in the other compartments ranging between these two.

Proven Success

The author who installed this partitioned tank over two years ago claims that it is a great success and that he had no cause yet to wash or change the gravel underneath the partitions. He just draws off the sediment in the usual manner, thus keeping the sand around the partitions loose. Close fitting partitions are essential as only then is the water forced to circulate actually underneath them. As it might be difficult to get really close-fitting partitions cut I suggest the fitting of split rubber tubing over at least one edge of the partition panels which will give a really good joint. Otherwise the installation seems to have much to recommend for its simplicity and cheapness. It enables an aquarist to maintain fish, not normally kept together, in one show tank.

NEW suggestions for livefood are always welcome to the aquarist, especially for the difficult Winter months. A letter in the February issue of *DATZ* suggests that pickling (i.e., conservation in salt) is a very good method for *Daphnia* and other livefood. It preserves their nutritional values and makes them available when livefoods generally are difficult to come by.

This preserving process seems to be a quite common practice in Holland and the method described is as follows:—Put a layer of cooking salt, say 1 in., into a preserving jar, then add a layer of

drained but live *Daphnia*, another layer of salt, and continue the addition of alternate layers of *Daphnia* and salt until the jar is filled. Top up with salt and screw down. To feed the preserved food, put a spoonful into a net and rinse well. No more than immediate requirements should be fed to the fish as any remnants might easily foul the water. The author, Dr. E. Meder, also used this method quite successfully for *Tubifex* though the preparation here is more cumbersome and, as *Tubifex* are available practically all the year round in our climate, it was of rather theoretical interest and not generally worth considering in Gt. Britain.

WATER ANALYSIS

Samples should be sent in a clean pint bottle, well packed, to Water Life Analyst, 12, Featherbed Lane, Addington, Surrey, together with a fee of 5s. per sample. The name and address of the sender and details of prevailing conditions should accompany each sample which is submitted.

Sample received from D.H., Leicester. Taken from a 36x15x15 in. aquarium which had been set up about six months. In the few days prior to the sample being sent most of the fish had died although the water appeared very clear and the plants were in excellent condition. The fish seemed to be gasping. A filter had been used occasionally and aeration was supplied at all times. The only chemical introduction had been a very weak solution of methylene blue.

Test for impurities:— Appearance: slightly turbid. Odour: none. Total mineral content: 0.0520 per cent, satisfactory. Organic matter: 0.0090 per cent, high. Nitrogen compounds: 0.000224 per cent, very high—pollution indicated. Ammonium compounds: 0.000224 per cent, very high—pollution indicated. Poisonous metals: none detected. pH: 6.0, too low. Chlorine, as salt: 0.0119 per cent, satisfactory.

Suggested corrections:— The results obtained from the chemical analysis of this tank water reveal that it is grossly polluted by organic matter of both animal and vegetable origin. The acidic pH value obtained rather suggests that the organic matter is not being properly oxidised, and that secondary decomposition is taking place with the production of toxic substances. Thoroughly clean the tank and wash the gravel in boiling water. Refill the tank with tap water and introduce into the gravel some small pieces of rock chalk. Feed fish with minced Earthworm and/or very sparingly with a reliable brand of dried food.

In and Around the Aquaria World

— By W. J. Page —

WHAT is described as "the finest public aquarium in the Southern Hemisphere" is planned for Durban, South Africa. The site chosen is between West Street and Wanne Parade. All that is wanted now before a start is made is, apparently, Government approval of loans from local authorities to finance the project. A correspondent tells me it will feature extensive displays of home aquaria and that there will be incorporated a modern research station for the study and conservation of fresh and salt water animals in and along the coasts of Natal and Zululand. Backing the scheme is the South Africa Association for Marine Biological Research, the President of which is Mr. G. G. Campbell of Pietermaritzburg, Natal.

THE development of the transit of tropical fish by air has been remarkable and rapid over the past few years. From the Far East consignments come regularly to London Airport and, when the home market is satisfied, large quantities are dispatched to the United States, the Continent and elsewhere.

A sign of the times is B.O.A.C. "Air Freight General Information" pamphlet which states that carriage of livestock on Comet aircraft is restricted to tropical fish and day-old chicks (at normal rates). Tropical fish take their place with other livestock, again at normal rates, on Servicrossers and Yorks. On other aircraft in the B.O.A.C. services normal rates are reserved for tropicals and chicks, other livestock coming within the "under 45 kilograms rate" plus 50% surcharge.

What with travel by Comet, accommodation in practically transparent, semi-rigid plastics containers and speedy servicing at Heathrow, many new species as well as further supplies of old favourites have been reaching not only British tropical fishkeepers but aquarists in many other countries.

ON pages 70-72 there is an account by John Edwards—F.B.A.S. Councillor, past supporter of A.S.L.A.S., and co-founder of the Lebies Study Group—of his new fishroom. I referred in the last issue to the car accident in which he was involved. He has made a good recovery and is now back at work. Trouble never comes singly. Whilst he was in hospital, his daughter was taken ill and rushed off for an emergency operation for appendicitis. Again a complete recovery is recorded. Since then Mrs. Edwards has been ill but is now able to get back to her normal routine.

The accompanying picture shows Mrs. Edwards discussing with her husband a point of interest in WATER LIFE. Herself a keen fishkeeper, she does much to encourage Mr. Edwards in his many voluntary activities for the hobby but with a house and family (there is a young son who so far has not been on the sick list) to look after, which two full-time jobs she does very well, opportunities to relax like this are not very frequent. In reproducing the photograph, I pay tribute to



Photograph]

[WATER LIFE

Mr. and Mrs. J. E. Edwards in a corner of the well appointed fishroom situated in the cellar of their home at Surbiton, Surrey.

one of the many wives of aquarists who all over the country make it possible for their menfolk to participate actively in our hobby.

ONE of the old school of professional naturalists who imported fish, reptiles and amphibians and other livestock to this country for many years, Mr. L. Cura, died recently. Those who have been in the hobby for a long time will recall that he carried on business up to the war years in Clerkenwell where the establishment was first opened by his father in 1859. This family concern moved out to Water End, near Hemel Hempstead in 1939 where fish were bred and plants cultivated on a big



A characteristic picture of the late Mr. L. Cura of Water End Hatcheries, Herts.

scale for the wholesale and retail trades. Mr. Cura's nephews, Messrs. N. Ermini and C. Campomino, who have gained considerable experience in the trade, are continuing the business under the familiar name of L. Cura and Sons.

THE Lord Chief Justice, Lord Goddard, with Mr. Justice Byrne and Mr. Justice Parker concurring, dismissed an appeal in the Queen's Bench Divisional Court, against the decision of the Becontree magistrates that for a rag-and-bone dealer to give a boy under 14 a Goldfish in exchange for rags was not illegal. The

1936 Public Health Act forbids handing over "Any article whatsoever" to under-fourteens in return for rags. Lord Goddard said that if the Statute had said "article or thing" there would be no doubt that a Goldfish is a "thing".

I have received a letter from the Oxford A.S. secretary, Mr. V. H. Lewin, who expresses the hope that the practice will be made illegal and that steps will be taken to prohibit giving away Goldfish as prizes at fairs. Maybe, others think along the same lines.

During the above mentioned appeal, one of the counsel referred to diseases of fishes, whereupon Lord Goddard inferred that if such diseases were transmittable to humans, steps could be taken to set up precautionary restrictions. The danger here, particularly as the Lord Chief Justice referred in passing to humans and parrot disease, is that sickness amongst fish could be thought to be a menace to humans and someone might advocate irksome limitations to be imposed on fishkeepers.

So far as I am aware, none of the diseases encountered in our aquarium fishes has been found to be responsible for illnesses among aquarists and it would seem that fish ailments are not contagious so far as humans are concerned.

A BRIEF report appeared in the last issue, of the Aquatic Traders' Association's fourth annual dinner. I can confirm that it was a well-run and enjoyable affair with everything laid on, including a professional red-coated toastmaster. Mr. and Mrs. T. Horemans received the guests, and Tom, replying to a very brief toast to "The Chairman", gave in his sincere manner a warm welcome to the guests. The formal toast to the visitors was made in breezy style by Capt. L. C. Betts and was replied to by the guest of honour, Mr. George Cansdale, B.A., B.Sc., F.L.S., who gave us some inside stories of his experiences on the B.B.C. Television Service.

My colleague, Mr. Chas. W. Brown, proposed the A.T.A. in what was his maiden public speech. He acquitted himself well, suggesting humorously that he felt like an *Acanthodoras*, the so-called Talking Catfish which produces noises when out of water. If he felt at all nervous,

C.W.B. did not show it and certainly did not seem to be like "a fish out of water". The response was by Mr. F. Jordan (Aquafern).

The organisers selected three talented artistes to appear—Harry Riley, R.I., an entertaining cartoonist whose 30-second crayon impression of Mr. Cansdale was excellent, Sybil Summers, a singer and saxophonist, and Kim Chino. The last mentioned, vivacious, clever, and scantily attired, danced and did intricate acrobatics. As she swayed this way and that, the menfolk looked and looked again. Who said that we were short of Bubble-eyes in this country? By the way, the menu cards each bore the A.T.A. Gold Seal. Did the advisory panel, I wonder, eat three sample meals based on the printed menu before giving their approval to the fare?

SINCE 1946, when WATER LIFE first reappeared after the war years, the number of societies has grown enormously and, in proportion, so has the number of shows. These shows in themselves have, in many instances, developed from small table events to full open exhibitions. With the limited space available, reporting these events in detail has become increasingly embarrassing. Rather than encroach still further on the space devoted to articles and other features of interest to all readers, it will be necessary to limit reports of all but the big national events to brief summaries, with suitable notes on outstanding exhibits or on any placings that excite comment. This decision will not, of course, affect the policy of publishing brief items of news. Club secretaries are invited to continue to send reports of their club activities.

ON holiday with his wife from New York, Mr. Walter Klein, President of the Bronx Aquarium Society, paid a surprise visit to this office last month. I gather that his society, which is shortly holding a local show, is in a very strong position. Mr. Klein referred during his visit to the proposed new public aquarium for New York, plans for which are still going ahead. Mr. C. W. Coates, Curator of the existing Aquarium of the New York Zoological Society, is one of the foremost exponents of the scheme, which was first mooted some time ago and to which reference was made in our October 1947 issue.

It was possible to take Mr. Klein along to the new South Bank Aquarium, the layout and contents of which impressed him considerably. He was engaged in an interesting conversation with the Curator, Mr. Eric Bowler, when I had to leave for another engagement. During his short stay in London, Mr. Klein visited a number of dealers' establishments and contacted individual aquarists. He left a day or so later for France where he hoped to meet French fishkeepers, particularly those living in and around Paris.

CHINGFORD A.A.S. had a gala night in March when Mr. George Cansdale gave a talk on reptiles and showed slides in black-and-white and colour from pictures taken during his trips abroad, including one to the Gold Coast. The popularity of their guest brought a number of visitors including Mr. Russell Holland and Mr. C. R. Looker. Mr. T. E. Butt, chairman of the Federation of British



Mr. George Cansdale greeted at Chingford by Mr. R. O. B. List, F.B.A.S. secretary.

Aquatic Societies, and himself an honorary member of Chingford, presented to Mr. Cansdale a badge which made him an honorary member also.

The photograph shows Mr. R. O. B. List, secretary of the F.B.A.S. making a second presentation to the guest of the evening, this time a Federation lecturer's badge, Mr. Cansdale having agreed to the invitation to have his name added to the panel of approved speakers.

Mr. R. W. S. Macfadzean, Chingford's secretary, tells me that there is the possibility of a "knock-out" series of shows being arranged for clubs in Essex and East London. Such interclub events do a lot of good and could well form a leading part of the programme of area organisations as and when they come into being.

IT is, by now, common knowledge in the North that there will be no British Aquarists' Festival at Belle Vue, Manchester, this year. The B.A.F. events held on previous occasions have only been made possible by a combination of the facilities offered by Belle Vue authorities; outside financial assistance; and the hard work put in by officials and some of the members of the Federation of Northern Aquarium Societies. There was a financial loss on the last event and now there is a falling off of membership in affiliated societies. The F.N.A.S. have this year, I gather, been forced to face the fact that there might be less help coming from non-Federation sources and that their own guarantee fund lacked the necessary support resulting in the decision not to hold another open event. They are doing the next best thing by staging a small inter-society Show at their October 3 Assembly.

HATS off to the ladies! A pardonable exclamation, I think, on looking back at the 1954 National Exhibition of Cage Birds and Aquaria. I know from experience

over several years past how useful they can be in the aquaria section and at the last show once again a team of them worked well together, so contributing to its success. Prominent amongst the ladies who were able to escape temporarily from their domestic chores were the three whose photographs appear on this page. Mrs. N. Russell is an active member of Tottenham A.S., and is well known in North London aquarist circles; Mrs. W. M. Meadows, who again acted as chief steward, is the Enterprise A.S. show secretary and an F.B.A.S. lecturer and judge; Mrs. R. H. Wood, another F.B.A.S. supporter, is vice-president of Enterprise A.S. They seemed to enjoy once again the change of surroundings and worked extremely hard for the show. What is more, they were ever ready to give a smile when asked to do a job, big or small.

MR. L. A. WHITE, who is secretary of the 'National Aquarists' Society, has recently assumed the secretaryship of the committee which controls the Pengilly Memorial Trophy competition. The committee, consisting of representatives of clubs who contributed to the cost, aims at spreading the competition over as many shows as possible. It is rumoured that this year it may be competed for at the annual show of the Federation of Guppy Breeders' Societies.



Pengilly Trophy

THOSE who favour one or other of the livebearer fishes or dabble in keeping most of them have much in common in their experiences. The out-and-out specialists have their organisations for exchanging views on Guppy and Platy culture but is there not room for a Livebearer Breeders' Club? I think there would be wide support for it, if someone with initiative drew up a programme and convened a meeting. Who would like to make the first move?

THE entrance to St. Ermin's Hotel, Westminster, has long been noted for its floral decoration. Passing by the other day, I saw that the flowers have been replaced by two aquariums, each between 8 and 9 ft. long. The decorative effect that has been created can be seen by passers-by and by hotel residents who use the luxurious ground floor lounge.



Left to right: Mrs. N. Russell, Mrs. W. M. Meadows and Mrs. R. H. Wood, three of the ladies who gave their services at the 1954 National Exhibition of Cage Birds and Aquaria.

Echoes from Olympia

Judging Competition Results

SUPPLEMENTING the report in our last issue of WATER LIFE Show, the accompanying table gives points in the furnished aquaria classes.

An innovation was the interclub class for livebearer pairs in connection with which a judging competition was held. The fact that none of the entrants returned an entry approximating to the judges' selection gives rise to some conjecture.

The judges gave the following points:— 1st No. 8 (Red-eyed Red Swordtails) 83½ pts; 2nd No. 4 (Black Mollies) 76; 3rd No. 11 (*Platypterus variatus*), 74; 4th No. 6 (*Platypterus variatus*) 73½; 5th No. 3 (Speckled Mollies), 71½; 6th No. 5 (*Molliesia latipinna*), 70; 7th Tie between No. 9 (Red Swordtails) and No. 10 (Black Mollies), 69½ pts. These were followed by No. 7 (Moon Platies) with 68½ pts. and No. 1 (Saffin Mollies) with 59 pts.

The following analysis of the competitors' returns shows how their opinions differed from those of the judges.

1st award:—The majority favoured No. 7, with an average pointing of 80.06, which entry was placed ninth by the judges. The four competitors who agreed with the judge gave an average pointing of 77.87 to No. 8. Competition winner's return:—No. 8, 75 pts.

2nd award:—The popular vote went to No. 5, with an average pointing of 75, which entry was placed sixth by the judges. The one vote recorded for No. 4, the judge's choice, gained 76 pts. Competition winner's return:—No. 5, 72½ pts.

3rd award:—The competitors' preference was No. 8, with an average pointing of 68.165, the entry placed first by the judges. Four agreed with the official placing of No. 11 and gave an average pointing of 76.5. Competition winner's return:—No. 11, 70 pts.

4th award:—Here the competitors were divided in their opinions, the greatest number of votes going equally to Nos. 7 and 11. Exhibit No. 7, which gained an average of 71.625 points, was, it will be recalled, regarded by some competitors as worthy of 1st place but was out of the first seven awards in the judges' returns. No. 11, placed 3rd by the judges, here gained an average vote of 69.625 pts. Two agreed with the judges' selection of No. 6 and gave an average pointing of 60.5 pts. Competition winner's return:—No. 7 with 68 pts.

5th award:—Most votes went to No. 1, with an average pointing of 82, which entry was placed last by the judges. One entrant agreed with the official placing of No. 3 as 5th; it was the competition winner who recorded 66 pts.

6th award:—The competitors strongly favoured No. 11, which was placed 3rd by the judges and was considered worthy of fourth place by some competition entrants, with an average of 68.5 pts. Three votes for No. 5, the exhibit chosen by the judges, gave an average pointing of 64.83. Competition winner's return:—No. 4 with 65 pts.

7th award:—A tie occurred here between No. 4, placed 2nd by the judges and No. 6, placed 4th by the judges. No. 4 gets an average 68.75 pts. and No. 6, 63. The judges thought Nos. 9 and 10 made a worthy tie for 7th place with 69½ pts. One competitor selected No. 9 and awarded it 60 pts. and two chose No. 10 with an average of 44 pts. Competition winner's return:—No. 10 with 44 pts.

The fact that the two judges are both on the accredited panel of the F.B.A.S., one coming from the Home Counties and the other from the Midlands, and that some of the competitors in the judging competition are well-known exhibitors, makes the diversity of opinion the more remarkable. Perhaps the most outstanding difference is in the choice of No. 8 as 1st by the judges, whereas the majority of the competitors selected No. 7 (not placed in the cards by the judges).

Compared with the official placings and the competition winner's return, the list based on majority votes (1st No. 7, 2nd No. 5, 3rd No. 8, 4th No. 7 or 11, 5th No. 1, 6th No. 11 and 7th No. 4 or 6), shows still a third order of preference with two alternatives.

Thanks are due to the two judges for agreeing to undertake a task that was bound to come in for an unusual amount of critical examination;

Points in Furnished Classes at WATER LIFE Show

Exhibit No.	COMPETING SOCIETY OR INDIVIDUAL	Fish		Plants		Design and Technique					Points Awarded	Prizes		
		Selection	Size	Quality	Selection	Quality	Design and Gen. Effect	Originality	Permanency	Clarity			Compos., Rockwork	Planting
		Max Pts.:— 5 8 12 10 15 15 5 5 5 10 10 100												
CLASS A1—INTERCLUB TROPICAL FURNISHED AQUARIA														
1	Hendon A.S.	4	5	8	7	9	8	2	3	5	8	6	65	
2	Wembley A.S.	4	5	8	8	7	8	2	3	5	8	6	58	
3	Hendon A.S.	4	5	9	9	11	11	3	3	5	8	8	76	4th
4	Surrey A.C.	4	6	9	8	10	10	3	3	3	8	7	71	6th
5	Hendon A.S.	5	7	10	9	12	10	3	4	5	7	8	80	2nd
6	Hampstead A.S.	3	7	9	8	9	9	3	4	4	7	7	70	7th
7	Hendon A.S.	4	7	9	9	12	11	3	4	5	9	8	81	1st
8	Ruislip A.S.	3	6	9	9	10	9	2	3	4	6	6	67	
9	Hendon A.S.	3	5	7	8	8	8	2	2	4	6	5	58	
10	Federation of G.B.S.	4	7	9	7	9	10	3	4	3	9	8	73	5th
11	Bromley A.A.	3	5	7	7	8	8	2	3	4	6	6	59	
13	Chelsea A.S.	3	6	8	6	8	8	2	3	4	6	7	61	
14	Stoke Newington A.S.	4	6	8	8	9	9	3	3	4	8	5	67	
15	Southampton A.S.	4	6	9	9	13	10	3	3	4	8	8	77	3rd
16	West Middlesex A.S.	4	6	8	9	11	9	2	2	4	7	6	68	
17	Northolt A.S.	2	4	7	6	8	7	2	2	4	6	5	53	
18	Hornchurch Aqu. Soc.	3	6	7	7	8	8	2	3	4	7	6	60	
20	Lynn Club A.C.	4	4	6	6	7	7	2	2	4	5	5	52	
21	Willesden A.C.	3	7	10	7	8	7	2	3	4	6	6	63	
22	Southall A.S.	3	5	8	7	7	8	3	3	3	7	6	60	
23	Aquarium Club, Fulham	4	4	7	6	7	7	2	3	4	4	6	54	
24	Marble Arch A.S.	4	6	8	7	8	9	3	3	4	6	7	65	
25	Lambeth A.S.	3	6	8	6	8	6	1	2	4	5	4	53	
26	Dagenham A.S.	4	6	9	7	9	7	2	3	4	5	6	62	
27	Balham A.S.	4	6	9	6	7	6	2	3	5	5	6	59	
28	Spelthorne A.C.	4	7	6	6	7	1	2	3	5	5	5	52	
29	Leyton A.S.	4	6	8	7	8	8	2	3	3	6	6	61	
31	Study A. & P.C.	3	4	8	7	8	7	2	2	4	5	6	56	
CLASS A2—INTERCLUB COLDWATER FURNISHED AQUARIA														
1	Surrey A.C.	4	6	8	6	9	7	2	3	4	6	6	61	
2	Hendon A.S.	4	7	9	7	9	9	4	3	4	7	6	69	4th
3	Hampstead A.S.	4	7	10	8	12	10	3	3	5	7	8	77	3rd
4	Hendon A.S.	4	5	8	8	10	11	3	4	4	6	5	68	5th
5	Stoke Newington A.S.	4	6	10	10	14	13	3	3	5	8	8	84	1st
6	Hendon A.S.	4	4	9	6	9	10	4	4	4	6	5	65	6th
7	West Middlesex A.S.	4	6	9	8	12	12	5	4	4	7	7	78	2nd
8	Hendon A.S.	4	5	6	8	7	5	2	4	3	4	4	49	
9	Willesden A.C.	4	6	7	7	7	8	3	3	4	4	4	57	
10	Hendon A.S.	4	7	7	6	8	8	2	3	4	7	4	60	
11	Aquarium Club, Fulham	4	7	8	5	6	9	3	4	4	7	5	62	7th
12	Lambeth A.S.	2	6	8	5	7	7	4	4	5	6	4	58	
13	Leyton A.S.	4	4	4	7	8	8	3	2	3	6	5	54	
CLASS A3—INDIVIDUAL TROPICAL FURNISHED AQUARIA														
1	Kelsey, W. H. J.	3	6	7	5	7	7	0	2	2	3	3	45	7th
2	Ward, J. E.	3	5	7	6	8	9	2	2	4	5	6	57	3rd
3	Meyer, P. W.	3	6	9	5	6	7	1	2	2	3	3	47	6th
4	Dee, P.	4	7	10	6	10	9	2	3	3	5	6	65	1st
6	Boxall, H.	4	6	9	4	5	7	2	2	3	3	3	48	5th
7	Wood, Mrs. R. H.	3	6	8	11	8	1	3	4	4	4	7	63	2nd
8	Johnstone, T. P.	2	5	7	5	7	7	1	4	3	4	7	52	4th
CLASS A4—INDIVIDUAL COLDWATER FURNISHED AQUARIA														
1	Oliver, F.	4	4	4	6	9	9	3	4	3	6	6	58	3rd
2	Pilsbury, E.	5	7	9	8	11	10	3	4	3	8	7	75	1st
3	White, R. N.	2	4	5	6	7	5	2	4	3	3	4	45	4th
4	Harvey, R. C.	5	7	9	8	11	10	2	3	5	6	8	74	2nd
CLASS A5—JUNIOR TROPICAL FURNISHED AQUARIA														
1	Bloxham, P.	4	5	9	7	8	7	2	3	4	6	5	60	1st
2	Buttin, K.	3	4	7	7	7	6	2	3	4	6	6	55	4th
3	Bourgeois, B.	3	4	6	7	7	9	3	3	3	8	6	59	2nd
4	Mears, D.	4	6	8	7	7	6	2	3	3	6	6	58	3rd

to the clubs who put in some interesting exhibits and to those who entered the competition.

The results show that the official awards were not in keeping with those returned by the competition entrants. Do they imply judging that can be faulted or does it mean that the majority of exhibitors need to understand better how points are allocated under F.B.A.S. Standards? Does

the competition prove that not everyone is fitted to be a judge? Further, can it mean that the limits imposed by the points allocated under the standards frequently bring to the fore fish which, at first glance, are not the best on show? We invite the two judges, the competitors who took part and the societies providing the exhibits to give us their views.

News from the North-west

Bitterling Established in British Waters

SOMETIMES fish, reptiles and amphibians not native to these islands are released in their areas by individual fanciers. At the annual meeting of the Merseyside Naturalists' Association, held in Southport's Botanic Gardens Museum, there was exhibited a tank containing Bitterling, an addition to the fish fauna of Lancashire, where it has bred in the wild for half a century. Before the war, Mr. F. Williams, a pioneer Wavertree (Liverpool) aquarist, discovered many anglers at St. Helens using what they called "Pomeranian Bream" or "Prussian Carp" for bait, but the iridescent blue line along the rear part of the sides of these little fish showed them to be Bitterling, natives of central Europe which are commonly kept by coldwater enthusiasts.

The source of these particular specimens was soon located in a disused canal nearby and a Minnow trap caught between 50 and 60 in a short time. With the aid of a pond-mussel Mr. Williams was able to breed them in his aquarium. That, however, was over 16 years ago. In seven other areas, at St. Helens, Leigh, Wigan, Bold, etc., the Bitterling has become well established, breeding in the wild in various ponds and flashes fortunate enough to contain plenty of pond-mussels. They have been distributed by anglers liberating surplus bait brought from elsewhere. The fish are still there and, as the Carp and the Grayling are introduced aliens accepted as British fish fauna, the Bitterling is now entitled to its place on the Lancashire (and British) lists. The oldest record occurred some 50 years ago in a field-pond at Moss Lane, St. Helens. This was possibly the parent stock.

The specimens exhibited at the Merseyside N.A. meeting were from the aquarium of another veteran aquarist, Mr. H. Alderson, treasurer of the old Liverpool Aquarium Society, who, incidentally, recently bred some Gudgeon in his tanks. Bitterling are easy to breed in tanks or garden lily-ponds if the mussels can be kept alive and if the fish are not too suddenly subjected to tap water. Last year, following a visit by St. Helens anglers, several Bitterling were liberated in Ethwaite Water, Rydal Water and Grasmere in Lakeland.

Another escapee which seems to have bred

in south-west Lancashire is the Continental variety of the Common Grass-snake. On February 22 a mild sensation was caused in Newsham Park (in the heart of Liverpool) when a snake measuring 29 in. long was found alive. After being killed and duly arrested, it was taken to the police station at the park gates, and finally reached the M.N.A. for identification. It was a Grass-snake, but the two light yellow lines down its back showed it to be the variety from southern Europe imported by pet dealers. The story does not end there, for the serpent was apparently not a recent escapee, but was aroused by sunny weather from its hibernation in the disused "Cheshire Lines" railway bank adjoining the park. In this situation a small colony of these Continental Grass-snakes appears to have established itself in recent years. Every Summer a few specimens caught and killed in the park are taken to the police station at the park gates, and the police sometimes see the live snakes basking on the railway embankment.

Over a number of years, Grass-snakes caught in St. John's Gardens, Sefton Park, Wavertree, Blundellsands and other Liverpool suburbs have been identified as the Continental varieties of our common *Natrix natrix* either escaped or turned loose by pet-owners.

Bury Society's Exhibition

Recently past its fourth birthday, the Bury (pronounced *Burry*) Aquarist Society, with about 60 members, is putting on what appears to be the largest show in the North this year. It has 51 classes, and will be held at the Athenaeum, in this East Lancashire cotton town, from May 4-8. In charge of show arrangements is Mr. G. D. Grimshaw, of Garston Street, a structural engineer in the drawing office of a local steelworks and thus the best man to handle the layout of a show. Four years ago he came into fishkeeping from the cycling world, and a few months ago he completed his fishhouse for 23 tanks where he breeds various Barbs. Regarding shows, he feels that the suggestion for dividing all classes between novice and champion is all right in principle, but would cost the organisers too much extra time, space and money to be practical without increasing entry fees—and he prefers to see these latter reduced to a minimum.

Chairman of the Bury Society is Mr. J. Taylor who won a prize at the B.A.F. show one year with a breeder's team of *Hypoxandrus sepius*. A plumber is always a useful man to have around where water is concerned, and another member, Mr. A. Wardle, comes to the hobby from this profession. He has won many prizes—with the aid of his wife—not only at Bury but also at Burnley, Oldham, Haslingden and Warrington. Last year they won prizes at every show they entered, their specialities being furnished aquaria and the breeding of Characins, Dwarf Gouramis and Tiger Barbs. As he is a plumber, the society made him tank allocation officer for the show! Bury aquarists are fortunate in having a mill-lodge only three minutes walk from the town centre where most months of the year you can see them with others from as far away as Leigh and Rochdale, catching *Daphnia* which swarm in the warm water.

After a meeting in Cheshire some years before the last war, a young graduate school-teacher member of the Belle Vue A.S. took me to his home in Ellesmere Port to show me a new community tank in his father's greenhouse. We have kept in touch since that day, and recently I was able to congratulate him on gaining a Ph.D. from Liverpool University for his work on sex determination in wild bees. He is Dr. Francis J. Manning, who has just shown me over his new heated fishhouse at Alsager Training College where young student teachers destined for Cheshire schools are given a good groundwork in aquatic biology, under Dr. Manning's supervision. Here he has some 30 tanks where he has encouraged students to raise Siamese Fighters, Red Swordtails etc., and to keep a wide variety of tropicals, a large community tank, and some aquatic insects. Although his students mainly collect material from two nearby marl pits (which were still most productive even in December) and Alsager Mere (full of *Littorella*), they also go much further afield to Abbott's Moss in

Cheshire. Last May one of them brought back a Crayfish from a Cheshire river and, despite the general idea that it needs running water, I saw this specimen still in a 12 x 8 in. tank with only a small filter and some Water Millifol. There had been no change of water.

Congratulations to Mr. E. G. Whitehall for recently starting an aquarist section of the Sports Club at the Universal Grinding Wheel Company's factory at Doxey, Stafford. About thirty strong, they meet monthly for films, etc., and are all more or less new to tropical fishkeeping.

It is very good, also, to see anglers linking up with fishkeeping as well as fish-catching. Mr. S. Watkinson, secretary of the Wallasey (Cheshire) Sea Anglers' Society, is both angler and aquarist. At present he has a tropical community tank containing Zebra Fish and Guppies, but he is planning to start a marine tank of shore-crabs, flatfish and rock-pool sea-anemones, and to interest more of his members in the hobby. Another member, Mr. F. Williams, of Brighton Street, already keeps tropicals. On the near tides the members make a boat trip for four or five hours into the Rock Channel off the Wirral coast, and thus have plenty of opportunity for collecting marine specimens. In January one of them caught a herring with his hands when they encountered a shoal (a rather unusual word, being chased by codling and herring-gulls).

We are all interested in seeing more fish in our local rivers and a proposal has been made to spend money stocking the Dee with some fresh trout and coarse fish to "change the blood" and increase the average size. Northwich anglers are restocking the Cheshire Weaver with more coarse fish from the North. Other waters which have lately been restocked include the Bridgewater (Warrington) Canal now cleared of the worst of its pollution and the Downholland (Formby) Brook.

Some recent studies of the Brown Trout at Lake Bala, North Wales, made by Dr. J. W. Jones, of Liverpool University, show that when one year old they average 6½ in. long, at two years they average 7½ in., at 3+ years, 9 in., and at 6+ years, 24½ in. Most spawn in their third year. The Grayling grow more quickly than the trout, migrating from the lake to rivers to spawn in April or May, returning as spent fish by July. The Perch in the lake spawn in May, the female fish growing the fastest, but the males eventually attaining equal size. Dr. H. B. Hynes, another University biologist at Liverpool, has recently made a study of the Stoneflies in North Wales.

Potentialities of the Antarctica

AN Australian National Antarctic Research expedition set off from Melbourne early this year to select a site for a permanent base on Princess Elizabeth Land or MacRobertson Land, and to survey the coastline of Australian possessions in Antarctica.

The expedition replaced the crew at Heard Island, a storm-swept island 27 by 13 miles, lurking in the gloom of some of the most tortured skies to be seen anywhere.

The Antarctica's surface waters, richer in phosphates and nitrates than any other ocean, are afloated with vast masses of plankton, minute organisms that provide the basic food supply of most marine life. This superabundance of plankton has a two-fold significance, it provides sustenance for the larger concentration of marine life of all the oceans and for the colossal harvest of whales.

Even more important, perhaps, is the possibility of preparing plankton for livestock and human food. Research is now being conducted with these ends in view. Biology, involving seasonal plankton studies, is engaging attention and rarities are studied closely. There are, for instance, the wingless flies of Heard Island. It is not known how they got to Heard Island, but it is assumed that such wingless flies have been in existence for millions of years. When 60-mile-an-hour gales became the normal weather for the island, the biologists believe the flies could not make use of their wings and over countless generations they have atrophied and disappeared. Support for the theory lies in the presence, on Heard Island also, of a number of wingless moths.

Peterborough Show

THE Peterborough A.S. staged its first open show during the Winter season and winners of members' cups were Mr. J. Larkman (best fish in show, best tropical aquarium, and also a WATER LIFE Diploma for best furnished aquarium), Mr. H. Richards (runner-up to best fish, best coldwater tank and highest points in show), and Mr. G. Stockdale (best Guppy). A WATER LIFE Diploma went to Mr. D. Wright whose Cherry Barbs were adjudged the best breeder's team.

Entries were received from Sleaford, Corby, Wisbech, March and Kettering and visitors came from as far afield as Doncaster. There was an herpetological display and also one by a microscopical society.

PRIZEWINNERS

CHARACINS: 1, R. Lickerish (Beacon); 2, A. Hull (Beacon); 3, J. Darby (Black-line Tetra). CARPS & MINNOWS: 1, J. Hill (*Barbus ticto*); 2, Wilkinson (Rosy Barb); 3, G. Stockdale (*Rivulus cylindraceus*). CICHLIDS: 1, M. Budding; 2, B. Budding; 3, G. Stockdale. All Zebra Cichlids. LIVEBEARERS: 1, 2 and 3, G. Stockdale (Merry Widow, Guppy and Red Wagtail Swordtail). A.O.S. TROP. FISH: 1, J. Darby (*Polycentrus schomburgkii*); 2, K. Abbott (Thick-lipped Gourami); 3, G. Stockdale (*Corydoras aeneus*). COLDW. FISH: 1 and 3, H. Richards (Goldfish); 2, J. Budding (Tench). BREEDERS' TROP.: 1 and 2, D. Wright (Cherry Barbs and Angels); 3, K. Abbott (Leeri Gouramies). BREEDERS' COLDW.: 1 and 2, H. Richards (Shubunkins). CRYPTO-CORYNES: 1, D. Hawkes; 2, R. Lickerish. A.O.S. PLANT: 1, D. Mallon (Spatterdock); 2, H. Richards (*Cabomba*). TROP. FURN. AQUARIA: 1, J. Larkman; 2, R. Lickerish. COLDW. FURN. AQUARIA: 1, 2 and 3, H. Richards.

Club Notes and News

The Editor invites clubs to send brief reports of meetings and announcements of forthcoming items for the June-July issue to the WATER LIFE office by May 12.

A MODEL form of quiz was arranged for the February 4 meeting of Kings Lynn.

SEVENTY-ONE entries were received for a recent seven-class table show put on by Westman A.S. First prizewinners were Mrs. P. O. Smith, Woolfitt, Land, Pykett, and Mrs. H. R. Readings. The society's A.G.M. was held for March 23.

NEW President of Coventry P. & A.S. is Mr. P. O. Smith, and vice-president, Mr. J. L. H. Jones. The chairman, secretary and treasurer were re-elected at the A.G.M. Mr. Jones spoke on "Water" at the February meeting and a table show for tropics was held in March.

ON April 4 East London A. & P.A. is arranging a trip to the London Aquarium at South Bank. From May to July a home aquaria competition will be held.

FOR the current year Forest Hill A.S. is holding eight table shows and a home aquaria competition. Whilst the first two shows are being judged, members will participate in a lecture competition.

A MODEL show of Stoke Newington A.S. will be held in the Library Hall, Church Street, Stoke Newington, from September 2 to 10. Local aquarists will be invited to enter.

NEW secretary of Corby A.S. is Mr. D. J. Wilson, 363 Willowbrook Road, Corby. At the March 17 meeting Mr. Wilson gave a lecture and a table show for freshwater pairs was held.

A FAVORABLE report was given by the President of Kingston A.S. at the society's A.G.M. A comprehensive programme of lectures, film shows, outings and table shows has been arranged for 1954. Membership classes will be introduced in all table shows and every alternate show will be an inter-club basis. Secretary of the society is Mr. A. J. Butland, 47a Twickenham Road, Twickenham, Middx., and show secretary, Mr. A. Ward.

ON February 1 Mr. P. Hewitt was elected vice-president of Redhill A.S. A show will be held on April 5 and the annual dinner is scheduled for April 25.

MEETINGS of South Glasgow A.S. are held on the third Wednesday of each month. A table show is included in the programme of each meeting; in February it was for Guppies and in March, for Gouramis. The member gaining most points throughout the year will be presented with a diploma. Mr. A. Waade spoke on "Setting up a Community Tank" on February 17, and Mr. D. O. Carr gave a talk on "Tropical Aquaria" at the March 17 fixture. The A.G.M. appointed the following office bearers, President, Mr. D. Philp; treasurer, Mr. T. G. G. and secretary, Mr. E. Readings, 222 Clarendon Road, Glasgow, S.W.2.

A FUTURE society to hold its A.G.M. in 1954 was the Harrow A.C. Meetings are now held at Welton Hall, Angel Road, Harrow.

NEW headquarters of Friends A.S. is 62 Brixton Road (rear entrance), London, S.W.6. Members will be able to install tanks in the permanent club room at these premises.

MR. H. RUSSELL HOLLAND has given a talk on "Breeding Catfish" to members of Bromley A.A.

THE Corn Exchange, Maidstone, was the venue for the February 5 and 6 show of Maidstone A.S. held in conjunction with the local cage birds society's event. The inter-club class was won by Oakwood Hospital A.S. for the second year in succession. This latter society was presented with the inter-club challenge cup during the Maidstone A.G.M. at which gathering Mr. A. G. Reif was appointed treasurer.

MR. W. CHISSELL, chairman of Bexhill A.S., has presented a challenge cup to be competed for at the society's table shows. Additional informal meetings are now held in members' homes. At the beginning of February, Mr. Walker judged a table show for Labyrinths won by Mr. N. Dengates with a Siamese Fighter. During the same evening the Harrow A.C. film was shown. "Anatomy of Fish" was the title of a lecture given at the March 4 meeting. In recent months aquariums have been set up in the Church Army Children's Home and the Merchant Navy Children's Home. A visit to McLynn's Aquarium at Ewhurst is planned for June 20.

"GENERAL Principles of Breeding Tropical Fishes" was the subject of a talk given by Dr. F. N. Ghadially at a meeting of Newcastle-on-Tyne A.S. He also showed his film on breeding the Brown Acara.

WINNERS in the table show competition of Romford A.S. received their trophies and special prizes at the society's A.G.M. Successful exhibitors were Messrs. F. Ahrens, R. Morgans and P. Howland. Officers elected were President, Mr. A. E. Falkus; vice-president, Mr. C. Alexander; chairman, Mr. F. Ahrens; vice-chairman, Mr. L. A. Elliott; treasurer, Mr. T. Thompson and secretary, Mr. R. Aley, 13 Hayburn Way, Romford, Essex.

NEW meeting place of Cambridge A.S. is the Anchor Inn, Silver Street. Officials elected at the A.G.M. were chairman, Mr. B. K. Elkerton; vice-chairman, Mr. J. E. Tingey; treasurer, Mr. H. Waugh; librarian, Mr. Gibson and secretary, Mr. E. A. Phillips, 10 Cockburn Street, Cambridge. Sixty-five members participated in a recent table show when cups were won by Messrs. B. K. Elkerton, C. Holmes, Auker and N. Mason Smith.

MR. A. GUMBRELL was elected chairman of Reading A.S. at the A.G.M. on February 11. Regular table shows are being held in which eight trophies are being competed for. Mr. H. Russell Holland is scheduled to speak on April 22 and Mr. A. Boarder, on May 20.

AN aquarist section has been formed within the Universal Sports Club, Universal Works, Universal Grinding Wheel Co., Duxey, Stafford. The secretary is Mr. E. G. Whitehall.

RECENT lecturers at Leicester A.S. monthly meetings have been Messrs. A. Manchester and T. C. Saville.

A VARIED programme was enjoyed by Carlisle A.S. members at their February 25 meeting. Mr. T. Armstrong spoke on "Spawning Zebra Cichlids," Mr. E. Hardisty described the breeding of White Cloud Mountain Minnows and *Nannostomus anomalis* and Mr. J. Davidson gave information on hand spawning London Shubunkins.

(Continued next page.)

Guppy Federation's Annual Meeting

PRESENTING the treasurer's report at the A.G.M. of the Federation of Guppy Breeders' Societies, Mr. E. H. Riddle stated that a profit had been made on the annual show. The balance at the end of the year showed an improvement on that available at the conclusion of the previous year.

Mr. E. S. Roach, as organiser of provincial members in the F.G.B.S., gave a favourable picture of provincial membership. The target of 100 provincial members had been achieved and this had been effected despite the fact that many new Sections had been formed throughout the country. Latest of these are the Hop Leaf Section at Reading and the West Midland Section which now meets at 11, Old Meeting Street, West Bromwich. Mr. Roach looked forward to the time when the number of Sections would justify the formation of Regional bodies. He thought there was every possibility of the Federation topping the 500 membership in 1954 and of many new Sections coming into being.

The Overseas Secretary, Mr. A. P. Stanley, gave news that negotiations are proceeding with a view to staging an international show in Germany during the Autumn. A team of fish from England would compete against exhibits from Austria and Germany under F.G.B.S. rules.

Federation officers elected were: vice-president, Mr. E. S. Roach; general secretary, Mr. A. J. Holloway; show organiser, Mr. H. S. White and show secretary, Mr. W. Howe. Messrs. H. Pearson and W. G. Layzell were appointed auditors.

Mr. R. J. Affleck, M.Sc., M.R.S.T., is to give a series of six bi-monthly lectures following Assembly meetings.

Societies can obtain a copy of each issue of the F.G.B.S. Bulletin for their libraries at a cost of 10s. or two dollars per annum (12 issues). Remittances should be sent to Mr. A. J. Holloway, 37, Garfield Road, Plaistow, London, E.13.

Formosan Aquarist Meets British Goldfish Keepers

FOLLOWING a visit to an early-1954 committee meeting of the Goldfish Society of Great Britain, Mr. Leon-Chang promised to correspond with the society on his return to Formosa. Forty-eight societies have joined the G.S.G.B. Advisory Service. Results of the competition held in conjunction with the scheme are as follows:—Weybridge (12546), Folkestone (462) and Huntingdon (98).

At the March committee meeting Mr. A. Leutscher, B.Sc., was welcomed as a new vice-president of the society. The G.S.G.B. is to stage fish of its four basic varieties in the Aquarium at South Bank, London.

Quarterly Meetings will be held on March 27, June 12 and September 29; during 1954. Mr. E. G. Weatherley will speak at the March fixture when there will also be a table show for Adult Singletails. June 12 will be the A.G.M. with a show for Twintails, Globe-eyes and Brambleheads. The show at the September meeting will be for current-year fish.

G.S.G.B. delegates are ready to meet a Federation of British Aquatic Societies sub-committee, under the chairmanship of Mr. R. J. Affleck, M.Sc., M.R.S.T., to discuss Goldfish show standards. The Goldfish Society would like its four basic varieties accepted and is also prepared to provide the F.B.A.S. with standards for other "popular varieties" on the understanding that these would not be acknowledged as official Goldfish Society standards but would be offered as the product of this specialist body's experience in Goldfish culture generally. Alternatively the F.B.A.S. might itself prepare these "popular" standards.

Bermondsey Exhibition

THE scope of this year's Bermondsey Municipal Exhibition is being broadened to include cage birds and aquaria classes. Previously the exhibition has been confined to horticultural, cookery and painting exhibits. Show secretary is Mr. P. F. Petto, Gardens and Open Spaces Department, Town Hall, Spa Road, Bermondsey, London, S.E.16. Dates: August 27-28.

Club Notes and News

— continued —

THE Aylesbury A.A. is staging an exhibition in Hazell's Theatre from June 10 to 12. At the February meeting Mr. F. W. Stanley spoke on "Cacti and Succulents" and on March 10 Capt. L. C. Betts judged a table show for coldwater fish.

CHAIRMAN of the F.B.A.S., Mr. T. E. Butt, gave a talk and judged a table show at a recent meeting of **Chingford A.A.S.** Best fish in show was owned by Mr. Jones. During March Mr. C. W. G. Creed visited the club and spoke on "Aquarium Plant Life."

A NEW society has been formed with the title of **Stockport & E. Cheshire A.S.** Secretary is Mr. A. Jordan, 47 Woodsmoor Lane, Stockport, Cheshire.

THE retiring secretary did not seek re-election at the A.G.M. of **Sunderland A.C.** Mr. K. Rosekilly, 6 Beechwood Street, Sunderland, was appointed to this post. Mr. A. E. Brunton and Mr. J. Harvey are now chairman and treasurer, respectively.

AS a result of the A.G.M. the following officers officiate in the **Midland & P.S.** for the current year, chairman, Mr. W. L. Mandeville; treasurer, Mrs. T. W. Pegg; junior representative, Mr. D. Yates and secretary, Mr. T. L. Dodge. "Breeding Technicalities" was the title of a talk given by Mr. G. F. Hervey at a recent meeting. The annual dinner and dance was held on March 20.

NEW secretary and treasurer were elected at the annual meeting of **Rotherham A.S.** The former is Mrs. F. Tomlinson, 33 Renshaw Avenue, Broom, Rotherham, and the latter, Mr. R. H. Oliver, Messrs. T. A. Tomlinson and A. Bartholomew were presented with a plaque for gaining the most points in table shows during 1953. The meeting closed with a showing of the film on spawning the Brown Acara.

THE new **Basingstoke A.S.** meets on the second and fourth Fridays of each month in a room at the Cricketers' Inn, Mr. W. H. G. Smart, 94 Western Way, Basingstoke, Hants., is the secretary; Mr. S. W. J. Franks, treasurer and Mr. F. Mapson, chairman.

FROM July 2-4 the **City of Salford A.S.** is staging an open show in the Drill Hall, Cross Lane, Salford. The society visited Stretford on February 25 for a table show and quiz. Newly-appointed secretary is Mr. W. Wainman, 249 Eccles New Road, Salford 5, Lancs.

MR. H. W. EDWARDS, 52 St. Peter's Road, March, Cambs., is the present secretary of **March W.L.C.**

THE Chelmsford A.S. is staging its annual show during the month of June.

F.B.A.S. Announces New Show Standards

TWO new show standards have been announced by the Federation of British Aquatic Societies' Judges' and Show Standards Committee. They are for Albino and Red Tuxedo Swordtails. The colour recommended for these two types is as follows:—ALBINO, the whole of the body and fins to be free from pigmentation; the eye must be pink. RED TUXEDO, the body to be an intense scarlet with a wedge of black evenly distributed along the side, the base coinciding with the base of the caudal fin and the apex with the eye. Both colours to be well defined and not inclined to run into each other. The sword to be yellow edged with black.

A new colour film has been prepared by Messrs. J. G. Stevens and R. G. Young with the title of "Siamese Fighting Fish and Black Widows Spawning". It was shown at the March 6

MR. E. H. RIDDLE spoke at the March meeting of **Bedford A.S.** The society is to participate in an interclub show with **Lettington A.S.** on April 14 with Mr. J. H. Gloyn as the judge. A newsletter is now being produced. New secretary is Mr. R. R. Pope, 51 Aylesbury Road, Bedford.

TROPHIES were presented at the annual dinner of **Erith A.S.** They went to Mr. S. Waymont (Points Shield), Mr. K. Hallett (Coldwater Aquaria and Breeders' Tropical Egg-layers), Mr. P. Kelly (Tropical Aquaria), Mr. G. W. Baker (Breeders' Coldwater) and Mr. S. Webb (Breeders' Tropical Live-bearers). The secretary is Mr. G. W. Baker, 12 Berkeley Avenue, Bexleyheath, Kent, and meetings are held at St. John's Parish Church Hall, Erith, on the second and fourth Mondays of each month.

FUTURE meetings of **Chelsea A.S.** will be held on the second and fourth Tuesdays of each month in the Chelsea Community Centre, 385, Kings Road, Chelsea, London, S.W.3. First prizewinner in the home

N.A.S. JUNE SHOW

FROM June 10-12, the **National Aquarists' Society** will stage its annual show in the Old Horticultural Hall, Vincent Square, Westminster, S.W.1. There will be 46 classes, an increase of two on last year, these being for novice Common Goldfish (open to aquarists who have never taken an award at an open show) and for junior coldwater furnished aquaria (open to fish-keepers who have not attained their 16th birthday by June 10). In the classes for *Cryptocorynes* and *A.O.S. Submerged Plants* this year, a single plant will constitute an entry.

Blair A.S. has now ceased to function and its Perpetual Trophy will be awarded to the best entry in the breeders' section at this year's N.A.S. event. Among the judges appointed are Mrs. B. Robertshaw, and Messrs. L. C. Betts, A. Boarder, E. A. Bowler, W. C. Cleveland, W. Dacre, S. Harker, P. Hewitt, J. H. Gloyn, C. R. Looker and H. S. White.

Entry forms can be obtained from Mr. C. R. Macdonald, 73 Tudor Gardens, West Acton, London, W.3 (Acorn 1063) and must be returned by May 18.

aquaria competition was Mr. L. Hibberd. Four tanks were exhibited at the new headquarters in conjunction with the Community Centre's opening celebrations.

MR. T. PAINE arranged a film show for the February meeting of **Southport A.S.**

THERE are now 132 members in the **Portsmouth A.C.** At the February 3 A.G.M. Mr. T. Bennett was elected President; Mr. F. G. Lush, chairman; Mr. B. Nunn, treasurer; Mr. J. Booth, vice-chairman; Mr. T. Smythe, assistant secretary; Mr. W. R. T. Eyre, social secretary; Mr. G. Elverson, show secretary and Mr. J. Stillwell, 262 Allaway Avenue, Paulsgrove, Portsmouth, secretary.

Assembly and is available to member-societies at a charge of £1 for the first day and 10/- for each subsequent day.

New affiliations to the F.B.A.S. are Bristol Tropical Fish Club, Corby A.S., Pisces (E. London) A.S., Pisces (Dulwich) A.C., Kingston A.S. and March W.L.C. Some printing blocks showing the F.B.A.S. emblem, and including the words "affiliated to", have been prepared. These blocks are available on free loan to constituent societies for use on letterheads, etc.

The Services Committee, under the chairmanship of Mr. S. T. Jelly, now has Messrs. A. Hastings, M. Hollinshead, R. C. Mann and R. Savage serving on it. A public relations committee has been formed. The three motions detailed in the last issue were defeated at the March 6 Assembly.

Bury's Aquarium Festival

A SHOW, which promises to be one of the largest ever held in the North, is planned by **Bury A.S.** for May 4-8 in the Athenaeum, Bury. There are 51 classes scheduled, divided into 12 sections. Each section winner will be awarded a Challenge Trophy and first prizewinner in the six furnished aquaria classes will receive similar trophies. The four Guppy classes will be judged to Guppy Federation standards, by Mr. E. Rawlinson. Officiating in the remaining classes will be Messrs. R. E. Legge and H. Loder.

Entry forms can be had from the show secretary, Mr. G. D. Grimshaw, 1, Garston Street, Bury, Lancs. Latest date for receiving entries is first post on April 7.

FIRST open show of **Chester A.S.** will be held at the Drill Hall, Chester, on June 11-12. Information is available from Mrs. C. Morrison, 22 Belgrave Place, Handbridge, Chester. Officers elected at the A.G.M. were Mr. R. Moulton, chairman and Mr. J. Bowyer, 27 Chichester Street, Chester, secretary.

THE following officials were appointed at the annual meeting of the **Riverside A.S. (Hammersmith)**: chairman, Mr. N. E. Winsley; vice-chairman, Mr. R. Barnes; secretary, Mr. N. W. Webb; show secretary, Mr. E. Daynes and treasurer, Mr. E. Owen. Table shows, a lecture on "Breeding Characins" and a discussion period have been enjoyed by members.

MR. P. S. KADWELL, 13, Minster Road, S. Tottenham, London, N.15, is now the secretary of **Tottenham A.S.**

THE annual meeting of **Lambeth A.S.** appointed the following officials, President, Mr. P. Newton; chairman, Mr. E. Compton; show secretary, Mr. B. Parker and secretary, Mr. R. Griffin, 231a Gipsy Road, W. Norwood, London, S.E.27.

GUPPY fanciers in the Accrington, Blackburn, Bolton, Burnley, Colne, Nelson, Bury and Rawtenstall districts interested in the **North-East Lancs. Section of the Guppy Federation** are invited to contact the new secretary, Mr. R. Rawlinson, 16 Woods Lane, Clitheroe, Lancs.

AN interclub competition was organised by the S.W. Middlesex A.A. between **W. Middlesex A.S.** and **Feltham A.S.** W. Middlesex were the winners. Speakers on this occasion were Messrs. Winsley, E. Law and A. Salter. The A.G.M. was held on February 16 and Mr. P. Hewitt spoke on March 16.

MR. J. CHALKLEY, 16 Thirlmere Gardens, Wembley, Middlesex, is going into the possibility of forming a new society.

RECENTLY-APPOINTED secretary of **Wigan A.S.** is Mr. L. Buchanan, 35 Whitley Crescent, Wigan, Lancs.

OFFICIALS elected at the annual meeting of **East Midlands Section of the F.B.S.** were chairman, Mr. H. Esterbrook; vice-chairman, Mr. W. Burwell; secretary Mr. J. Rudkin; show secretary, Mr. L. Matthews and treasurer, Mr. H. Sharpe. The section met the W. Midlands group on February 28, when the standards for Guppies were discussed and a short quiz held which ended in a tie.

NEW address of the **Guppy Federation's Eastern Counties Section** secretary, Mr. A. F. Holmes, is 279 Manor Road, West Ham, London, E.15. Mr. A. Fraser-Brunner is booked to speak on April 8.

MR. COVENEY has been elected show secretary of **W. Surrey P. & A.C.** and Mr. Way, librarian. Other main officials were re-appointed at the A.G.M.

THE Staines A.S. is hoping to expand its interest in coldwater fishkeeping. Officials of the society are Mr. G. Clarke, secretary; Mr. F. Soanes, chairman; Mr. F. Taylor, vice-chairman and Mrs. G. Barrett, treasurer.

FROM May 29-30, **Rochdale A.S.** is staging an open show in the Fire Station Hall, Rochdale. Show schedules can be had from Mr. N. Gott, Crossways, Kendal Avenue, Norden, Rochdale, Lancs. Mr. R. Yates spoke at the February meeting and the A.G.M. was held on March 1. Future programme includes a lecture by Mr. McDowell on April 5, and another by Mr. Neild, on May 3.

OVER the Easter holiday, **Lancaster & Morecambe A.S.** is staging a "Palm Court Aquarium" in the Winter Gardens Ballroom, Morecambe. The official opening will be on the evening of Good Friday. New secretary of the society is Miss A. Rothera, 2a Langley Road, Lancaster.

MRS. E. RUSHTON, 551 Plodder Lane, Farmworth, Lancs., is the recently-appointed secretary of **Bolton A.P. & M.S.**

FIRST prizewinners in a table show arranged by **Wilkesden A.C.** were Messrs. Game, Atkins and Smith. The judge was Mr. E. Cannon.

A GOOD attendance was recorded at the annual meeting of **Accrington A.S.** when Alderman W. W. Cocker was elected President; Mr. J. G. Holden, chairman; Mr. F. J. Green, vice-chairman; Mr. M. Scaife, treasurer and Mr. E. Smith, secretary.

MEETINGS of **Southall A.S.** are now held at fortnightly intervals. As a result of the A.G.M. the following officers were elected, chairman, Mr. A. Hastings; vice-chairman, Mr. C. Copley; treasurer, Mr. J. Wincott; press and social secretary, Mr. R. Savage; show secretary, Mr. R. Farrin and secretary, Mr. A. N. Shilstone, 3 Howard Road, Southall, Middx.

THERE were two meetings of **Blackpool & Fylde A.S.** during February. At the first, Mr. C. Higginson presented a picture quiz with the aid of an epidiascope, and at the second Messrs. G. N. Hadley and V. Sharp gave a practical demonstration of setting up a furnished aquarium. New secretary is Mrs. V. Fletcher, 13 King Edward Avenue, Blackpool.

APRIL meeting of **Bristol T.F.C.** will be held on the 14th instead of the scheduled date for the convenience of the visiting lecturer, Mr. W. L. Mandeville. All future meetings will be arranged for the normal third Thursday of each month.

CHANGE of secretary is reported by **Walthamstow A.S.** The present holder of this position is Mr. W. J. Chesneau, 44 Capworth Street, Leyton, London, E.10.

ON February 8 the **Dukeries A.S. (Workshop)** held its first table show. Main prizewinner was Mr. Kirk. The society is hoping to stage a large show in April.

FILMS were shown at the March 16 meeting of **Kettering A.S.** Earlier in the month Mr. E. Gorlitz spoke on "Breeding Tropical Fish." On March 30 Messrs. Simons and Brigstock gave short talks. The club's annual outing will be to London on June 20, when the Aquarium London at South Bank and either the Zoo or Kew Gardens will be visited. The annual show is scheduled for September.

AT the A.G.M. of **Steaford A.S.** members celebrated the club's first anniversary.

OLD-ESTABLISHED **Bristol A.S.** elected a new secretary at its A.G.M. He is Mr. D. S. Paul, 1 Bower Walk, Bedminster, Bristol 3. Other officials are President, Mr.

H. C. B. Thomas; vice-president, Mr. R. V. Coombs; treasurer, Mr. S. J. Davis and librarian, Mr. W. G. Bryant.

WITHIN three months of its inauguration **Yeovil A.S.** put on a three-day exhibition in empty shop premises near the town's centre. There were 1,300 visitors.

THE **Streatham A.S.** is hoping to stage its annual show some time in September.

NEW meeting place for **Wembley A. & P.A.** is Terry Watson's Restaurant, 763 Harrow Road, Sudbury, Wembley, and new meeting days are the first and third Mondays of each month.

WINNER of the Table-show Cup for 1953, awarded by **Ilford A. & P.S.**, is Mr. Wilson. A quiz was the feature of a recent meeting.

ON March 8 **Worcester A.S.** organised a table show in which the first prizewinner was a Tiger Barb owned by Mr. R. J. Munslow. Secretary N. P. Starkey was the judge.

"**WATER**" was the title of a lecture given by Mr. A. L. Gray at the March 4



Top: some of the cadets swimming in the Mediterranean. They are wearing goggles made from converted gas masks. Right: a cove on the south of France coast where the party camped for a time during the trip undertaken by coach.



As reported on page 43 of the last issue cadets from the London Nautical School recently journeyed to Southern France for a holiday in which they studied the marine life of coastal areas where they camped.

meeting of **Halifax A.S.** During the same evening a table show was held. Mr. G. H. Crossley won first prize in the tropical section and Messrs. Ryan and Wolmersley led the coldwater class.

FILMS were shown at the February meeting of **Peterborough A.S.** During the same evening Mr. B. Smith, 73 Wootton Avenue, Old Fletton, Peterborough, was elected secretary and treasurer. Short talks were given by members at the March meeting, at which there was also a table show for Danios. There will be a talk on "Native Fishes" in April and a home aquaria show and talk on "Tropical Reptiles" in May.

FROM May 1-15 **High Wycombe A.S.** is staging a show in the Library, Queen Victoria Road. On September 4 a show will be put on in conjunction with the local Borough event. Schedules for either can be obtained from Mr. R. Adkins, 7 East Drive, Totteridge, High Wycombe, Bucks.

THE **Middlesbrough A.S.** has been re-formed under the title of **Middlesbrough & District A.S.** Meetings are held every third Wednesday at the Black Lion Hotel, North Ormesby. The secretary is Mr. V. Bennington, 7 Oak Street, South Bank, Middlesbrough.

DR. MYRON GORDON has accepted honorary presidency of the **Walworth A.C.** At the A.G.M. all officers were re-elected except that the chairman took over the duties of vice-chairman and vice versa. A social was held on March 17 and a visit to McLynn's Aquarium, Ewhurst, is planned for April 25.

MR. G. H. C. CRAWFORD was elected chairman and Mr. G. B. Kelly, 216 Lea Road, Penn Fields, Wolverhampton, secretary, at the A.G.M. of **Wolverhampton A.S.** Mr. E. Bagnall, retiring chairman, was given life membership in acknowledgement of his services to the club.

THE last three meetings of the **National Aquarists' Society** have been given over to lectures by Messrs. S. G. Wismark and H. W. Higginson and a quiz session.

SECRETARY of **Dunstable A.S.** is Mr. B. C. Flatman, 71 West Parade, Dunstable, Beds.

A TROPHY has been presented by Mr. Hartigan to the **Plymouth A. & P.S.** A recent lecturer was Mr. Franks who spoke on the "Acidity and Alkalinity of Aquarium Water."

MESSRS. J. A. Mackintosh, S. MacAllister and J. Allyson have spoken at recent meetings of the **Inverness A.S.**

NEWLY-FORMED **Hull & East Riding of Yorkshire G.B.S.** has affiliated to the Guppy Federation. Meetings are held on the second Monday of each month at Argyle House, Anlaby Road, Hull. Secretary is Mr. P. A. Thompson, 56 Hotham Road, Hull.

FIFTH annual open show of **Southampton A.S.** will be held from July 1-3.

Royal Visit to Great Barrier Reef

MENTION is made, on page 74, by Professor C. W. Emmens, of the colourful marine life found in the waters off the North coast of Australia which lead up to the 1,000 mile-long Great Barrier Reef. H.M. The Queen and H.R.H. The Duke of Edinburgh spent some interesting hours looking at the fascinating underwater scene common to the area. A glass panel in the bottom of the small boat which they boarded from the S.S. Gothic permitted them to see down into the clear sea, where brightly-hued fishes and other creatures could be seen swimming amongst grotesquely-shaped, multi-toned coral masses.

More Information Sought on the Spanish Armada Shells

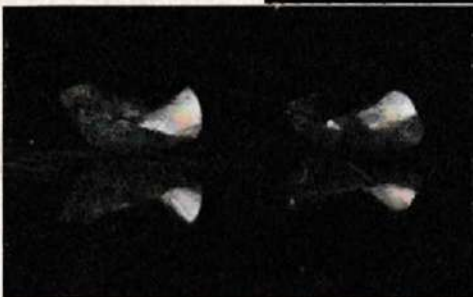
Further Particulars of the Fossilised Oyster Bed Uncovered
at Chapel Copse in Wiltshire

CONSIDERABLE interest has been shown in the letter in our August, 1953, issue, concerning the four small Mother-of-Pearl Shells owned by the correspondent, Mr. Ernest A. Chapman, and in the report in our October, 1953, issue of the discovery of a bed of fossilised oyster shells at Chapel Copse, near Chilmark in Wiltshire.

Miss Dorothy C. Nee of Farborough Green, Herts., writes:—"After reading about fossilised shells in WATER LIFE I decided to visit this 'sea floor', situated in and about Chapel Copse, Wiltshire. By the time I arrived, rain was falling heavily, but despite this, the view was well worth the long journey I had made, as it has left in my memory an interesting picture, showing how the sea departed from this part of the land about 100 million years ago. On glancing upwards at a high cliff of green sand, I saw what, to me, looked at first sight like an old Roman Road buried in the sand. With the water from the rain pouring over the very small fossilised shells, it resembled very fine mosaic work. I was able to pick up from the ground, several of the bivalves of the extinct oyster, *Ostrea vesiculosa*, which the rain water had recently washed out of the old sea-floor. The thickly populated bed of shells was too high up in the sandy cliff for me to reach. The bivalves I collected are extremely small, not more than an inch in length, similar in shape to the present-day Whitstable oyster shells. There is no trace of Mother-of-Pearl in any of these specimens."

Another lady reader, Miss Elizabeth Purkiss of Sydenham, London, S.E., says that the article in the October, 1953, issue reporting the discovery of fossilised shells in the Salisbury area particularly intrigues her and asks "Surely the finding of a sea floor said to be about 100 million years old in this locality is extraordinary? What is the length and width of this very old English sea floor?" Miss Purkiss goes on:—"Also, there is in the August 1953 issue, a letter entitled 'Link with the Spanish Armada?'. As both these shells are well over 50 million years old, do they in any way resemble each other? WATER LIFE refers to the Four Armada Pearls, as each being smaller than a shilling piece. If the oyster *Ostrea vesiculosa* fossilised shell is of a small species it should prove very interesting, as oyster shells as known today are considerably larger than a 5/- piece. Mr. Ernest A. Chapman's small Mother-of-Pearl shells could have been preserved millions of years ago in the Eastern hemisphere by a process

The Mother-of-Pearl shells owned by Mr. E. A. Chapman. They are shown life-size and their shape can more easily be seen than in the photograph which appeared on page 215, August 1953, issue. A photograph of four specimens of *Ostrea vesiculosa* will be reproduced in our next number.



of preserving pearls which is unknown to scientists of today. In what other way, if a preservative has not been used, could these four pearl shells have survived down to the present day in living preservation?"

Mr. R. Lyubery of Ashted, Sarrey, contributes the following explanation of the position in the Geological Record of the *Pecten asper* zone, in which the fossilised shells were found:—"I am extremely interested in the two contributions dealing with 'The Four Spanish Armada Pearl Shells' and the specimens of *Ostrea vesiculosa*. Both subjects appear to me to be remarkable discoveries. The geological periods which these rare specimens originate from are two very interesting ones. The zone of *Pecten asper* belongs to the Secondary or Mesozoic division of the Geological Record. The latter is classified into five main divisions, i.e., Pre-Cambrian or Azoic (lifeless); Paleozoic (ancient life) or Primary; Mesozoic (middle life) or Secondary; Cenozoic (recent life) or Tertiary; and Post-

Tertiary or Quaternary. The Mesozoic division is divided into the Triassic and Jurassic Cretaceous systems. The Cretaceous system is further divided into Lower and Upper Cretaceous. The Upper Cretaceous may consist of four sub-divisions, of which the lowest is the Gault and Upper Greensand to which the zone of *Pecten asper* belongs.

"The abundance of fossil shell specimens of *Ostrea vesiculosa* recently found at Chapel Copse therefore belong to a much earlier period of time than the four Spanish Armada Pearl Shells which are identical with the rare and extinct species

Pteria phalanacea (Lam) of the Miocene system, which belongs to the Cenozoic or Tertiary division—the fourth division of the Geological Record. The Cenozoic division is divided into the Eocene, Oligocene, Miocene and Pliocene systems, and is preceded by the Mesozoic division, of which the latest system is the Cretaceous. In May 1953 many fossil shell specimens of *Ostrea vesiculosa* were found; perhaps somebody will find more specimens of *Pteria phalanacea* to throw further light on the origin of the four Spanish Armada Pearl Shells, which are living (recent) specimens, each containing a large solid pearl.

"I would like to know more about both subjects. Who discovered the remarkable prehistoric sea-floor of Greensand and oyster fossil shells? Was the *Ostrea vesiculosa* a producer of naure (mother-of-pearl)? Why have they not been discovered before in this locality? (The question raised by Mr. Lyubery will be dealt with in our next issue—Ed.)

(To be continued.)

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