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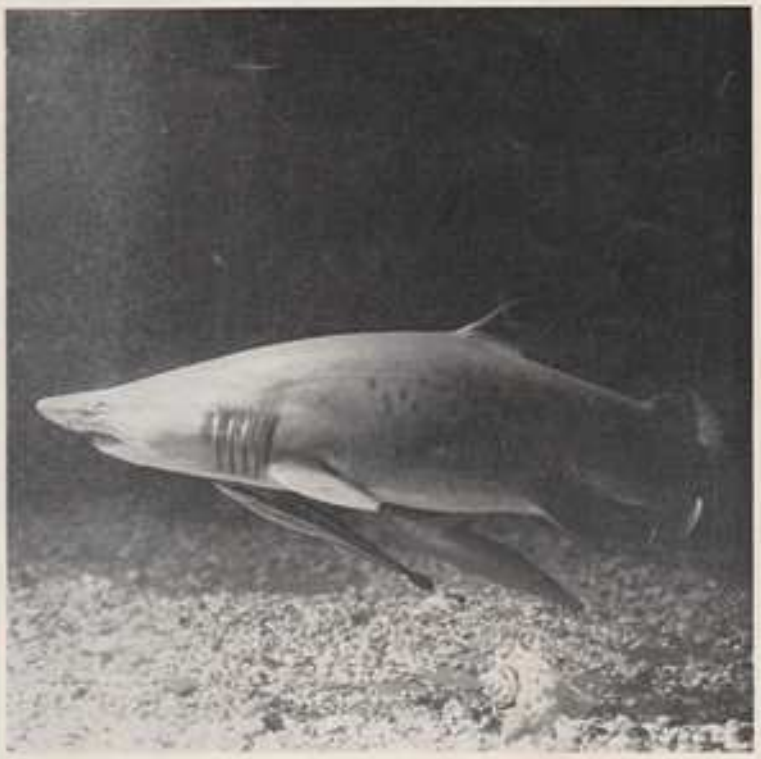
APRIL, 1960



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Contents

VOL. XXV No. 1 1960

Editorial

HOW much do you know about what goes on in your aquaria after you switch out the lights and retire to bed? We have heard of aquarists who have crept quietly back to their tanks after a few hours of darkness to flash a torch light into them in an attempt to find out if their fishes sleep. But usually there is little out of the ordinary to be seen except the commotion caused by those nocturnal types such as the catfish, darting back into the mulm in resentment at the sudden flash of light.

One of the strangest stories that we have read in this connection was described as being about "the fish that wears a nightgown." It was reported in *The New Scientist* recently as the observation of an American zoologist, made on the parrot fish, an exotic marine species. The scientist had evidently been making much the same sort of investigation as we have described above, for he discovered by flashing a light in the parrot fish aquarium after dark that this fish rested at this time within a filmy, loose, temporary skin of its own manufacture. Formed in about half an hour, the mucilaginous skin was complete except for openings at head and tail for a through circulation of water. When the lights of the aquarium were put on and left on the parrot fish discarded its "nightgown" by swimming out of it. The skin appears to be used as a protection for the resting (sleeping?) fish, for it has been shown experimentally that the substance that the fish uses to make this envelope is obnoxious to the predatory moray eel.

Coming closer to home, as it were, we have not heard of nightgowned goldfish being spotted, but we did learn with some surprise last month that the goldfish is apparently not unappreciative of a "nightcap." In the pets' column of a Scottish newspaper we saw the following, given as advice to a reader whose goldfish persisted in lying on its side: "remember that two or three drops of whisky in his bowl is the finest tonic a fish can have when he is one degree under!"

Scientists Study Shark Attacks

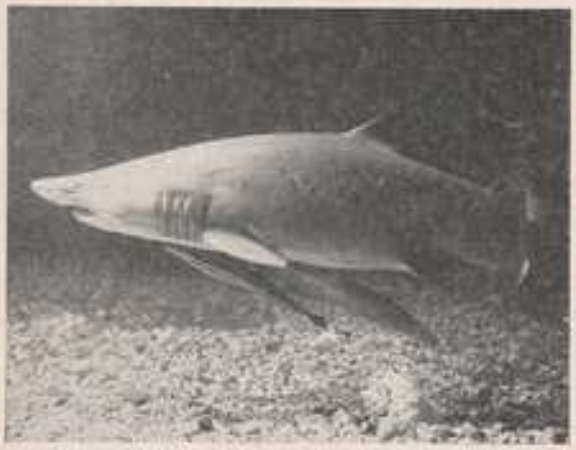
by Dr. JAMES W. ATZ, *Associate Curator, New York Aquarium*

(Photographs by the New York Zoological Society)

OF man's natural enemies, only the shark and the serpent still exact from him a full measure of primeval fear. When man was a naked, unarmed savage, he was preyed upon by many animals; to-day it is he who has become the Nemesis of all wild life. Animal gods and Leopard Men now govern the lives of a bare handful of jungle folk, but all over the world, even the most sophisticated of city dwellers, if they imagine themselves in contact with the wild, continue to dread sharks and snakes, often to the extent that the mere mention of their names elicits feelings of apprehension and revulsion. Moreover, as far as sharks are concerned, that dread is growing. More and more people are becoming aware of the sea—as a place for sport and play, as the principal source of man's future wealth, and as the home of original wonders and high adventure. Inevitably they are acutely aware of the shark as a menace, as one of the very few animals given to unprovoked attacks on man.

There is not the slightest doubt that sharks can be man-killers. In fact, when the overwhelming evidence is considered, it is hard to realise that not many years ago some scientists sincerely believed that sharks rarely if ever attacked human beings. Sharks, however, cannot in any way be considered a major threat to mankind. The malarial mosquito, for example, kills more people in a single year than the shark has dispatched in all time. Since 1919 about one hundred shark attacks have been recorded in Australia, which of all countries with adequate records is the one that has suffered the most from sharks. Dr. V. M. Coppleson, who carefully studied these incidents as well as other unusual causes of death in Australia, has put the shark in a proper perspective: "The idea that the sea is full of savage sharks swimming around seeking what humans they may devour has little to support it. In fact, death by shark bite, while grotesquely spectacular, is an uncommon cause of death in Australia. The risk is less than walking across a road or playing cricket or football. More people are killed by snakes, bulls and spiders than by sharks, three times as many are struck by lightning, and many more are killed by horses."[1]

This 15-feet white or man-eater shark (Carcharodon carcharias), became entangled in a net off the coast of southern California in the spring of 1958. It weighed slightly more than 3,000 pounds, and the largest of its characteristically triangulate teeth were more than 2 inches long. The white shark is generally acknowledged to be the most dangerous of all sharks



A sand tiger shark (Carcharias taurus) with shark suckers attached beneath it, on exhibition at the New York Aquarium. Although not known to attack man in the north-western Atlantic, this species, or its very close relative, the grey nurse (C. arenarius) is a man-killer in South African and Australian waters

All of which makes most people's fear of sharks appear a bit morbid. Nor can the suddenness and savagery of the onslaught, the hideous wounds and high mortality, even the inscrutable nature of the attacker itself, quite explain why people feel as strongly about sharks as they do.

Strangely enough, the very intensity of this irrational fear is likely to be responsible for the increase in knowledge that may eventually dispel the emotion. When people feel very strongly about something, sooner or later something has to be done about it. This is exactly what the U.S. Navy discovered during World War II when it began to send men on long flights over lonely, shark-infested oceans. Facing the enemy was one thing; fear of being forced down in such waters was quite another. To meet this problem of morale, the Navy developed the "Shark Chaser," a small cake of chemicals repugnant to sharks, so prepared that they dissolved slowly when exposed to sea water. As soon as a downed flyer, floating in his "Mae West" life preserver, spotted a shark, he removed the cake from its waterproof envelope and dangled it in the water by means of a tape.[2] The Shark Chaser was considered a success, both psychologically and operationally, but in recent years the desire to improve it has grown and with this the realisation of the need to know exactly why sharks attack men in the first place.

Obviously a programme of scientific study was required, and the Office of Naval Research turned

to the American Institute of Biological Sciences for help. In April, 1958, 34 experts from the United States, Australia, South Africa and Japan met at Tulane University, where they discussed shark attacks and their prevention. The need to organise existing knowledge about sharks quickly became apparent. As a result, the experts are now preparing a book to do just that. In order to stimulate and direct new studies, they formed the A.I.B.S. Shark Research Panel. This committee is now supervising a world-wide programme of research whose aim is a better understanding of the behaviour and biology of sharks which in turn may lead to the solution of the shark problem.[2]

Dangerous Species of Sharks

Chairman of the Panel is Dr. Perry W. Gilbert, Professor of Zoology at Cornell University, and his office serves as one of its headquarters. A visit there quickly reveals how varied is the Panel's approach to the study of shark attack and how all sorts of seemingly unrelated facts are being fitted into one coherent picture. Part of the ample room forms a laboratory; here a technician is preparing slides of shark eyes so that their finest structure may be described with the use of a microscope. Near her stands a large cabinet filled with carefully labelled sharks' teeth and pieces of shark skin. In less than 5 per cent. of the cases of attack has the culprit been identified. This is understandable when it is realised that 29 different species of shark have been placed either in the category "Known to be Dangerous" or "Potentially Dangerous" and that several of these are wide-ranging in habit. The victim or witness of a shark attack is not likely to notice the fine points of structure or coloration that characterise different kinds of sharks. Some species have uniquely shaped teeth, which occasionally break off in the wound—a grisly calling card. In such instances, the collection of shark teeth provides a simple and accurate key. Someday we may be able to identify sharks by the kinds of wounds they inflict. To this end, an ever-growing collection of sharks' jaws and photographs of wounds inflicted by sharks is being assembled by Dr. Gilbert.

Lining the walls are shelf upon shelf of books and papers devoted to some aspect of the shark—the work of biologists, medical men and various non-professionals who preceded present-day investigators and on whose shoulders they figuratively stand.

Records of Shark Attacks

An important part of the Panel's activities is centred in the large green metal filing cabinet that stands by itself near Dr. Gilbert's desk. Here are kept the records on every shark attack known to the Panel. A second set, elaborately cross-indexed, is maintained by the Panel's secretary, Dr. Leonard P. Schultz, in the Division of Fishes of the U.S. National Museum. As soon as Drs. Gilbert or Schultz learn of an attack, they communicate with a scientist in the area, no matter how remote, who then gathers all the information he can about it. He has the help of a printed questionnaire which calls for such detailed data as the colour of the victim's clothing and the clarity of the water in which the attack occurred. Multiple documentation is sought whenever possible so that accounts may be checked against one another. Newspapermen and the attending physician often contribute significant details. All this is assembled in its own individual folder along with newspaper clippings and photographs. Later, official documents, such as a coroner's report, may be added. There are 39 folders on file for the year 1959, originating from such widely scattered localities as Tasmania, Mozambique, the Solomon Islands, Panama, the Philippines, Florida and California. Twenty-five of them are identified by white finding-tabs, which indicate that the victim recovered, but the rest are marked with red. In these 14 instances, the individual died.

Subduing a 9½-feet lemon shark by means of rapidly acting anaesthetic forced into the mouth and over the sensitive gills with a garden spray. The shark is then easily put in a holding pen

Sometime in the future, when the green filing cabinet is much fuller than it is now, an analysis of the carefully documented attacks may reveal some as-yet hidden regular patterns or correlations. Then we may be able to predict with confidence under what conditions shark attacks are most likely to occur—and so avoid them. Up to now, the single most impressive feature of the attacks on men by sharks has been their *unpredictability*. Men have floated in the sea for hours while sharks circled them, even nosed and touched them, but did them no harm. On the other hand, attacks have occurred under the most unusual and different conditions in places where no attack had ever been reported before. Commandante Jacques-Yves Cousteau, who has probably had more underwater experience with sharks than any other man, has declared that "The better we are acquainted with sharks, the less we know them, and one can never tell what a shark is going to do."[1]

A few generalisations can be made, however, as Panel Member Stewart Springer has done, for example. Seldom will a shark bite a man in water that is cooler than 65°F. This seems to explain the seasonal pattern of shark attacks occurring around Australia, on the south-east coast of Africa and along the U.S.A. Atlantic seaboard. That the presence of blood or other body exudates attracts sharks and puts them in a feeding mood everyone will agree. This was dramatically confirmed 5 years ago by a diver who, while moving along the bottom near shore in California, was

In the special shark pen at the Lerner Marine Laboratory, a bull and a lemon shark (right) approach the dead fish lure, above which is a bottle of nigrosine dye that is being tested as a repellent

suddenly struck on the head by a leopard shark, a small species not known to attack man and so poorly armed that it did not inflict any injury. The diver then noticed that his nose had been bleeding and that blood had been passing into the water. After snapping at some blood-tainted exhaust bubbles, the shark turned and again struck at the diver's head. This time it was warded off and swam away.[4] Similarly, spearfishermen are learning that any dead fish they tie to their belts often makes them the centre of attraction for sharks that ordinarily would pay them no heed.[5]

"Rogue Shark" Theory

Once a shark attack has occurred, the chances of several more taking place in the same area are relatively high. This fact, plus the frequent history of no attacks in a given area for many years, then several attacks within a period of a few weeks to a few years followed by another long period of freedom from attack, led Coppleson to propose his "rogue shark" theory.[6] A single, particularly aggressive shark, or one that had acquired the habit of feeding on human beings, could account for these patterns nicely, and in a couple of instances a "rogue" appears to have been caught, whereupon the assaults ceased. Man-eating lions and tigers immediately come to mind, but there is no evidence that man-eating sharks give up feeding on other kinds of prey as the big cats frequently do once they have killed and eaten a man or two. The classic example of a "rogue" shark was the 8½-feet white or man-eater shark that terrorised the New Jersey coast in the summer of 1916. Within a 10-days period it killed four men or boys and mutilated another boy. Two days later a shark was caught not far away, and in its stomach were found human flesh and bones. No more attacks occurred after this. More recently New York has had two or three "shark scares," but no injuries that were unequivocally shark-inflicted have been suffered by bathers in the metropolitan area since 1916.

One of the New Jersey attacks was unique in that the shark's fourth victim was killed while trying to rescue its third, who was being held in his arms at the time. This appears to be the only instance in which a would-be rescuer has been attacked by the shark responsible for the original disaster. Incredible, yet fully documented, stories have been told of how sharks have returned to attack their human prey again and again but have not harmed swimmers who were trying to save the injured bather, although they were close enough to have been bathed by his blood. In one case, the shark was able to slip among five men who were trying to pass an inflated rubber tube around its victim, and administered still another bite.[7] In more than one instance, the shark actually pulled its unfortunate victim out of the arms of a friend who was trying to save him.

Several similar cases are on record, and they all indicate that the shark can accurately locate its prey even amid situations of great confusion. They also show the shark as singularly intent on its prey, even in the presence of other vulnerable examples of the same species. This behaviour is strikingly different from the "mad dog" feeding behaviour exhibited by schools of bluefish, tuna or piranhas, or by groups of sharks in which each individual wildly and rapidly snaps at almost everything that crosses its path. Evidently sharks in groups act differently from sharks alone.

Diet of Sharks

There are times, at least, when some sharks show no discrimination whatsoever in their feeding habits. The list of things that have been found in sharks' stomachs is long and bizarre and includes just about everything, edible or inedible, that occurs in the upper levels of the ocean. Fishes eaten include seemingly well-protected species like the armoured trunkfish, the pin-cushion porcupine fish and the stingray, which sometimes leaves its sharp bony "sting" embedded in the shark's mouth. Sharks eat other sharks, even smaller members of their own species.

Some sharks specialise in shellfish; most of them relish squid and octupus if they can get them. Turtles are consumed shell and all, and sea birds, sealions, seals and even whales are not immune to occasional attack. Sharks are strictly meat-eaters, and since no one has ever accused a shark of being fastidious, the presence of horses' hooves and other offal, as well as a corpse now and then, is to be expected. But how to explain the mouldy bread, decayed oranges, tin cans, oil-soaked cotton waste from ships' engine rooms, and sacks of coal that have been removed from various sharks' stomachs?[8] Behaviour that permits the swallowing of such a miscellany seems poles apart from that of a man-eater boring in for his particular prey.

Dr. Perry W. Gilbert (centre) prepares to operate on a nurse shark, Ginglymostoma cirratum. Although considered one of the most inoffensive sharks, the nurse shark has been known to bite under some conditions

We really know very little about the feeding behaviour of sharks—except that they don't have to turn on their backs or sides to bite, as popular belief would have it. As a matter of fact, we know surprisingly little about all aspects of shark behaviour, and the underlying physiology as well. This is a situation that the A.I.B.S. Shark Panel has set out to change. Without a good understanding of shark behaviour we cannot hope to know what makes certain sharks attack men and what we can do to eliminate this tendency.

An obvious first step is to study the sense organs of the shark. This reasonably well accomplished, we shall have a rudimentary idea of what a shark's world is like—to a shark. We do know that sharks are primarily smell-minded. General observations, the anatomy of the brain and a few controlled experiments all agree that smell is the most important faculty by which the shark finds out what is going on in its environment.[8] Practically nothing has been determined about the sensitivity of shark noses and not a great deal more about what specific chemicals are attracting or repelling to a hungry shark. Research along these lines is fundamental to any improvement of the U.S. Navy's "Shark Chaser." It is being actively pursued on several fronts.

Shark Pens at Bimini

In order to study the behaviour patterns and responses of large sharks, including dangerous species, special pens have been built in the shallow, clear waters at the Lerner Marine Laboratory on Bimini, B.W.I. These pens are unique, since they include an operating chamber into which a large shark may be guided, there to be secured in a net and lifted out of the water by an overhead crane. Dr. Perry W. Gilbert designed these facilities to enable him to administer an anaesthetic to a shark, then temporarily blind it or block its sense of smell. To operate successfully on a shark in this manner is no mean accomplishment when one is dealing with a thrashing 800-pounds monster, which could amputate a man's arm or send him flying through the air with ease. In another pen, the reactions of sharks, either normal or those after operation, can be observed and recorded by means of a motion-picture camera. The present tests are being made with chemicals, foods and physiological fluids such as blood to find out which are attractive, which repellent under different conditions. One group of substances that is being tested are those formed during the rotting of shark flesh. A good many years ago, whalers noticed that when they killed sharks and allowed them to remain in the water to decompose, no sharks would be seen for long periods afterwards. More systematic observation has confirmed this effect on at least some species of sharks, although not for all. But it would not be practical to carry a piece of rotten shark meat around in order to keep the sharks away! Therefore a patient search is being made to discover which of the hundreds of decomposition products are the active agents. Many other materials also require testing, for example, the "ink" that the octopus releases when disturbed. When moray eels, which regularly prey on the octopus, are exposed to this pigmented fluid, they will not bite an octopus even if they accidentally bump it with their snout.[10]

Some people may give off substances—in their sweat, for example—that make them especially attractive to sharks. Or they may *lack* a repulsive substance present in most people. Dr. Gilbert suggests that some day swimmers, divers or pilots may be able to take a pill that makes them malodorous to sharks.

There are even greater gaps in our knowledge of the vision of sharks. At one time sharks' eyes were believed to be of little use to them, but Dr. Gilbert's anatomical and behavioural studies indicate that their eyes are very sensitive, although incapable of acute vision. This would explain the attraction that light or shiny objects frequently have for sharks, and why some dark-skinned natives hide the soles of their feet with black sandals before going in the water and Greek sponge divers hide the palms of their hands in the armpits of their black suits. Possibly this may be why a shark attacked only the hands of a man who recently spent 18 hours in the Atlantic, clinging to a life-preserver cushion from his sunken fishing skiff. The myths that sharks rarely if ever attack dark-skinned people or that they cannot see any dark object may have originated in the attractiveness that light or bright things have for them.

Future Investigations

Other senses must be considered also. Why will sharks gather from considerable distances around a source of weak, spasmodic motions in water, but not strong rhythmic ones? On occasion divers have been able to drive away sharks by shouting at them underwater, but some sounds definitely attract them. The whole subject of the effects of underwater sounds and vibrations on sharks needs to be investigated.

The need to analyse the feeding behaviour of sharks has already been pointed out. Reproduction may require some attention, too, because the possibility exists that a waxing and waning of aggressiveness may be associated with hormones and the reproductive cycle. Experiments recently conducted at the Cape Haze Marine Laboratory on the Gulf coast of Florida have showed that sharks are capable of learning in a simple fashion.[11] Does learning play any role in the development of an habitual man-eater or "rogue" shark?

The Shark Research Panel of the A.I.B.S. is primarily concerned with a single, rather unusual type of behaviour that occurs in less than 10 per cent. of all the species of sharks. Nevertheless, in trying to find out what causes sharks to attack men and how this can be prevented, the Panel has had to go far afield. Harmless as well as dangerous species have been studied, and fishes other than sharks have provided clues pointing to profitable lines of research. We have also seen that there is much more involved in a thoroughgoing analysis of attack behaviour than the study of the attacks themselves. In fact, the Panel is interested in every aspect of the biology of sharks, because no one knows just where some piece of information vital to the solution of the central problem will turn up.

The more we learn about sharks, the less mysterious they must become. We hope eventually to be able to predict and control their behaviour to such an extent that shark attacks will become a thing of the past. Nevertheless, we are sure that the sinister essence of the shark will linger in the minds of men long after it has ceased to be the cause of sudden, unpredictable death.

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Breeding the Flame Fish *(Hyphessobrycon flammeus)*

by E. WALLWORK

THIS lively little characin has none of the bad characteristics usually associated with the larger members of the family, as it is shy and peaceful and does not nip the fins of other fishes. When fully established in a tank, it will mix well with almost all other fishes of moderate disposition.

The posterior two-thirds of the fish is a bright flame red and this is continued into the fins, which are, except for the pectoral and caudal fins, edged with black. Immediately behind the eye on a silvery background are two vertical black bars of variable intensity according to the mood of the fish. The adipose fin, which is a feature of the characins, is easily seen on the flame fish in contrast to the colourful body.

No great variation of colour is apparent in the sexes, which are easily identified, not only by the fuller body shape of the female but also by the shape of the anal fin, the lower border of which is almost straight in the female but shows a distinct concavity in the male. These are best seen when the fish are not moving, as the anal fin of the female appears concave, too, if the fish are swimming fast. Quite often the female is larger than the male, who will display his colour and fins in front of her as sexual maturity is reached. Against a well-planted background, a group of flame fish present a most attractive picture.

Feeding the fish presents no problem as they will eat almost anything small enough for their mouths, but, being by nature carnivorous, they prefer live foods such as *Daphnia*, *Tubifex*, *Cyclops*, glass worms and small white worms. Sometimes the larger white worms will cause the flame fish to choke or distress it by finding its way through the gill plates.

Male flame fish

Generally this fish will live in a community tank at 75 F and can be brought into breeding condition in this way, but it is sound psychology to separate the chosen pair for 10 days or so before breeding them—the breeding tank being prepared in the meantime. It is my opinion that to obtain the best localisation of sperm and eggs small shallow tanks are best, and 24 in. by 6 in. by 6 in. and 12 in. by 8 in. by 8 in. aquaria have both been successfully used.

Consideration of the water used in the breeding tank is of primary importance, and I can attribute a number of personal failures to experimentation along these lines. According to the available aquarium literature, the flame fish would seem to do best in faintly acid water, pH.6.8-7.0, but to stabilise this is more difficult than it seems to be. Mineral acids often prove fatal to fish and plant life, so these were not tried. Peat digested in water produced an acid solution which was added to mature tank water to lower the pH on one occasion, but within a week the plant life had changed the value to its own liking. Tannic acid was also tried, with the same results. However, one day whilst collecting *Daphnia* and glass worms from a local deep pool, the bottom of which was covered with oak and willow leaves, I brought back some of the clear faintly brown water in a bucket, and this was used to fill a tank 24 in. by 6 in. by 6 in. previously cleaned out and without gravel or plants. Without any means of testing the water hardness, I should think it was considerably softer than my usual tap-water supply, which is notoriously hard in my area. Suitable combination of pH and hardness of the water is known to be the secret of successful breeding of the egglayers, and the flame fish is no exception.

The breeding tank containing this water was then set up and, as a spawning medium, boiled willow root was massed towards the one end. No other plants were used; the temperature was raised to 80 F and the pH was found to be 6.8-7.0. In order to minimise the nervousness of the breeding pair, which were about 1 in. long, the front glass of the tank was masked with newspaper.

The pair of fish were introduced to each other and to the tank in the evening, both fish losing much of their colour and each adopting a different corner of the tank. At that time they showed no apparent interest in one another. After about 24 hours or so their colour was brighter than ever and they swam around the tank together, dashing deep into the willow-root masses. At that time, with a restricted "peep hole," no eggs were seen and they were left for a further 24 hours and then it could be seen that the female was thinner. Both fish were then removed and returned to their original tanks.

Only with difficulty could a few eggs be seen, as they were faintly amber and showed no contrast in this water and with a background of willow roots. These eggs were very minute and adherent to the roots. Assuming that I may have detached some of them in netting out the parents, the tank was left for 36 hours. Then, and only with good top light, tiny transparent splinters, which were the young fry, could be seen with a lens. Here was where the real problem started; my stock Infusoria culture was *Paramoecium*, which was much too large to feed to them. Fortunately some *Euglena viridis* was available and this was used in conjunction with an almost continuous top light, and if I did not raise a large batch of flame fish, I certainly grew a better culture of *Euglena* at this time. At this time, micro worm was not available to me but the young fry were graduated on to brine shrimp, small *Daphnia* and dust-fine dried food.

A batch of 47 was successfully raised. No doubt the size of the batch is dependent on the aquarist's sense of judgment in removing the parent fishes from the breeding tank at the right time, that is before they start to eat their own eggs, which they are very prone to do. Under identical conditions and with two males to one female, I did raise a batch more than twice as large, but they all developed swim-bladder trouble when they were about ½ in. long. No explanation can be offered for this, as a third batch, though smaller, was quite normal, from the same parent fish.

Generally speaking, flame fish do not grow rapidly in the early stages but are pleasurable to watch if you can spare the tank. It is quite some time before you can introduce them to a tank of grown fish. It is well worth the effort to provide them with such a tank and, if you can provide them with a background of fine-leaved green plants, they soon overcome much of their inherent nervousness and look most attractive in a shoal.

The Garden Pond in April

by ASTILBES

THE pondkeeper will find that this month is the busiest of the year, as all water plants will be starting into new growth after the winter's rest and so it is a good time to plant and transplant. Any newly made pond can be planted now, and the plants will soon make good growth from now on. Any pond which has been in existence for 3 years or more will benefit from a good thinning out of many of the plants and some may be split up to make fresh ones.

As far as the new pond is concerned a few words of advice to the newcomer to the hobby may not be amiss. The old method was to put a good layer of loam and sand at the bottom of the pond in which to plant the water subjects. This method is all right as far as the growth of the plants is concerned, but after a few years it will be found that the plants have made so much growth that their roots are intermingled together and the clumps of plants have become so dense that it is a very difficult task to get anything like order back into the pond. A large quantity of mulm will also have formed and this will increase the depth of the base compost to such an extent that the depth of water may be lessened considerably by such action.

Over-grown Pond

No one who has not come up against an over-grown pond could possibly realise how some of the plants have grown and become such a dense mass. To get anything like a decent result from now on will require the drastic use of a sharp spade, with which to cut into the clumps of water plants. Most plants will make rapid and very strong growth as they will never suffer from lack of moisture as would ordinary plants in the garden. Provided there have been fishes present in the water the plants have also never had to go short of manure. The result is that what was a nice-looking open pond will soon become so overgrown that the water itself cannot be seen and any fishes will be practically hidden from view and may as well not be there at all.

What can be done to lessen the tendency for this ultimate crowding of the pond with plants? The answer is, of course, that the plants should all be set in separate containers. These can be ordinary flower pots, special ones with side holes at the base, or plastic pots or pans. These last-named are very useful indeed, and some good-sized trays can be had which lie comfortably on the bottom of the pond, give plenty of space for the commencement of root growth and yet can be removed quite easily when it is necessary to clean out the pond at some future date. Where any containers are used it must not be thought that the roots of the plants will be for ever confined to these receptacles. Once the plants make active growth the roots will soon venture outside the pans and get food from the surrounding mulm. Even if this happens it will be possible to lift the containers out if needed, and provided that there is no base soil in the pond no trouble will be encountered.

Planting Medium

When planting any water plant it will be found that old turves make the best material for potting. If ordinary potting compost is used it will be found that it will soon get washed out of the container by the movements of the fishes, but if the old turves have been used the numerous fine roots in it will give a firm anchorage for the roots of the plants, which in turn will soon bind the compost together. Once the pans have been prepared the plants can be set very carefully. Any strongly rooted plants such as water lilies present few difficulties. It is when one comes to plant some of the tender-stemmed oxygenating

Photo: W. J. Howes

The plant in the foreground of this surface view of a pond is Canadian pond weed. The photograph demonstrates the degree of crowding that can occur when growth is unrestricted

plants that trouble may ensue. Unless great care is taken with these it is possible that the fragile stems will break and the plants will float up to the surface of the water and take a long time to get established again. When planting such specimens it is well to lay the stems on the surface of the turf and then cover with stones so that they are kept rigidly in their places until they are able to send out roots and become firmly held.

Functions of Water Plants

When considering which plants to use remember that water plants serve several purposes. The under-water ones will give off oxygen in strong light and will use up much of the waste matter in the water, as well as being a strong deterrent to the formation of free-floating green algae. The reoxygenation of the water is not of great importance as most ponds are reoxygenated from the atmosphere and do not have to depend on water plants as does water in a small tank, where the surface is reduced a large amount. Some under-water plants are very good in the pond and some of the others which may be favourites with the indoor tank are not nearly as good. It is probable that most pond-keepers would agree that the finest under-water plant for the pond is *Lagarosiphon major*. This plant grows with long closely leaved stems which can run up to 3 feet long in a couple of weeks. If well established this plant will make grand dark-green growth which is a fine deterrent to algae forming in the water. It also makes a fine receptacle for fish eggs and the closely packed, recurving leaves make a good hiding place for any fry.

Another good plant but one which is not quite as strong growing is *Elodea densa*; it has less tightly packed leaves, but is a good grower and oxygenator. Such plants as water starwort and *Myriophyllum spicatum* are rather too tender for the pond and would be likely to be broken up too easily by the fishes. There is no need to plant too many of the above-recommended plants as they soon make plenty of growth as long as they are given a chance to become established before large fishes are placed in the pond. If large goldfish are introduced into a newly planted pond they will soon dislodge any fragile or insufficiently rooted plant.

When planting such subjects as water lilies it is necessary to fix them into their containers firmly or else when the plants have made a good crop of leaves which float on the surface the whole root system can be pulled up from the bottom to float on the top of the water. To prevent this from happening it is necessary to tie the rootstock to the

container with some plastic string. Pass this under the pan and through the stems of the lily. Be careful when doing so that any flower buds are not broken off. These form quite early in the year and can usually be seen as early as April. Such plants as *Pontederia cordata* and *Sagittaria japonica* are also fine plants for giving a good show of flowers once they are well established, but it must be understood that their leaves are held well above the water and so cannot be considered oxygenators by any means. However, the action of their roots helps a lot to keep the water pure and sweet by breaking down and utilising the droppings of the fishes. Also they break up the flat surface of the water and provide plenty of flowers throughout the summer months.

Always plant with care, as it is so easy to get too many plants in a fairly small pond, and after a short space of time, even within the year, the pond can be overgrown and lose its beauty. To discourage the growth of green algae in a newly made pond it is a good plan to place a good quantity of floating plant life on the surface, as this will shade the water from much of the sunlight and help to keep the water clear. Once the other plants have become well rooted and growing the surface covering can be largely removed without algae forming excessively in the water. It is hopeless to expect to make a pond and then not have the water become green soon after it is planted, as this is quite a natural happening. However, even if left alone it will clear itself once the sun loses its power and may not return again the following year. Frequent changing of the water is not likely to clear the pond as fresh water seems only to encourage the formation of the algae, but an occasional change of water does give the other water plants a chance to get growing well, when they can help to choke out the algae.

The Clown Barb (*Barbus everetti*) *by* JACK HEMS

THIS, one of the handsomest fishes that the genus *Barbus* has bestowed upon tropical aquarists, is native to the rivers and streams of the Malay Peninsula and Borneo. It is reputed to attain a length of 8 inches or so in the wild state, but in the aquarium it reaches only about half that size.

Quite a number of aquarium fishes fail to reach the size they attain in nature, and perhaps this may be attributed to lack of certain salts in the water, paucity or complete absence of preferred live or green food, and other factors about which we cannot know. But be that as it may, it is better from the aquarist's point of view that a fish does not grow so large that it becomes a problem to accommodate, and maybe loses its colours into the bargain, as happens to so many large fishes after they have reached maximum size.

The clown barb, which is scientifically known as *Barbus everetti*, in general body colour is light greenish yellow to pale green-gold, darker on the back and shading to silvery white on the underparts. The side is adorned with several prominent blue-black blotches and wedge-shaped markings. The fins are pink to red. There are two pairs of barbels on the mouth. However, the colours of the fish do not show to any marked degree until it is about 12 to 18 months old, or when it is in the region of 2 or 3 inches long. At this size, it is not difficult to tell the sexes apart, for a mature female has a deeper body than the male, and her colours are a trifle more subdued.

B. everetti is not a pugnacious species, and is quite suitable to place in a community tank spacious enough to support it in comfort, and stocked with fishes large enough not to be mistaken for live food.

Mention of food brings to mind that this species will eat any type of live or dried food. And, like its relative the goldfish, it will even grow fat on finely minced scraps from the dinner table. It also likes to eat mossy algae and duckweed.

Although a temperature of 78°F suits the clown barb best, it is hardy enough to stand cooler water, say, down to 65°F, without suffering any ill-effects. All the same, it should not be kept in a low temperature for any length of time as it is essentially a warmth-loving species.

This barb is not among the prolific species. But when it does succumb to the aphrodisiacal effect of extra heat, good food, the right partner and so forth, it spawns in the manner of other barbs, the highly coloured male exciting and chasing the fuller-sided female in and out of the plant life, where she scatters her adhesive eggs.

The eggs are scattered at all levels of the water, that is, in plant thickets on the bottom or among the feathery roots of floating fern or water hyacinth. A well-lit tank holding some 12 to 15 gallons of water is necessary for spawning, and after spawning is over the parents must be removed from the tank as quickly as possible, for they do not take long to make a banquet of their several hundreds of eggs.

The eggs, which are quite large, hatch out in about 3 days, and the fry stay tail-down on the plant life and the sides of the aquarium until they have absorbed their yolk sacs. Absorption of the yolk sac occupies 2 or 3 days, and then the baby fish assume the normal horizontal position and become gluttons for food.

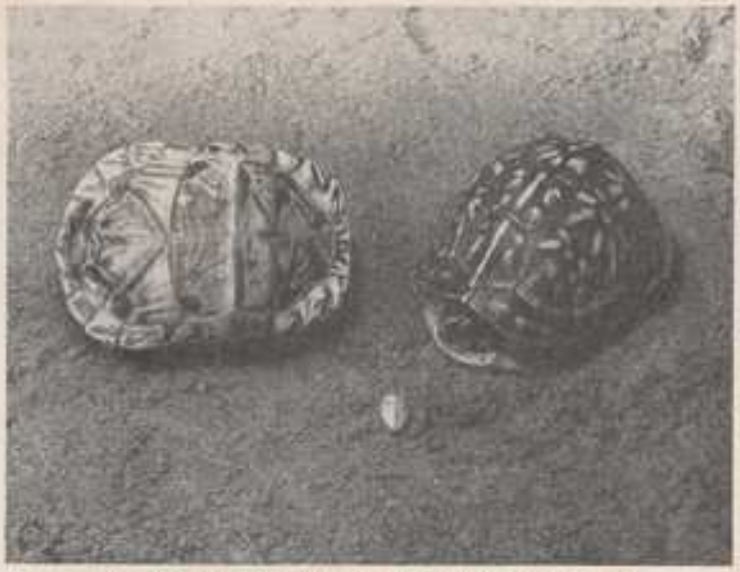
For the first week or so after becoming free-swimming, Infusoria, or an infusion of hard-boiled yolk of fowl's egg, must be fed to them. The latter food is easily prepared by shaking some crumbs of the yolk in a small quantity of water, and introducing small amounts of the cloudy yellow mixture into the aquarium several times every day. The fry also appear to benefit at this early stage of their existence if some soupy green water is poured into the aquarium; but not too much of this at a time, mind you, or else you will not be able to watch the progress of the fry because of the green fog.

As the fry increase in size, a steady supply of larger live food such as micro worms, mosquito larvae, tiny white worms or newly hatched brine shrimps becomes necessary. Powdered proprietary dried food or powdered Bemax may also be used to supplement their carnivorous diet.

If kept in cramped conditions the fry will make slow progress, and many of them will die; so it is up to the aquarist to sort out the strongest looking youngsters from a brood and transfer them to other understocked tanks, or just keep a score or so to grow on in the spawning aquarium (aeration and filtration of the water accelerates growth); and, believe me, a tank of clown barbs is a lovely sight.

About three decades ago, some confusion existed between the spanner barb (*B. lateristriga*) and the clown barb, and the one often masqueraded under the scientific name of the other, for, generally speaking, their body outline and side markings are not unlike. But though the spanner barb, which also comes from the Malay Peninsula, is an eye-catching fish, it lacks the showy circus tints of *B. everetti*.

As a rule, the clown barb will outlive most other fishes kept in the aquarium because it has a life span of above 6 or 7 years; but then a long life is not uncommon among large fishes which take a considerable time to reach maturity.



One of this pair of box tortoises has been turned over to show the completely closed under shell (plastron)

BOX TORTOISES *by* ROBERT BUSTARD

(Photographs by the author)

NOW that the warmer weather is approaching we can once again turn our attention to reptiles that are suitable for life in the outdoor enclosure. One very interesting group which immediately springs to mind is the box tortoises, which can be allowed to roam freely if the garden is securely walled in. Box tortoises have long been popular pets in Britain, where their attractive coloration, longevity, relative hardiness and intelligent nature have made them firm favourites with collectors.

Box tortoises are once again quite readily obtainable in this country. Those most commonly kept are the American species belonging to the genus *Terrapene*. They do not grow very large and those available usually have a shell length of about 4 to 5 inches. Unlike other tortoises, box tortoises will clear your garden of slugs, they are largely carnivorous and will devour any grubs, slugs, earthworms and the like which they find. They are also frugivorous, being very fond of any soft fruit such as bananas and strawberries.

Many collectors prefer to keep their box tortoises in an enclosure in the garden so that they do not wander away. If this is done the chosen location should receive a reasonable amount of sunshine. The enclosure for box tortoises should also contain some vegetation for them to hide amongst and to provide shade. It is a good plan to provide a small home for them as do most tortoise collectors. This can be a wooden or metal box sunk into the ground, consisting of a back, two sides and a roof; the front is open. The box is sunk into the ground until the roof is about 6 inches above ground level. Loose earth and dead leaves can be added, and into these the box tortoises will burrow during cool spells.

Box tortoises are thought to be aberrant terrapins which are once again becoming terrestrial creatures (terrapins are tortoises which have taken to a semi-aquatic existence, with various adaptations, such as a streamlined carapace, webbed feet etc.), and they still frequent damp places, unlike true land tortoises. This must be remembered when they are kept in captivity and a shallow depression should be provided with mud and a water depth of only 1 to 2 inches. Whereas most terrapins will feed only in the water box tortoises feed readily and indeed largely on land. They do not, however, hesitate to enter the water if they see a tempting earthworm. When in water the swallowing of the food is usually done above water.

The general appearance of these creatures—reminiscent rather of tortoises than terrapins, owing to the raised carapace—belies their nature. They can and do move quickly, and frequently fight over food in true terrapin fashion, unlike the slow dignified tortoise, which unless chasing a mate moves in a most leisurely manner. It is this facet of the behaviour of box tortoises which gives them much of their appeal. They quickly learn to come to their owner for food and when he appears in the enclosure or opens the door he is likely to be met by all the box tortoises at once. Should one specimen be given a large earthworm, too big to swallow at once, it will race off pursued by the others. Captive specimens readily accept raw meat.

Box tortoises are so-called because they possess a hinge

Carolina box tortoise (Terrepene carolina). A hardy and intelligent species that is usually available from dealers

running across the plastron, which, when moved, allows the two sections of the plastron to enclose the animal completely. Box tortoises, it should be noted, are by no means the only testudinates which possess a movable plastron but they possess it to a marked degree. One specimen is shown closed up on its back in the accompanying photographs. This is not, of course, a natural position, the specimen being turned over so that the complete closure of the plastron against the carapace can be seen. When newly purchased they tend to close up when handled but they soon become tame and trusting, their natural greed soon overcoming any shyness.

The species most commonly available is the Carolina box tortoise (*Terrepene carolina*) or one of its sub-species. The average price is about 30 shillings per specimen. Coloration is very variable; the plastron is normally yellowish with brown markings and the carapace is brown with bright-yellow markings. There is a notable vertebral stripe and ridge which is made more conspicuous by being bright yellow.

I strongly urge that several, or at least a pair, of them are kept. They are easy to sex as the female has brown eyes whereas those of the male are red.

During the winter I bring my specimens inside and house them in a roomy vivarium at a temperature of about 65° to 70° F. The winter quarters should always contain a shallow dish of water.

A very handsome species occasionally available is the ornate box tortoise (*Terrepene ornata*), which is lavishly streaked with vivid yellow on a dark, sometimes blackish, carapace, making it decidely reminiscent of the starred tortoises. The ornate box tortoise lacks the distinctive eye colour of the Carolina species and prefers a drier habitat, otherwise it requires identical treatment in captivity. Specimens are likely to be somewhat more expensive than the common box tortoises and when available usually cost between 40s. and 50s. each.

I strongly recommend box tortoises to anyone who has not tried them; they make handsome, interesting and very long-lived pets.

Ornate box tortoise (Terrepene ornata). This species prefers a drier habitat than does the Carolina box tortoise

CACTI IN THE FISH HOUSE

MANY cacti and other succulents can be repotted during this month. A start can be made with those plants which show fresh growth. When in this condition they are able to stand the change more easily than if they were still resting. When re-potting it is essential to remove all the old soil, as this will have become impoverished by the action of the roots during the past year. Do not use too large a pot. For the globular types it is enough to leave a half inch between the plant and edge of the pot for small plants and an inch for larger plants. See that the fresh pots are quite clean and use a piece of broken flower pot as a crock as large as possible to cover the drainage hole, which, of course, must not be blocked. For potting use a good porous soil; special compost for cacti can be purchased from some nurserymen, and if this is not available use John Innes potting compost no. 1 to which has been added a one-sixth extra part of very sharp, coarse sand (that known as washed river grit is ideal). See that the soil is "crumbly moist" when used, and then do not water for a week.

CULTURE OF WATER FLEAS

ABOUT a month ago I was expecting the arrival of a pair of blue gularis. However, in spite of the fact that the New Forest swamp conditions yield perfect "cyprinodont water," the tap water is so alkaline that it does not register on the normal pH set. In view of this, I had either to treat the tap water or to import it. The latter proving impracticable I went to Woolworths and bought a polythene bowl. I filled it with water to which I added mulm and assorted muck from my filters, uneaten raw meat, liberal helpings of dried food and long-deceased bog vegetation. The foundation was soiled peat stable-bedding.

After a fortnight, the pH stuck immovably at 7.6. I decided that even if all the known methods of making water go bad and acid failed, my bowl of vile-looking liquid should fulfil some useful purpose, so I added some *Tubifex* and left the bowl in a dark corner of the fish room for a fortnight.

I shone a torch on to the water the other day to see what had happened, and was surprised to see that the water was thick with *Daphnia*. The parental stock could only have

(Please turn to page 12)

AQUARIST'S Notebook——

by

RAYMOND YATES

NOW that so many of the "get-rich-quick" type of dealer has got out of the hobby, fanciers are probably better served. Anyone who has been in the hobby a reasonable time now knows just what to expect from the dealers in their vicinity, or for that matter, within a radius of 20 or 30 miles. There is the shop which caters for the expert and which is always ready to offer new and more expensive varieties, the dealer who keeps only the major "bread-and-butter" lines, the one who sells mainly locally home-bred fishes and the type whose fishes are always so diminutive (but not so the prices) that one feels his stock can appeal only to midgets from a circus. In big centres where trade is constant, service can be excellent; it can also be very bad indeed. It is a mistake to imagine that all the best stocks can be purchased in London. Undoubtedly excellent fishes are available but the visitor from the country who arrives with several cans expecting to find every variety in the book on sale is in for a shock. Some dealers have a casual, couldn't care less attitude, or their assistants have, and this creates a bad impression on the visitor from afar. My own observation is that the best fishes cannot be bought by any other method than by calling in any and every aquarium shop one gets a chance to visit, just on the off chance. Nine times out of ten you will be disappointed, but you are lucky on the odd time out.

I remember once, years ago, finding two marble cichlids both 7 inches long, 8s. 6d. the pair, in a back-street shop in Liverpool where I had never previously seen anything worth bothering about. In Sheffield I once found three 10-inch angels (and a 10-inch angel is a find) for 25s. I have had similar good fortune in Leeds, Portsmouth, Accrington, Birmingham, Oldham and Bradford, to mention but a few. Like the scouts, you have to be prepared. It helps a lot if the dealer does not know you as this way you can look in and out again without having to waste any time passing the time of day. I cannot think how many times I have carried jars on fruitless journeys, but these disappointments are made up for by those rare occasions when a real find is made. Saturday is the worst possible day to be about on these jaunts; a weekday is far better as you have more room to look around.

Some of the smaller fishes are not always on view when a tank is given a cursory glance. Nowadays we get very little in the form of ignorance or misrepresentation of goods by dealers; such types have left the business. However, we still have the haughty "Well, what do you want" variety and the over-insistent pushers who don't realise that they are driving custom away. Most hobbyists to-day know what they want and see they get that and nothing else. High prices are still a sore point, but one which only supply and demand is likely to affect. I never buy in a shop where no prices are shown, as no dealer is so busy these days that he hasn't time to indicate his price list for what he has on view. I think it very annoying where one finds several varieties in a tank duly priced and one rare type not mentioned. This is commonly done because some collectors have the fever so severe that they will pay far in excess of a reasonable figure. As one gets older it is a great comfort to be able to say no, and deny oneself things which in younger, less-experienced days would have been a must at any price. Do you remember how neons used to sell, or were at least offered, at fantastic prices? Look at them now.

Persistently poor quality of fishes offered is soon noticed by the wise shopper. Small, runtish, weak-coloured specimens, lacking in vitality on view month after month mean that it is useless bothering to visit this shop any more if you want really good fishes; the dealer has got into a groove and is not likely to get out of it for the better. Good fishes can, of course, be picked up at shows, either from the dealers with trade stands or from aquarists with entries in the show. However, shows are not come across every day, in your direction, and owners are often loath to part with good fishes, even if you are the first to enquire about them. Of course, it is the same in other hobbies. The market gardener who has good plants almost always has good plants for sale, the seller of rubbish stock always sells rubbish stock.

As in so many other things personal recommendation is usually to be depended upon. If a dealer is recommended to you by a keen and experienced aquarist you can generally depend on this source. We all know how annoying it is to arrive at the shop and find just nothing worth looking at available, and the dealer says "I'm expecting a fresh consignment in tomorrow or the day after". Well, what else can he say? He doesn't want you to go away and tell everybody you've just left Mother Hubbard's Aquaria Cupboard! Funny, though, if you ring up the next day and the next to ask if the consignment has arrived, how slow these are in arriving. In the end you get back to the "hope for the best—prepared for the worst" attitude of calling in on spec. I know quite a few hobbyists who buy up any good fishes they see on their travels, not for themselves, but for friends. They never have any left on their hands.

* * *

The twentieth anniversary of the arrival of the now famous coelacanth at The East London Museum, Cape Province, South Africa was marked with the issue of a commemorative plate made by the English firm of Wedgwood. The plates are 6 inches in diameter and are white with a raised rim and central figure of the fish in coelacanth blue. These are obtainable only from the museum and could, in time perhaps, become collectors' items of value. Enquiries should be sent to Miss Courtenay-Latimer at the museum.

* * *

The English climate being what it is one can never be forgetful with tropical fishes without paying the penalty, but in warmer areas this is not always so. At a festive occasion in Texas the table decoration consisted of birds, butterflies and flowers with blue-and-green fighters in glasses set to catch the eye. The *Betta* arrived in half-pint jars, sealed and half full of water each. After setting out the fish in the table decor the empty jars were put away in a store room and forgotten. Exactly a month later, when cleaning up, one of the jars was found to contain a blue fighter . . . . . very much alive indeed. Fed with some brine shrimp he was left for an hour, and then discovered to be really at his best after his delayed breakfast, and with a fair-sized bubble nest, too. However, it is wise to mention that although fishes can survive without food for quite long periods by human standards they prefer more regular meals. Fishes which are starved intentionally or by going on hunger strike, as some do, can reach a point of no return, so don't try foolish experiments in this line with valuable fishes.

Fish for the Garden Pond *by* JOHN S. VINDEN

IT is surprising that many people will spend a considerable sum of money on pond construction and plants, and yet begrudge that little extra which will ensure a stock of healthy and suitable fishes.

These people will pay a hasty visit to the local market and come home with a few miserable goldfish in a plastic bag and expect them to thrive and multiply. Sometimes they do, but frequently such fish are moribund at the time of purchase owing to overcrowded and insanitary conditions, coupled with starvation.

The expression "It pays to buy the best" probably applies to fishes more than most other commodities, and by "best" we mean, in this case, the healthiest and liveliest, and not necessarily the largest and most expensive.

A goldfish 3 inches long may cost anything from a few coppers up to a shilling or two, and the pond owner may, with justice, wonder wherein lies the difference. Most goldfish are imported from Italy in rather overcrowded containers, and "cheap" goldfish are those sold very rapidly on the basis of small profits and quick returns. The buyer stands the loss due to the inevitable mortality of a proportion of these fish, for the long journey, and the sudden change of conditions from Southern Europe to the British Isles, is too much for many of them to withstand.

A "dear" goldfish is one, either imported or home bred, which has been kept in open-air ponds in this country for some time, has settled down and has possibly even been overwintered here. Such fish will quickly adapt themselves to the conditions prevailing in the average garden pond.

Although these remarks are made about goldfish, the same argument applies to other types of pond fish. Cheap imported shubunkins, for instance, are frequently brought in with gill flukes, and newly imported orfe, and other species, often carry such unwelcome guests as *Argulus*.

It is always the best policy to buy pond fishes from reliable sources, for one diseased or parasite-infested cheap fish can infect all the other fishes in the pond and cause great losses.

Another source of danger comes from the angler. He will see your pond and offer to bring you some carp, rudd or what you will, the next time he goes fishing. At the risk of giving offence the pond owner must, politely but firmly, refuse the offer. Nearly all wild fishes carry parasites and fishes that have been hooked develop fungus more often than not. The only fishes to accept as gifts are those that you know to be healthy and are merely being given away to make space.

Goldfish are undoubtedly the most popular of pond fishes but there are many others which are equally suitable and, in some conditions, far superior.

For any pond larger than a bath, golden orfe take a lot of beating. They are surface fish, so are always visible, they are lively and not likely to fall as prey to angling cats, they grow rapidly and are exceptionally hardy. Although these fish have usually been imported from the continent in the past, this season substantial quantities of home-bred fish are available. Some have been wintered out of doors in the midlands and are well coloured. The golden orfe is a coloured variety of the Iluropean ide or so-called silver orfe. This fish has all the virtues of the golden orfe except that of colour. They are interesting, but scarcely as beautiful as the golden variety.

Shubunkins are as hardy as common goldfish, but offer more variety, and, under pond conditions, they colour well and breed as readily as the ordinary goldfish. With such uncontrolled breeding one can scarcely hope to raise cup-winning fish, but, if the stock is good to begin with, many well-coloured and attractive offspring can be expected.

Apart from shubunkins there are many colour varieties of common goldfish. These, which go under such names as pearl fish and canary fish, add variety to the stock. Comet goldfish make good pond fish and, in favoured districts, scaled fantails will winter safely. The other deep-bodied goldfish cannot compete with more boisterous fishes and should not be kept as pond fish.

The carp family offers us several other desirable fish including the rudd, the mirror carp, the wonderful hi-goi from Japan and the green and golden tench. The rudd is said to be one of the few fishes which will eat blanket weed, and is, in any case, a handsome fish. The tench, though bottom fish and rarely seen, are exceptionally useful as scavengers. Fish such as orfe never feed from the bottom and the tench will clear up such food as the orfe may miss.

All the fishes so far mentioned are easy to keep and easy to feed for they will all take dried food readily, although they will appreciate the occasional meal of chopped worm, white worm or other live foods.

America offers us several species of attractive perch-like fishes of the bass family. While these fishes are carnivorous they are perfectly safe with other fishes except small fry and, in a large well-established pond, will find enough natural food. In small ponds, however, live food should be offered from time to time. The varieties usually on offer are the common sunfish, a fish as attractive as many tropical cichlids, the peacock-eyed bass, with a distinctive ocellus on its dorsal fin, and the diamond bass, another desirable species.

The American catfish has a doubtful reputation and, since they grow rapidly and have large mouths, they are not too safe with smaller fishes. They are also said to be particularly subject to fungus.

When adding any fishes to ponds make certain that the temperature of the water in the carrying can is approximately that of the pool. Coldwater fishes, like tropicals, do not appreciate sudden chills; if there is a substantial difference in the two temperatures, float the can in the pond until the temperatures have equalised.

When stocking ponds do not be tempted to add large freshwater mussels to "keep the water clear." Sooner or later, and usually sooner, these creatures die, and one large dead mussel can pollute a surprisingly large quantity of water!

Occasionally such fishes as bitterling, loaches and dogfish are offered as pond fishes. Although they will live in ponds they are really too small to be effective and are far more interesting if kept in the aquarium, where their interesting habits can be observed.

Culture of Water Fleas

(continued from page 10)

been introduced with the *Tubifex*, as I have never bought it in my life.

I have used it ever since and as yet there is no evidence that the supply will run out. Contrary to the advice of the experts, no algae or Mastigophora etc., have been introduced in any form, and in any case the absence of light would have prevented photosynthesis taking place.

As far as I am concerned the biggest mystery of all is why the culture has never smelt in the slightest. Normal clean bedding is useless as a foundation; I set up a similar bowl with fresh peat but with no results whatever.

ANTHONY LYMAN DIXON

This veiltail goldfish is the female parent of the trio of fish shown overpage

"Artificial Evolution" in Goldfish

by N. E. PERKINS

(*Photographs by* LAURENCE E. PERKINS)

ALTHOUGH the general principles of evolution are to-day well known, the exact mechanics of the process are still far from complete comprehension, even amongst specialists, since these differ over points of major importance such as the possibility of influence of body cells on hereditary factors in germinal cells (i.e., somatic influence on chromosome material). Although both sides have considerable evidence to support their views, it remains impossible for the intelligent layman to follow either one or the other exclusively.

As an example of the above perhaps it would be as well to cite two such instances. The work of Weismann in proving that damage to somatic material, even if carried on for 20 generations, failed to affect the chromosome material at all, so that injury to the parent was never reproduced in the child, is, perhaps, too well known to require further explanation and illustrates the view most commonly held. More recently, however, to illustrate the other side of the argument, there is the work of R. Glavinic (International Horticultural Congress in the Netherlands, 1955). In these experiments the seedlings of the tomato variety Gold Trophy were grafted on to the stock of the variety Kartofelisni, the two varieties being markedly different in the colour and shape of the fruit and also the type of leaf. The buds on the scion were bagged to prevent cross-pollination and when these eventually formed fruits after self-pollination, the seeds from these were planted. The result was rather astounding, for the plants which grew from these seeds exhibited combinations of both types as if they were true hybrids. Furthermore, on "selfing" some of these, continued variation occurred. Apparently two possible explanations are given, one being that the result may have been caused by chromosome fragments which have broken away and run wild, and the other, that the determinant involved is the cytoplasm rather than the nucleus. The fact remains, however, that somatic material has, by demonstration, affected chromosome material.

"Artificial Evolution"

Now, I can imagine some readers thinking: "What's all this got to do with fishes?" Well, just this. There are a great many people keeping, breeding and exhibiting fishes of various kinds and since many of these fishkeepers are consciously attempting to produce specimens to a standard conceived by man, it may be said that such results as are achieved represent what might be called examples of

A trio of young goldfish from the same parents, showing metallic, matt and nacreous scaling

artificial evolution, since they are brought about by man's selection based upon appreciation of artistic or bizarre forms, in contrast with the selective force of nature where adaptability to present environment and versatility to ensure further adaptability are of paramount importance. However, the mechanics involved are probably the same and each of the breeders must conduct his efforts on some sort of plan based on available knowledge, although he may have intuitive ideas of his own which he also pursues. Now it is the intuitive idea which, in my opinion, is important, for although more than 99 per cent. will prove erroneous on practical examination, existing viewpoints will thus receive continual verification whilst the possible chance of success means the acquisition of a genuine new viewpoint which could be invaluable.

Effect of "Wintering"

With regard to the question of somatic influence on germ cells, I like to think that methods of allowing complete hibernation for all types of fancy goldfish yield something more than the mere selection of those that survive, for it must be understood that any fishes under these conditions, even our own native carp and tench etc., scarcely present a cheerful spectacle when the temperature is around the critical mark of 4° Centigrade (39°F), so that for a fair portion of the year one's fishes are either out of view if in a pond, or wobbling unsteadily around a tank if in unheated aquaria in a cold house. (This latter method of wintering fishes throws a far greater strain on the specimens than would life under ice in the pond owing to the smaller quantity of water generally involved.) The temptation to raise the temperature of their water is therefore twofold. One, in that it is more pleasurable to have active fishes where one can see and enjoy them, and two, that doubts about their ability to stand the strain arise as we see their ungainly movements at the very low temperatures generally experienced in the first 2 months of the year.

However, for myself, having kept many of our native fishes under like conditions, I am not unduly perturbed and all the fish here illustrated have passed their winters in the same manner. Since the ova are undergoing development during this difficult period there is always the chance that the chemistry involved in this process may be affected by the lower temperature at which it is compelled to function, whereas if one considers that the metabolic rate is so lowered that the development in this direction is practically halted, then again there may even be advantageous results from this.

Variation and Hybridisation

Whilst on the point of possible somatic effect upon germ cells, I think it fair to point out that since evolution is considered to have been largely effected by accumulative minor mutations, it is rather unfair to decide the parallel issue of somatic influence by experiments which must yield a major change to justify their point. Surely, very minor influences in this direction could guide the whole mechanics of life and these might be of such a slight nature as to hamper detection.

Since goldfish have been under the influence of this

This veiltail goldfish is the male parent of the trio of fish shown in the colour picture above

A nacreous fish with patches of matt and metallic scaling

A coarse nacreous goldfish with a strong tendency toward metallic scaling

artificial selection for a far greater period than any other known species, it is not surprising that we find a great variation in form, colour and finnage exhibited. Notwithstanding great divergences of characteristics, however, they are all still very much members of the same species and the system is still quite open in that indiscriminate crossings of any kind may be made. This, however, does not mean that it will always be so, since if specialised breeding to type was continued for a sufficient period, the possibility of isolation would occur; i.e., incompatibility of chromosome material between that type and others. This is considered to be a feature of evolution, races undergoing speciation to consolidate their evolutionary gain. Definition of what we mean by species is, however, difficult, since many of the carp family (Cyprinidae) are quite capable of interbreeding, known hybrids produced under natural conditions including such varied forms as white bream and bleak, bream and roach, bream and crucian carp, and the goldfish has been known to breed with the latter and to produce fertile offspring. However, the likelihood of some of the more extraordinary types of goldfish becoming isolated is, to my way of thinking, quite a possibility and is a condition to be looked for in the future, provided that a variety is continually bred as though geographical isolation had occurred.

Metallic, Nacreous and Matt

Perhaps the most interesting of these genetical developments has been the production of fish of the same spawning exhibiting entirely different outward appearances in colour and metallic shine. Although this occurred many years ago it was only in recent years brought to the fore as a genetical difference illustrating incomplete dominance. In the early days it was pointed out by those best qualified to know, that three groups of goldfish existed, these being in accordance with the usual Mendelian sequence where incomplete dominance is exhibited. The three types were named metallic, nacreous and matt by the Goldfish Society

Celestial goldfish : a multi-coloured male (left) and a uniformly coloured female

These 2-years-old celestial goldfish are the offspring of the pair shown in the colour picture on the preceding page

The characteristic features of celestial goldfish are well displayed in a pond, where the fish are viewed from above, as can be seen by comparing the appearance of the fish in this photograph with those in the colour picture at the top of the page

of Great Britain, these terms suitably describing their appearance. At the time there were some of us who did not think this entirely accurate, since it was possible to find specimens ranging from the completely metallic forms through every conceivable shade of difference to a completely matt form. However, since the majority of specimens could be arbitrarily placed in one of the accepted categories the position was accepted by most people. Recently intermediate types have been found and my own view of this matter, which I have held for a considerable period, is that the external appearance is but the outward sign of an internal change, and that, although this may vary according to Mendelian laws, it does not follow that the outward and secondary signs entirely or accurately reflect the issue.

A Functional Change?

To be more specific, it is my opinion that the variation in external appearances of goldfish in the presence or absence of iridescence is caused by a functional variation in the kidneys together with possible related changes and that it is this which follows Mendelian laws and in turn influences the deposition of substances in those skin cells (iridocytes) responsible for the metallic shine, or the breakdown of the substances or their removal as the case may be.

It will be seen that several factors are probably involved, for, apart from the retention or disposal of the chemicals occurring in iridocytes, there is the question of their deposition.

Breeding the Harlequin Fish

by R. E. MACDONALD

SUCCESS in breeding fish that appear to have a reluctance to spawn relies a great deal on the amount of attention that is paid to the conditions of the environment of the fish. Conditions should be reproduced that conform as close as possible to the fish's most natural habitat.

The harlequin fish (*Rasbora heteromorpha*) is one that needs very close attention to environmental conditions if a fruitful mating is desired. This handsome little fish from Malaya, with its bold black triangle and pearly white foreparts that are beautifully emphasised by the warm gold-and-red colouring which abounds in profusion along the rest of its body, needs no introduction at all. Its eggs are fertilised externally and develop outside the body. It will grow to about 2 inches and breeds at about 1½ inches. The main important factors involved in breeding this species of *Rasbora* are as follows.

Temperament

It is an extremely peaceful species and one of the most desirable ones in the community tank. Therefore one of the first obstacles to clear is the possibility of the fish being worried by others not so timid, as this could very well upset them and interfere with their desire to reproduce. If possible, it helps to isolate about a dozen harlequins by giving them a tank to themselves. This will produce an air of tranquillity and peace that will obviously be enjoyed to the fullest extent by this quiet-natured fish and will also help you in the observation and selection of the pairs for breeding.

Harlequins enjoy seclusion, so erect a screen and do the necessary observations from behind it. Also avoid scaring the fish with sudden, loud noises. They have ears which lie entirely within the skull and are very sensitive to sound.

Like all fishes, harlequins should be well conditioned beforehand so as to bring them into peak condition for breeding. A good substantial diet of white worms, *Tubifex* and *Daphnia* is essential to bring about the peak condition required for harlequins, and will have the effect of making the fish more promiscuous in their sex life.

The harlequin fish will stand a temperature range of 70-85° F, but it should be remembered that as this fish is extremely prone to the "ich" (white spot), any temperature change in the water must be very gradual. The best temperature for conditioning and breeding is 76° F. When a pair have been selected for breeding, they should be placed in a tank specially set up for this purpose, containing freshly conditioned soft water of pH 6.4. The pH factor is an important point and is often overlooked by many aquarists when breeding fish.

The tank into which the breeding pair are placed should contain a good variety of plants that have broad leaves, such as the Amazon sword plant (*Echinodorus brevipedicellatus*), species of *Cryptocoryne* (which will do well in the slightly acid water) and the smaller species of *Sagittaria*. The reason for this is that the fish will hunt out the vegetation with broad leaves, to which they prefer to attach their eggs.

Egg-laying and Hatching

After the female has been well and truly chased by the male, they will search out the most suitable site on which to lay their eggs. When one has been found, the female will rub her belly along the underside of the leaf and at the same time will be embraced by the male; the pair will then deposit their spawn. When they have finished spawning they should be removed from the tank. The eggs are adhesive and have a specific gravity a little greater than that of water, which means that any eggs that become detached from the leaves will sink to the bottom of the tank. The eggs, which are transparent for the first few hours, turn milky and will hatch out within 24 hours. Harlequin fish are abundantly productive in their spawnings and yield from 250 to 500 eggs at a time.

Harlequin fish (Rasbora heteromorpha)

Once hatched, the young fry are extremely hardy and will need rotifers and other pond Infusoria, followed by brine shrimp. The fry will be insatiably eager when it comes to feeding, so always ensure that there is enough for them to eat. It is always wise during the early stages of fish life to overfeed rather than to underfeed. Any surplus food can always be siphoned off and the addition of a few small snails after the eggs have hatched will help to keep the bottom of the tank clean. It would be amazing to learn the exact number of fry lost due to starvation during the first week or so of their lives, so remember to be liberal at this stage when feeding.

One of the ways to be successful in breeding fishes that appear to be reluctant to spawn, is by being patient and observant. If success is not met with at the first attempt then the aquarist should have the patience to start all over again, and once successful spawning has taken place he should have been observant enough to realise where he went wrong in previous attempts.

Above all, find out as much as possible about the particular species that is to be bred, particularly about the fish's natural environment. This will help a great deal in reproducing conditions that the fish will recognise as being "just like home."

MICROSCOPY FOR THE AQUARIST—53

by C. E. C. COLE

What do You Know about Daphnia?

WE come this month to a little creature known to every aquarist as a much relished and eagerly sought after tit-bit for both tropical and coldwater fishes. I refer, of course, to the water flea, *Daphnia*. I have said that every aquarist knows of these little crustaceans, but of how many can it be truly said that they know the creatures themselves?

Have they seen them moult, lay eggs, release a batch of fully developed youngsters, can they distinguish between resting and the more common parthenogenetic eggs, do they know how many youngsters can be in a single brood, how often a brood is produced? Could they distinguish between a male and female *Daphnia*?

I suggest that if the answer to the majority of the above questions is "No!" it is high time that a few specimens were transferred to a little water on a slide on the microscope stage and more closely observed. Such a study is highly rewarding, and, with a few exceptions, the examined specimens can still provide a light supper for our fishes!

On first looking at *Daphnia* through a hand lens or low-power objective two things are most noticeable. First is

Side views of head of male (left) and female Daphnia

their method of propulsion through the water. This is jerky; they possess a pair of branched antennae roughly in the position arms would be if they had such things, and the downward beat of the antennae lifts their bodies upward and forward. At the moment the downward beat ceases, the body begins to sink in the water and continues to do so until the antennae have once more been raised.

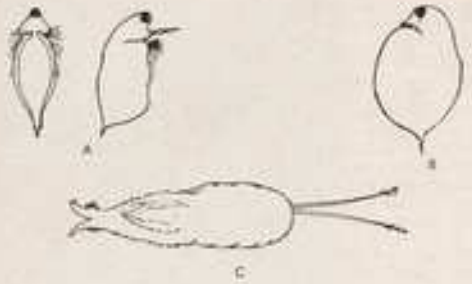
The second most obvious thing is a rapid and rhythmic movement embracing the whole of the front half of the creature within its carapace—frequently mistaken by the uninitiated for the beating of the animal's heart.

In fact, the heart is almost completely transparent and situated at the top of the carapace above the brood chamber. What we see so readily is the beating up and down of the five pairs of legs of *Daphnia*.

Five Pairs of "Legs"

The legs are not adapted to permit the crustaceans to walk or run about, but are really a complicated system of sieves and filters and flat, paddle-like segments which serve solely to create currents of water. The currents produced by the beating of the legs bring food in the shape of minute algae or rubbish, which is forced through the filters, broken down and finally stopped at the mouth or jaws. The jaws possess a pair of finely toothed and hooked grinding surfaces. Anything which reaches these surfaces is finally macerated and passed into the gut. Nothing which has made the journey through the many filters is rejected—even their own excreta is pulverised and re-swallowed if it is accidentally caught up.

If the water contains too much detritus the filters become clogged. The *Daphnia* then combs them through with the



A. *Front (left) and side views of carapace of male Daphnia*

B. *Side view of female Daphnia*

C. *Clawed end of abdomen of female Daphnia seen from beneath*

D. *"Fringe" on the front edge of carapace of male Daphnia*

end of its abdomen, specially adapted for the purpose into a chitinous, clawed, foot-like extension. The shape, number of tooth-like projections and the presence or absence of supplementary "combs" are all useful to distinguish and identify different species of *Daphnia*.

The carapace can be likened to an overcoat, loosely covering the body, and unbuttoned so that it is open down the front. If it were closed, the water would be unable to reach the legs and no food could be filtered from the currents. There is a space between the back of the body and the inside of the back edge of the carapace, known as the brood chamber, and it is in this that the eggs are laid and developed. The number laid by a female seems to be limited only by the capacity of the chamber. The younger the female the smaller and the fewer the eggs. The smallest number I have seen is five, and the largest hatched out and released was about 70. After each release, the carapace is moulted and a fresh batch of eggs laid in the new carapace 2 to 3 hours afterwards. Eggs, or embryos, develop rapidly (every 3 to 4 days during the summer—longer during the winter).

At the rear of the foot-like termination of the abdomen

First (left) and second (right) legs of male Daphnia pulex

Numbers against these drawings indicate the number of the "leg" depicted. These structures occur in pairs and the ones shown are from the female Daphnia

are several finger-like, soft, backward-pointing extensions which serve to keep eggs and young in the brood chamber. Each time the leg filters are combed these projections are automatically moved forward, and the eggs or young drop towards the base opening in the carapace. They gradually push the body forward as they grow, and eventually escape past the retaining projections.

"Resting" Eggs

Some time in the life of each parthenogenetic female a different kind of egg is produced which requires fertilisation by a male *Daphnia*. This is the ephippium, or "resting" egg, which can remain viable even after passage through the gut of a fish or the drying up of the mud in which it lies. An examination of proprietary "Dried Daphnia" I recently carried out disclosed the presence of innumerable ephippia among the dehydrated pieces. Placed in water, some of these hatched out in the normal manner. This purchase of packets of dried *Daphnia* might be a good way of starting a culture.

Different theories have been put forward to account for the production of "resting" eggs—starvation, approaching death, drought etc., but I largely discount these for what I think are sound reasons. To begin with, wherever I have taken ephippia-bearing females they have never been the maximum size for their species—arguing that they have merely reached the "ephippia" age or size. Furthermore, with them, larger and smaller parthenogenetic females of the same species were caught. When these females were isolated, and kept in the same water, the ephippia were moulted in the normal way, but the females did not die. Instead, they produced normal eggs, which hatched in the usual manner and continued to produce broods regularly for a noticeable period afterwards.

Finally, ephippia-carrying females taken from ponds 40 miles apart, but of the same species, were all as near as possible the same size, over a period of several years.

Male Daphnia

Male *Daphnia*, too, are much commoner than is supposed or suggested in text-books. I believe the idea of their scarcity arises because they are much smaller than the females, and escape through the meshes of a coarse net.

They are noticeably different in shape and frequently also in colour. They are promiscuous and try to attach themselves to any passing female, large or small. But the females shake them off unless they are "ephippia-minded." Frequently two males attach themselves to the lower portion of the female's carapace, giving her the appearance of a large and clumsy *Cyclops*.

All the above observations can be checked and re-checked by anyone so minded before feeding specimens to fishes.

A. Various aspects of the "jaws" and "teeth" of Daphnia; B. swimming antenna

Views of the foot-like terminations of the abdomens of male (above) and female (below) Daphnia

OUR EXPERTS' ANSWERS TO TROPICAL AQUARIUM QUERIES

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

I wish to keep some tropical fishes in a 16 in. by 8 in. by 8 in. aquarium. I should be grateful if you would tell me what size heater I should buy to keep the water warm.

In a small tank there is always the danger of the water becoming overheated when the weather becomes warm. We advise you to obtain a 75 watt heater, and have this connected up to a thermostat. During the hottest days of summer, when the temperature goes up into the high seventies or eighties, the thermostat will cut out, and so prevent the fishes from being cooked by the heat. Set the thermostat to give a temperature anywhere between 75° and 78° F. In the winter, a temperature between 72° and 75° F will prove ample.

Please will you give me the names of a few "tropicals" that will live together in harmony in a tank holding seven gallons of water?

We suggest the following: two zebra fish, two moon tetras, two males and a female guppy, two *Pristella riddlei*, two harlequin fish.

I am a newcomer to the fishkeeping hobby, and I am very concerned about my aquarium because, though I use the dip-tube regularly, the water remains thick green and I cannot see the fish until they approach the side of the glass. How can I clear the water?

There is no really quick way of clearing aquarium water once it has become green. One has to have patience. Green water is caused by microscopic green plants known as algae. They almost always make their appearance in a newly established aquarium set close up to a window, or lit by bright electric light. Most newcomers to the aquarium-keeping hobby make the mistake of paying more attention to the fishes to go into the aquarium than to the plants. Plenty of healthy plants are an absolute necessity if the water is to remain clear. Filtering the water helps a lot to keep the water clear, but there is no question that the water in a thickly planted aquarium looks better than water in an unplanted aquarium, particularly in a newly filled aquarium. Plenty of plants help to shade the water, and their roots and leaves absorb nutrients in the water without which algae soon dies. So our advice is: plant thickly along the back and two ends of the aquarium, and put some bunched plants in the centre of the aquarium. A handful of duckweed or *Salvinia* to float on the top of the water will keep too much strong light entering the aquarium from above. Do not feed the fishes with more dried food than they can eat in a few moments—several small meals during the day or early in the evening are better than one big meal every day. Use live food as often as possible. Add filtered water from a wood butt or unpolluted pond to the aquarium when you can manage it. If you cannot obtain clean rainwater, strain tap water through peat.

My fighting fish has difficulty in rising from the bottom of the water. It has gone off its food, and seems most unwell. Please can you tell me what is the matter with it?

From your description it appears likely that your fish is suffering from the effects of a chill. It would be happier if you placed it in shallow water, say, not more than 6 inches deep, and raise the temperature several degrees above normal. Feed it, or try to tempt it to take, live food or tiny pieces of scraped lean meat. If it does not recover within about a fortnight, it is likely that it will die.

How should I set about breeding nigger barbs?

Place them in a tank thickly planted along the back and two ends with fine-foliaged plants such as *Myriophyllum* or *Fontinalis gracilis*. Raise the temperature to about 80° F. Feed the fish very well on chopped earthworms, tiny pieces of meat or the usual live food. If possible, separate the male from the female for a week or two. When you place them together again, they may spawn. The eggs are scattered in the plant life. After spawning is over, remove the parent fish to another aquarium. The eggs hatch out in about 2 days, and the fry become free-swimming a day or so later. When they become free-swimming, introduce Infusoria to the water, or dust-fine dried food. Keep the bottom siphoned to prevent the water from becoming polluted by uneaten food, and all should go well.

Would a 12 in. by 12 in. by 8 in. tank be sufficiently large to breed dwarf gouramies in?

Yes, you can breed dwarf gouramies quite successfully in a tank the size you mention. Have some floating plants on the surface of the water, and plenty of plants along the back and sides. Maintain a temperature of about 80° F. There is no need to remove the parent fish until the fry have become free-swimming and are eating well.

The excreta of one of my fish has bubbles in it, and hangs on the fish for quite a time before it is dropped. A friend tells me that this is a sign of constipation. How should I deal with this trouble, please?

Feed your fish on a laxative live food such as *Daphnia* or earthworms. A little medicinal paraffin mixed in with the chopped earthworm often helps to bring speedy relief. Dried food helps to prolong the condition.

I have been told that I should not add water straight from the tap to my aquarium to make good the loss of water through evaporation. Is this true?

Water straight from the tap will not do any harm if added in small quantities to a large aquarium, say, one holding more than 12 gallons of water. But it is not wise to drain off a large amount of matured water from a tank and add water straight from a tap to it, or to a tank which has lost half of its original amount of water through evaporation. But tap water allowed to stand for a few days is safe enough. It is a good idea always to keep a large jar filled with tap water to use when an aquarium needs topping up or a small tank needs filling.

I am always reading how "bad" algae is in the aquarium. I am a newcomer to the hobby, and would like to know if every bit of algae should be scraped off the glass or scrubbed from the rockwork?

Algae is a nuisance. It smothers plant life; it coats the glass and prevents the aquarist from seeing the fishes; it clogs filter tubes and so on. But it does not do any actual harm to the fishes. In fact, most fishes like to nibble at it. Some fishes will not flourish unless they have it in their diet. The mossy algae that grows on the glass and rockwork is the most useful. Mollies and guppies and certain species of catfish thrive on it, and, in so doing, keep it in check. The thread algae that look like thin pieces of cotton are not much use except to provide oxygen. And a very thick growth can prove dangerous to tiny fry which sometimes become entangled in it, though, admittedly, it does make a wonderful spawning bed for zebra fish and White-Cloud Mountain minnows. Our advice to you is to keep algae scraped from the front glass of the aquarium, and leave the fishes to deal with the growth on the ends and rockwork.

Water Soldier

A PLANT SUITABLE FOR THE SHALLOW POND

by ERIC HARDY

THE type of water plant to choose for the garden fish pond depends upon many things, but chiefly on the depth of water. A case in point is the water soldier, a shallow-water plant readily established by the pondkeeper in the shallow margins of a deeper fish pool and which will quickly colonise an entirely shallow pond.

Summer Flowers

A true semi-aquatic that always wants its feet in water, *Stratiotes aloides*, the only species of water soldier, rises to flower in white magnificence in June or July where it is grown in masses; odd plants look little different from the three-petalled water frogbit, except for their finely serrated leaves. Named from its leaves (the size of daggers rather than swords), it spends much of the year submerged, rising to the surface at flowering time because of changes in the amount of calcium carbonate in the leaves, and remaining floating thus until the autumn, when it sinks again for the winter.

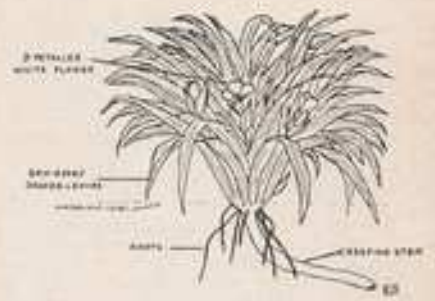
Only the female plant normally grows wild in Britain (as with the Canadian *Elodea* pondweed), but hermaphrodite flowers are to be found. Thus, like so many water plants, its reproduction is almost entirely vegetative. Clustering off-shoots rapidly colonise the surrounding mud when in summer the shallow pools become a reservoir of the sun's warmth. A few divisions from the wild plants can be used to introduce it into the garden pool; but unless you keep an eye upon its growth in future years you will soon be taking divisions of its stolons or creeping stems back from your pool to the field ponds and canals to rid yourself of the surplus.

In this way pondkeepers have been responsible for much of its present distribution as a wild plant in Britain. Indeed, in the past 50 years or less, aquarists and pondkeepers have originated many wild "stations" for water plants by dumping their surplus stock of *Azolla* or *Vallisneria* or *Egeria* in the countryside rather than destroying it.

Distribution

In Cheshire, for example, water soldier thus introduced to twin ponds at Clarke's farm (the second and third ponds after entering the eighth gate-opening on the right along Heron Road, after Acre Lane, or directly by a long footpath from the inner end of Acre Lane half-way between Meols Station and Three Lane Ends, Gressby) has choked them in profusion, and their massed flowering is a bonny sight in summer. Likewise in south Lancashire it has flourished in the disused canal at Droylsden, near Manchester. I know other haunts in Lancashire and Cheshire whose history has largely been colonisation by introduction from a garden pond, followed by its increase and subsequent collection by the botanists. Going through a sales list over a century old, from a Manchester dealer, I noticed with interest water soldier from a pond where Platt Church was later built. Near London it grows in Julius Caesar's ponds at Stanmore Little Common; but its stronghold is in fenland, and though lost to Wicken Fen it still grows in the Cambridgeshire dykes in fens not far away.

Although probably native only to calcareous districts, water soldier succeeds even in town ponds, defying the acidity caused by pollution. It is perfectly hardy and in its summer stage resembles a miniature aloe, with its saw-edged leaves produced in profusion. In spring, from



A single water soldier plant

among the leaves of old plants arise numerous thick suckers, which produce young plants. Their flowers, enclosed at first under water in a sheath or spathe, are pure white with yellow stamens, opening about an inch and a half wide. Male plants, seldom seen in the wild, have up to three, longer flower stalks than the almost sessile, and smaller, single female flowers. This brief aerial life is to permit fertilisation above water, but its green, slightly succulent fruit is stated never to be produced in this country. Like sweet-flag it seems never to have seeded with us, although fertilisation can be effected artificially.

The very rapid growth of *Stratiotes* makes it popular with the pondkeeper who wishes to see some results from his planting while his enthusiasm lasts. When planting in spring or summer, divisions of the white roots or creeping stems are taken and planted in ordinary soil, with the crowns having several inches of water over them. The many leaves grow 6 to 18 inches long, but the spiny teeth along their margins are much smaller than many illustrations to the botany books imply. They have given rise to a far less frequent gardener's nickname of "crab's claw" for the plant. These tufts of more or less succulent leaves are sessile, or stalkless, unlike those of its nearest ally the frogbit.

In the Aquarium

Water soldier may also be grown in the aquarium. It used to be a novelty of the old-fashioned Wardian case—a dish of water for aquatic plants and fishes, surrounded by a small rockery of ferns, and the whole enclosed in a glass cabinet for humidity. But the Victorians were apt to overplant their Wardian cases, and *Stratiotes* is a very restless bedmate if it has to share much of the loam beneath the pebbles with *Vallisneria*, *Aponogeton* etc. I do not know of any variation in the plant from the normal, except the hermaphrodite form, so that growers have to cope with the normal-sized male and female plants. Moreover, it is the sole member of its genus, a "dead end" apparently in the evolution of this branch of the frogbit types, for it is no longer in an active state of variation and therefore not a very "plastic" species for the cultivator to develop different varieties from it.

our readers write

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

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

Production of Gases by Water Plants

MAY I thank Mrs. V. C. Fyfe for her valuable point about the visible production of gases by aquatic plants (*The Aquarist*, February), and elaborate my original criticism of Mr. N. E. Perkins' statements in the February (1959) issue?

In discussing the effects of aquatic plants on the concentrations of dissolved oxygen and carbon dioxide, it is necessary to distinguish between the visible production of gases by the plants and the exchange of gases, in solution, between the tissues of the plants and the surrounding water. Mr. Perkins should remember, when he writes that "plants . . . yield carbon dioxide during the night when the absence of sunlight stops the process of photosynthesis and its production of oxygen," that photosynthesis and respiration, with the respective production of oxygen and carbon dioxide, are not chemically complementary processes, except when they are expressed in terms of the over-simplified equation seen in text-books of elementary biology. Very little is known of the quantitative relationships of the dissolved gases which pass into, and out of, aquatic plants; there are so many variable factors, such as temperature, light intensity, decay of organic matter and the presence of carbon dioxide as dissolved bicarbonate, that no superficial statements are valid. The annual reports on Water Pollution Research (H.M. Stationery Office) describe recent experiments on this subject, though from these only tentative conclusions can be drawn.

May I re-emphasise my original point (*The Aquarist*, April, 1959) that gaseous oxygen and carbon dioxide are not passed out into the water from intact aquatic plants. I am well aware that bubbles of gas stream from many aquatic plants, although I do not agree that the rate of their production is always proportional to the light intensity; I have observed, on several occasions, no visible decrease in the rate of flow from *Elodea canadensis* and *Egeria densa* as the intensity of light decreased. In the *Bulletin de la Societe Botanique de France* of 1866, van Tieghem reported that the gases bubbling from wounds in the green shoots of submerged plants contained about 90 per cent. of oxygen. Bubbles of gas cannot be produced from healthy, uninjured species of *Elodea*, *Vallisneria*, *Thallasia* and other genera of the Hydrocharitaceae, for example, as these plants have no pores or stomata through which the gas could emerge (see the *Beihefte zum Bot. Centralbl. Bd.* XXX, Abth,1, pp. 24-104, for a very detailed study by Solereder of the leaves of all the genera of this family). The flow of gas bubbles from these plants must come, as Mrs. Fyfe suggests, from the sites of injury. The wounds need not have been inflicted by pruning etc., though this is an obvious additional cause; they may be self-inflicted by the building-up of a very high gas pressure within the plant as a result of a high rate of photosynthesis, though I have no evidence to support this idea.

The readers of this periodical have everything to gain from the distrust and disproof of the many myths and erroneous ideas which still pervade the aquarium hobby, and it should be clear to Mr. Perkins that the days when uncritical remarks and superficial experiments could be published unchallenged have passed.

C. D. SCULTHORPE,
Cambridge.

READER Mrs. V. C. Fyfe (*The Aquarist*, February) may be interested to know that there are several experiments which can be used to demonstrate various facts concerning the production and distribution of gases in plants. Not all of them are suitable experiments to carry out in the home; for instance, radioactive isotopes have been used as tracers, I believe. However, the following publication might be of interest: Maud Jepson (1955). *Illustrated Biology*, Pt. 1. Plants, pp. 6, 7, 36, 38 etc. (J. Murray, London, W.1).

No doubt the reason why bubbles of gas may be seen to come from cut or damaged surfaces more frequently than they do from other sites is because damage exposes the intercellular spaces, which in some aquatics may occupy as much as one-tenth of the entire bulk of the plant, and it is in these spaces that storage of gas takes place—some aquatic insects obtain their oxygen therefrom.

If the excess by-products of photosynthetic action pass from plant to water through the stomatal apertures perhaps the bubbles only appear after the complete oxygen saturation of the water, or if they pass entirely by osmosis then bubbles might never be seen as the gas would be dissolved in the water in the membrane during its passage through it (MacDougal, D. T., *Elementary Plant Physiology*; 1902).

I would be interested to know whether the results of radioactive tests (which appear to have proved the question of perpetual respiration and light-stimulated synthesis, queried by Mr. Sculthorpe) have ever been circulated among aquatic or other popular periodicals, if any readers have information on this point.

H. J. VOOPER,
London, S.E.27.

Winter Sickness

I AM a tropical fishkeeper of about 10 months standing so a comparative newcomer though I have kept cold-water fish for 7 or 8 years. I was very interested in the article headed "Winter Sickness" (*The Aquarist*, February) as I have lost a great many fish ever since I started, but

certainly move since the winter started. I should not have thought that I had any of the conditions described in the article—my plants have all kept green and healthy, the water clear and the tank well lighted by any sun there is and electric light the rest of the day. At first I was extremely worried that the fish I bought seemed to live at the most 2 months, some much less (I think I have only one of the original lot left but a few are still going strong at 7 months). However, when my friend Mr. James Kelly told me that he had lost about 100 fish, and valuable ones at that, I cheered up, thinking it must not just be beginner's bad luck.

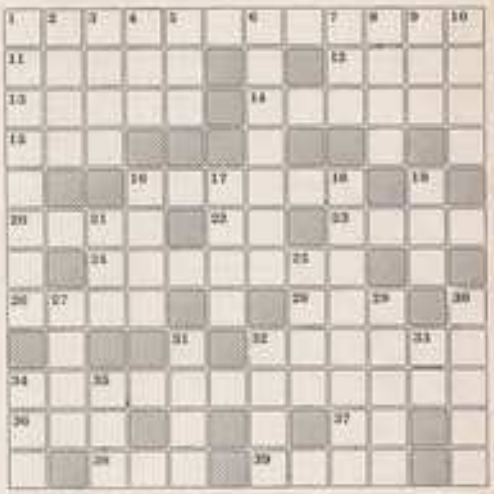
Recently I had come to the conclusion that the high death rate is more than likely due to the fact that amateurs like myself have to purchase our fish in the local shops and have really no idea of the age of the fish we buy, particularly the smaller ones. In view of the comparatively short life of tropical fish I feel they may be on their last legs when one buys them. I have therefore now decided to buy only small fish of the larger breeds which must be young and, I hope, have a longer span of life in my tank!

I am now rather afraid that I may have a germ of some sort in the tank as several fish have developed humped backs and become thin and then died. It seems there will be nothing for it but to take out everything and boil it and start again, though I dread having to catch all those fish in my 36 in. by 15 in. tank!

(Mrs.) D. A. Hanning,
Plymouth, Devon.

The AQUARIST Crossword

Compiled by J. LAUGHLAND



Clues Across

1. Former name of *Epiris cyprinoides* (6, 6)
11. A hanover in the gravel (5)
12. Joins (4)
13. A secreting organ (5)
14. Weeds to a T for the angler among others (6)
15. Little Leonard is smaller than 2 Down (3)
16. Angler's sharp movement to hook a bite (6)
20. Yellow of the egg (4)
22. You and I begin to be useful (2)
23. *Poecilia vidalia* (1, 5)
24. —— fish is not a flying fish (7)
26. Beautiful British fish (4)
28. Not big enough to be a size (3)
32. Oxygenate (6)
34. One Across goes sundays (6, 6)
36. Charge a copper more for a feed (5)
37. Predecessor of chromium plate (5, 1)
38. Repose (3)
39. Goes after bait? (4)

Clues Down

1. Not a freshwater (9)
2. *Ambassis* ——
3. Egg-shaped (4)
4. Lair of golden orfe (3)
5. Sundry (3)
6. *Corydoras* (7)
7. Orfe (3)
8. Kidney fat (4)
9. Floating leaf of aquatic plant (3)
10. Additionally (4)
16. Slip (4)
17. Enemy of iron-framed tanks (4)
18. Dying (6)
19. Long limb of water boatmen beetle (3)
21. Half a ladder
25. Linden's river (4)
27. Pond although less than organic (4)
29. Spurs about gratingly (5)
30. Scorches (5)
31. Movement of ids to a T (4)
32. Opposite of alkaline (4)
33. O'Connor sounded like an Indian tent (3, 3)
34. Newt (3)
35. Slippery fellow (3)

Solution on page 33

News from AQUARISTS' SOCIETIES

Monthly reports from Secretaries of aquarists' societies for inclusion on this page should reach the Editor by the 5th of the month preceding the month of publication.

OFFICERS elected at the annual general meeting of the **Bedford and District A.S.** were as follows: Chairman, Mr. W. E. Donnelly; vice-chairman, Mr. B. A. Abraham; hon. secretary, Mr. J. J. Burke, 16c, Leith Road, Bedford; hon. treasurer, Mr. G. Booth; show secretary, Mr. R. Pope, 51, Aylesbury Road, Bedford.

A varied programme has been enjoyed by the members during the past year which included table shows, lectures and an outing to McLynn's Aquarium, and a summary of the table shows during the year gives the following prizings: 1, Mr. Bell; 2, Mr. Simpson; 3, Mr. Pope. Best tropical fish, Mr. Tyne; best cold-water fish, Mr. Simpson; own breed, Mr. Abraham.

The club meets on the second Thursday of each month at the Trades Club Hall, Alexandra Road, Bedford, and all visitors are welcome. An excellent programme has been arranged for this year, which includes an open show, to be held in conjunction with the Bedfordshire Agricultural Show on 15th and 16th July. Show schedules and entry forms are available from the show secretary or secretary.

* * *

MEETINGS of the **Salford A.S.** are held on alternate Tuesdays at The Pendleton Co-op. Soc. Recreation Club, opposite Langworthy Road, Bolton Road, Salford. An attractive programme has been arranged which includes table shows, lectures, visits, quizzes, etc. A special feature will be a series of talks designed for the new aquarist.

Mr. H. Reuben, 4, Derwood Avenue, Higher Blackley, Manchester, 9, is the new secretary and he will be glad to hear from any prospective new members.

* * *

THE annual general meeting of the **East London Aquarists' and Pondkeepers' Association** saw the retirement of many officers, among those being the secretary, Mr. P. Petto, who had served as an officer for many years. Mr. Hylton also retired as chairman and was succeeded by Mr. A. Fairweather.

The president, Mr. P. S. Campkin, spoke of the success of the club over the past year and thanked the retiring officers for all their work. He said the club had had a very successful year and hoped for an even better one next year.

The newly elected members are as follows: President, Mr. P. S. Campkin; chairman, Mr. A. Fairweather; vice-chairman, Mr. S. Leary; secretary, Mr. Saunders; asst. secretary, Mrs. V. Gray; treasurer, Mr. Harris; show organizer, Mr. M. Gray; show asst., Mr. Parry; press and social sec., Mr. J. Hodges; committee—Mr. B. Whitmore, Mr. J. C. Bryden, Mr. R. G. Emery. Any future correspondence should be sent to the hon. secretary, Mr. Saunders, 32, Claremont Road, Forest Gate, E.7. Telephone, MAYfield 5987. The club's annual show will be an open one this year and will be held on 8th, 9th, 10th September.

The annual dinner and dance of the **East London Aquarists' and Pondkeepers' Association** was held on 26th February. Fifty-four members and friends were present, mostly members. The president, Mr. P. S. Campkin, thanked Mr. S. Leary for all the work he had put in to make the evening possible. The first table show will be on Friday, 8th May, (barbs, danios, characins and int. guppy). New members and old are welcome.

The club meets the first Friday and the third Tuesday of each month at 8 p.m. at Ripple School, Ripple Road, Barking. The new secretary is Mr. S. J. Saunders, 32, Claremont Road, Forest Gate, E.7.

* * *

RECENT activities of the **Yeovil and District A.S.** have included the annual dinner held in February which with several speeches and entertainment proved a great success, and a coldwater table show at the March meeting, judged by Mr. A. Dominey, the results being 1, Mr. V. Collier (bettas); 2, Mr. G. Aston (goldfish); 3, Mr. N. Stainer (aberrations); A quiz, organized by the chairman, Mr. N. Stainer, also caused great interest and amusement, the winner being Mr. E. Langdon.

* * *

AT recent shows of the **Friends A.S.** Messrs. Beaven, D. Robinson, J. Ruddoch and F. Jaker have all received first awards. Tape-recording lectures have also been given by Messrs. Morrice, Villiers and Glenn, and in addition, the society heard the first-class tape-recording of the B.A.S.'s "Any Fishy Questions." The society would be grateful to hear from any person who would be good enough to loan any 2 in. by 2 in. black-and-white or colour slides on "Betta" subjects for showing at one of the club evenings.

Meetings are held every Thursday at 7.30 at the Landor Hotel, Landor Road, S.W.9 and Mrs. R. Hanley, 78, Lilian Road, S.W.16, hon. secretary, would be pleased to hear from anybody who would like to join.

* * *

THE second of the two meetings, open to all aquarists, arranged this year by the **British Aquarists' Study Society**, will be on 28th May. An "Any Questions?" panel will give answers to questions submitted from any aquarist in advance of the meeting. The meeting is at the Lecture Hall of the Zoological Society of London, Regent's Park, and commences at 3 p.m. Tickets, to include tea and Zoo Aquarium visit, cost five shillings and can be obtained from Mr. J. E. Edwards, 42, Berrylands Road, Surbiton, Surrey.

* * *

THE second annual open show of the **Catford A.S.** will be held on Friday and Saturday, 10th and 11th June. An even greater entry of exhibits is anticipated this year than at the first show when over a thousand fish were on view. Many trophies are being awarded again this year including the Bancroft Cup for the club that wins the highest number of points in the inter-club contest, The Evans Cup for the London Egg-laying Toothcarp Championship, The Ilex Cup will be awarded to the best exhibit in the Catford Characin Championship, just to mention a few.

The show is being held at the Catford Secondary School for Boys, Bromehill Road, Catford, London, and aquarists who intend to show at this event should send for their schedules as early as possible to the show secretary, Mr. S. Cornock, 33, Howard Road, Bromley, Kent.

* * *

FILMS, table shows, talks on breeding and on rocks make up the **Brockley and District Breeders Circle** programme for March, and in April they will hear talks on barbs, hold a quiz, a one-man table show and put on a brains hunt. With four visits to places of aquatic interest plus an excursion into the countryside by some members to help in a survey of British freshwater creatures, the group can look forward to an active period.

Apart from the visiting judges, each of the evening's entertainment will be provided by one or other of the members, for all are encouraged to pass on their knowledge and ideas—for the group firmly believes that the personal experiences of experimenting aquarists is of considerable use.

* * *

THERE was a large number of entries for the table show at the last meeting of the **Erith and District A.S.** Before the judging, Mr. A. E. Jessopp, the club captain, gave an informative and interesting talk on furnished aquaria, stressing the prime importance of the choice of fish, the selection of plants and rock, and their positioning in the aquarium, when setting up a tank for exhibition. Mr. Jessopp has gained several awards for his furnished aquaria, and the keenness of members in this subject was shown by the large number of questions he was called upon to answer at the close of the talk.

The judging of the table show was undertaken by Mr. L. Clarke, of Welling, the awards being: Catfish: 1, Mr. Bothwell; 2, Mr. Clarke, Welling; 3, Mr. M. Mills, Erith. Danios and rasboras: 1 and 2, Mr. Quick, Hextable; 3, Mr. Bothwell, Erith.

The most gratifying feature of the society is the enthusiasm of the members, as shown by the number of entries for table shows, their keenness in the debates, and their offer of their homes for business talks, which leaves the first Wednesday in each month to be devoted entirely to fish. The secretary is D. R. Cronin, 84, Park Crescent, Erith, Kent.

* * *

AT a recent meeting of the **Bristol A.S.** members were addressed by Dr. P. H. Whiting, of Bristol University. Dr. Whiting's subject was "Unusual Aquarium Animals." He brought with him many specimens, both alive and dead, including a Cornish sucker fish, a pair of tropical toads and a lung fish. He mentioned the simplicity in maintaining a marine aquarium since the introduction of sea corrosion tablets to the market, and that Bristol water in conjunction with these tablets produces a properly balanced sea water.

The visit of Dr. Whiting forges yet another link between the Bristol Aquarist Society and Bristol University as at present many of the members are taking a course entitled "Biology for the Aquarist," under Dr. H. Crafton.

* * *

A NUMBER of aquarists and other people interested in water life belong to the **Lewisham Natural History Society,** and they heard a talk recently on the subject of British freshwater fish. Given by Mr. Derek Keeley, the subject matter dealt with feeding sites, habitats and external features of a variety of common British species. A keen field worker, Mr. Keeley's conclusions (based on personal knowledge of Kent and Surrey waters) often ran counter to established ideas and he was never reluctant to say exactly what he thought.

Together with Mr. W. Allen (Brockley Circle) he is now engaged in recording the aquatic life in certain Kentish ponds and streams, part of the group's special studies for 1960.

Another "fish evening" will be held by the society on 2nd June, when Mr. M. Thomas (Brockley Circle) will read a paper dealing with certain live-bearing fish of Central America.

* * *

THE **Hendon A.S.** open show is to be held in May and schedules are available to club secretaries. Other forthcoming events in the Hendon programme are the Annual congress; an all-colour film show from the U.S.A. (original expedition shots); brine shrimp processing from San Francisco and a visit to the world-famous Steinhart Aquarium).

* * *

AT the February meeting of the **Leeds and District A.S.** the table show was for guppies.

There were many entries and competition was very keen. Prize-winners were: 1, Mr. Reynolds; 2, Mr. Parsley; 3, Mr. Wockham. Prize-winners for A.O.V. were: 1, Mr. Parsley; 2 and 3, Mr. Bowers. The society also enjoyed a lecture and excellent colour slides, presented by Mr. B. Pengilley, of Burnley, who photographed the various subjects himself.

* * *

AT a meeting of the **Pontypool and District A.S.** Mr. Hardy of Cardiff spoke about fish-keeping from a scientific point of view and stressed the importance of a sound knowledge of this subject for the serious aquarist. His explanation of hardness of water, pH values and osmosis added greatly to the knowledge of the members. He surprised members with his explanation for the difficulty encountered in breeding neon tetras, and stated that neons bred in very high level tropical streams where the atmospheric pressure was low and until aquarists reproduced similar conditions of temperature and pressure they would not succeed.

Mr. Hardy also reported that large quantities of fish were now being imported from the Far East and that drugs were being successfully used to cut down their oxygen intake during the journey. He also discussed diseases, aeration and food, and commented favourably on the use of formalin for sterilisation and brought along several rarer species of fish for members to see. The secretary is Mr. D. R. Bowers, The Highway, New Inn, Pontypool, and the meetings are held every second Thursday in the month.

* * *

AT the well attended annual general meeting of the **Blackpool and Fylde A.S.** a number of alterations to rules were successfully carried, the main one being the increase in subscriptions from 10s. to £1. This was due to the increased running expenses connected with the proposed new programme. The new strategy would allow for more lecturers to be engaged and provision for film shows. Every effort would be made to introduce the hobby to local schools, and although a deal of progress had been made in this direction, it was the intention to give this aim maximum assistance.

Alderman Clifford Cross was re-elected president, Mr. Vic Fletcher, vice-president and a new additional vice-president, Mr. G. N. Hadley. R. E. Legge (Blackpool Tower Aquarium Curator) remained as technical adviser and a new secretary was appointed, Mr. R. Crowther, 15, St. Hellens Road, Blackpool. Mr. A. Sidebotham, the retiring secretary, retains the office of publicity officer, and is also elected on the executive and show committees.

N.F.A.S. delegates remained the same: Messrs. R. W. Cook and A. G. Gower. Meetings are held on the second and fourth Wednesday in each month and are held at Vernon Arms hotel, Cookson Street, Blackpool.

* * *

AT the fourth annual general meeting of the **Colwyn Bay and District A.S.** the following officers were elected for 1960: Chairman, Councillor A. L. Clayton; vice-chairman, Mr. J. R. Reed; hon. treasurer, Councillor J. K. Mitchell; hon. secretary, Miss Mary Walsh, Hollywood, 36, Lawson Road, Colwyn Bay. A successful bring-and-buy sale of aquarium equipment was held at headquarters, the proceeds being handed to the society funds.

* * *

AT recent meetings of the **Riverside A.S.** the A.V. Cup was won by Mr. D. Biggs. A miniature furnished aquaria competition in 4 in. by 4 in. show jars was a great success and was won by Mr. Ainsworth. At the last meeting of the society a show was held for livebearers and the result was as follows: 1, Mr. Flintham; 2, Mr. Dayner; 3, Mr. R. Biggs. The fishes gaining the awards were a xiphius mollie, a black swordtail and a sphinxop. A full programme has been arranged for the remainder of the year and will include a visit to a breeding establishment on the 10th April, and a visit to the Aquarium at Regent's Park Zoo on the 22nd May. A home furnished aquaria competition is also to be run this year and judging will be carried out at the request of each member between the 1st April and 31st October. At the recent meeting of the N.W.L.G.A.S., the application by Riverside to join the group was favourably received and the society will be competing in the 1960/61 series of inter-club competitions. An open night is being arranged for 25th April and visitors will be very welcome. Further details may be obtained from the secretary, Mr. J. G. Flintham, 307b, Chiswick High Road, W.4. Chi. 3749. The society has recently changed its meeting place to the Three Jolly Gardeners, 215/217, Hammersmith Road, Hammersmith, W.6 (approx. 200 yards from Hammersmith Tube Station). Meetings are held on alternate Monday nights and during the months of April timer will be at 8 p.m. on the 11th and 25th.

* * *

AT the March meeting of the **Cambridge and District A.S.** members heard an extremely interesting and informative talk by Mr. Mackenzie, of the Great Ouse River Board, on the work of that Board, dealing with the maintenance of fish population and some of the problems faced in netting and moving quantities of fish from one stretch of water to another.

* * *

THE annual general meeting of the **Association of Yorkshire A.S.** will be held in the Church Institute, Albion Place, Leeds, on Saturday the 21st May at 2.30 p.m. Nominations are required for vice-chairman, treasurer and secretary. Mr. C. Duckett, of Skipton, will become chairman, in accordance with the constitution whereby the vice-chairman moves to chairman the following year.

Other matters to be discussed are the suggestions that all meetings should be held in Leeds, this being the most central point, and that delegates' expenses should be pooled, thus making the cost of attending meetings more equal.

It is proposed to try and hold a meeting, followed by a "tape" talk and a film show, and if any societies know of good "baby" films, the Association will be pleased to hear from them. The name and address of the secretary is Mr. R. Winterburn, 19, Woodhall Place, Thornbury, Bradford, 3.

* * *

MEMBERS of **Bells Vue Society** had a judging competition at their March table show of guppies. A trip to Blackpool Aquarium has been arranged for 30th April, and it is expected that there will be the usual visit to Chester Zoo later in the year. The April month's table show will be for cichlids.

* * *

THE **Portsmouth A.S.** is holding their eighth annual open show this year from the 1st August until the 6th August inclusive. It will be held at the Twyford Theatre, Portsmouth Community Centre, Twyford Avenue, Stamshaw, Portsmouth. The setting up will be on the 31st July. All schedules and information can be obtained from the show secretary, Mr. W. Ryder, 80B, Commercial Road, Portsmouth.

* * *

MEMBERS of the **Keighley and District A.S.** are eagerly preparing to take part for the first time in the town's agricultural show in September. The show, which attracts about 17,000 people, is a big event in the Keighley calendar, and the Keighley Society, besides staging an attractive display of fish, hope to create more interest in the hobby. They have enlisted the aid of local pets enthusiasts and six neighbouring societies are being invited to participate in a furnished aquaria contest. The secretary is Mr. T. Atkins, 14, Lynton Drive, Riddlesden, Keighley, Yorks.

* * *

THERE were 12 entries for the Scott Trophy table show at the **Dundee A.S.** meeting, and the results were as follows: 1, G. B. Kirkland; 2, P. N. Greening; 3, A. J. Roger; 4, G. B. Kirkland. The placings to date are: A. R. Bell, 11 pts.; A. Cross and G. B. Kirkland, 8 pts.; P. N. Greening, 6 pts.; B. J. Seymour, 5 pts.; and A. J. Roger, 3 pts. Judging for the Monifieth Trophy Competition for furnished home aquaria will take place during April.

* * *

TWO leading speakers have addressed **Bradford and District A.S.** meetings recently. Mr. C. Graham, of Wakefield, spoke on cichlid breeding, F.N.A.S. shows, rock and water gardening, botany, mountaineering and colour photography, with suitable illustrations, and Mr. K. Tate, of Leeds, lectured on furnished aquaria. An open table show has been arranged for Sunday, 12th June, and a room has been booked at the Co-operative Institute. Schedules will be available in the near future.

* * *

A QUIZ on fish and plants was recently held by **Romford A.S.** Mr. P. Ahrens was the winner. The society also listened to a recorded talk from America and one from Holland on judging guppies and the problems a judge has to solve. The programme was presented by Mr. K. Alley, Overseas Secretary of the Federation of Guppy Breeders Society.

Result for the table show (barbs) was: 1, Mr. J. Hayes; 2, Mr. Hayes; 3, Mr. R. Morgans. Mr. Hayes, honorary secretary, now lives at 85, Woburn-avenue, Elm Park.

* * *

A FILM show is being held by the **Hornsey & District Aquatic Society**, on Saturday, 30th April, at 6.30 p.m. Free admission and refreshments. All welcome. The Priory, Priory Road, Hornsey, N.8.

* * *

GOLDFISH SOCIETY OF GREAT BRITAIN

CONSULTATIONS are taking place with the Bristol Aquarists' Society in order to find common ground for agreement about the standards for Fancy Goldfish. Four G.S.G.B. committee members travelled to Bristol on Saturday, 12th March, to explain views on colour and appearance with the aid of sample fishes. It is well known, of course, that G.S.G.B. advocates realism in standards. The colours described and the shapes illustrated must be possible.

* * *

CHANGE OF ADDRESS

BRIGHTON Amateur Aquarists' Society: Miss B. Stephenson, 14, Lincoln Street, Brighton, 7.

* * *

SECRETARY CHANGES

CHANGES of secretaries and addresses have been reported from the following societies: Blackpool and Fylde Aquatic Society (E. Crowther, 15, St. Hellens Road, Blackpool). East London Aquarists' and Pondkeepers Association (S. J. Saunders, 52, Claremont Road, Forest Gate, London, E.7.). Salford Aquarists' Society (Mr. B. Reuben, 4, Derwood Avenue, High Blackley, Manchester 9). Southend Leigh and District Aquatic Society (R. M. Poole, 32A, Cobham Road, Westcliff-on-Sea). Walthamstow and District Aquarists' Society (Mrs. Reigh Parmenter, 121, Hamilton Avenue, Barkingside, Essex).

Crossword Solution

E	L	O	D	E	A	C	R	I	S	P	A			
C	A	V	E	L	■	A	■	D	U	A	L			
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