

NOVEMBER 1988

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AQUARIST AND PONDKEEPER

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COVER STORY

(Photograph: Bill Torrey)

Brycinus longipinnis, the Long-finned African Characin or Tetra, is an active, but peaceful (despite growing to around 5in-13cm), rarely imported shoaler from the Niger Delta, Ghana, Sierra Leone and Togo. The common name of the species refers to the extended dorsal fin rays which the males possess — clearly shown in our Cover photograph. Although we know quite a bit about the aquarium requirements of this attractive fish — pH around 6.8, hardness approaching 25°dGH, temperature in the mid 20's°C (high 70's°F), good-quality water, animal-based diet, well-planted aquarium... and so on — there are, as yet, no documented reports of successful aquarium spawnings.

GUEST EDITORIAL

Having regular contacts with the Trade, being a Council Member of the FBAS and a member of his local Society, Dick Mills, our Product Round-up reporter and internationally-renowned author, has a unique observation post from which to view many aspects of the hobby. Here are his personal views of Fish Shows.



FISH SHOWS — ARE THEY WORTH THE EFFORT?

Faced with either the organisation or the sponsorship of an Open, or National Show, Societies or Companies may well ask themselves the fundamental question, 'Is it all worth it?'

It may be argued that, as success depends very much on 'reciprocal support' from neighbouring Societies, mutually arranged inter-Society Shows would serve the purpose just as well, without involving anyone else outside the hobby. However, the hobby is not self-supporting, and the relatively small band of travelling, competitively-minded Society members will not go on forever. New members must be encouraged; Society life depends on it, as does the aquatic Trade.

At Shows, previously-uncommitted members of the public can see the whole range of popular (and locally available) aquarium fishes; they learn of fishes being bred, and are also more than likely attracted into the hobby by the furnished aquariums. Society members are on hand to answer questions, not just on membership, but on fishkeeping in general. A further factor, and one not often appreciated, is that, thanks to the 'fanatics' who relentlessly pursue and exhibit new species, hobbyists are made aware of new importations, thus stimulating interest even further. So far, Societies seem to be benefiting the most from Shows; so, what's in it for the sponsors?

At Shows, attending manufacturers can display goods directly to the consumer, keep abreast of interests in the hobby, and make sure that future projects are aimed at precisely the right targets.

Quite as to what support the Trade can provide, gives rise to some discussion. It should no longer be the traditional financing of the Show Hall's rent, taking advertising space in the Show Catalogue or providing Trophies. A refreshing sign this year has been the growing awareness by manufacturers that practical information is of paramount importance; demonstrations, videos, etc., showing just how products are used go a long way to encourage confident starts.

Those Societies continually complaining of lack of 'Manufacturer Presence' should note that domestic, or even National, Shows are not always regarded by manufacturers as corresponding 'high-spots' in their yearly calendar — especially if such events are to be supported in addition to the many Trade Shows already in existence. Sometimes it really is simply a question of financial or staffing ability. We often hear of fishes becoming 'Show-shocked' — what about Trade Reps?

On balance, the Fish Show serves many purposes, with Society membership and exposure of the hobby to newcomers among the most important. In this Olympic year, maybe the taking part should count more than instant gains.

How often, around the Shows, have you overheard the remark, "I see old so-and-so's not here then?" Could it be it's you (Society Member or Manufacturer) they're talking about?

Dick Mills
Dick Mills

COMPETITION

Exclusive, exciting and unmissable £1,500 Tetra 'Stamps' Calendar Competition. See page 34.

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Clown Loaches are, I believe, manic depressives — going from total inactivity to frantic periods of digging in no time at all.

BEAUTIFUL BOTIAS

Amanda Grimes puts in a heartfelt plea for Botias — beautiful (sometimes manic depressive!) fish which, she believes, should be more widely available and popular than they are.

If the fashion houses — who are they anyway? — say pastels are in, you will suffocate in washed-out colour for at least a year. And if, God forbid, an enterprising shop stocks anything vaguely resembling a brighter range, they will apologise for having sold out within three weeks — but they don't appear to think of the obvious and order further supplies. It is the law of supply and demand — but what happened to demand and supply?

It is in an attempt to rectify this situation that I write, not about clothes you'll be relieved to hear, but about loaches. I hasten to add that I do not know the reason why these charming and attractive fish are not more widely sold. It could be that they are seasonal — and, true to form, I always ask for them at the wrong time. Might it be that they are expensive or rare? Or is it possible that there is little demand for these beautiful Botias?

In the hope that I have not offended any retailers, I will proceed to offend many readers by maintaining that a display tank of Botias is one of the most fascinating sights in fishkeeping. You can keep — I do keep — the dazzling Gouramis, Cichlids, Tetras, Barbs, etc. But to me, "Botias are the Best". And don't be fooled by the picture given in some encyclopaedias that these fish must be closely related to Hamsters — a nocturnal form of life so shy that only a nighttime vigil will bring any reward. The Clown Loach (*Botia macracantha*) is the only one of the four Botias I have kept which will not put in an appearance throughout the day...

Clown Loaches, I believe, are manic depressives. With subdued overhead lighting — easily arranged with surface plants and switchable lights — they will emerge from their necessary cover, head down in the gravel and looking doleful, for all their flamboyant colour. They appear to spend most of their time, when not hiding, digging large holes in the gravel — apparently in an attempt to find food; more likely they're trying for an early burial! I have reached this conclusion by close study. They rarely get the food — the crowd of opportunist bottom-feeders that follow them in these manoeuvres are too quick for them. One of the common myths is that a shoal of Tiger Barbs, being the same colour, will draw these recluses into displays of enthusiastic aquabatics. Maybe mine just gave up when they saw who was keeping them...

Zebra Loaches (*Botia striata*) need only a glance to establish themselves as the most fashion-conscious fish. Only the most pessimistic could describe them as shy. They are also the most audible fish I know, sending



The Chain Loach (also referred to as the Dwarf Loach from time to time) seems to have an in-built long-running motor which keeps it on the go nearly non-stop.

showers of gravel up against the glass (yet never disturbing plant growth) and clicking, for such prolonged intervals that the only time you need worry is when your tank goes silent.

Skunk Loaches (*Botia horae*) are very similar to Zebras in habit, though, of course, they are not so colourful. I have found mine shoaling with *Corydoras*, tail-standing behind heaters, perched on plant leaves and riding on the airstone bubbles — all this, it must be said, in subdued lighting as they are not as outgoing as Zebras.

My one overriding reason for keeping these fish is an ability they have which is not widely written about. If you are tending towards overweight, they are much cheaper than squash, weight-training or aerobics classes. An evening spent trying to catch one, even in a bare tank, will relieve you of about a stone...

On the exercise front, while a Skunk is guaranteed a place in the speed race, Chain Loaches (*Botia nishikunoi*) are overall winners. I'm not quite sure of their genetic make-up but it's something akin to Aldaniti, out of Exocet. Chains are not just fast, either. They're cunning. Mine don't bother queuing for the Tubifex feeder; they get in it.

If you're still cautious about the visibility of Botias, search out a shop that has Chain Loaches in the same tank as other fish. They are gregarious fish, happily shoaling with Tetras and Danios — I find Zebra Danios are favourite. Of all the Botias, they need few, if any, hiding places and they are very friendly, taking food from the hand as a matter of course.

For all its beauty and charm, this species has a sadness that maybe some of you might be able to dispel. I can find no advice on breeding them. Maybe that is why so few shops in my area give them the prominent position they deserve. So, I will finish with a Botia-lover's appeal: How do you breed these superb fish?

Herpetology matters



By Julian Sims

Coloured inside and out

The external colours of reptiles are often very important to herpetologists. South American Boa constrictors occur in a range of colours and patterns and many snake enthusiasts have a distinct preference for either a light 'phase' or a dark form.

Another reptilian colour variation exists with the Californian Kingsnake (*Lampropeltis getulus californiae*). Characteristically, this black or dark brown snake has broad white or cream bands around its body from head to tail. However, a second phase exists which has a single light line running centrally along the back of the body. This dorsal stripe replaces the more typical banding. Hatchlings of both types can emerge from a single clutch of eggs.

Unseen by most herpetologists, internal coloration is important to many reptiles, e.g. the European Slow Worm (*Amastridium*) and Rough Green Snake (*Ophodrys aestiva*) from Florida. The lining of the body cavity, called the parietal peritoneum, is coloured black, with deposits of melanin. This pigment develops in human skin in sunlight to form a sun-tan — natural protection to help prevent harmful ultra-violet rays from penetrating the body. Yet Slow Worms and Green Snakes are highly pigmented

externally and would not normally need additional internal protection from UV rays. When a female Slow Worm is gravid with young, or after a snake has swallowed a meal, reptilian scales are stretched apart and a dark peritoneum will absorb any harmful UV rays which may penetrate between them.



Slow Worms are pigmented on both sides of the body wall.

It has been suggested that a black peritoneum acts as a "heat sink" to help maintain a constant body temperature. However, the African Vine Snake (*Thelornis kirilandi capensis*) and Boomslang (*Diphidusa tyssa*) are tree-living reptiles which are exposed to a lot of sunlight. Both species have richly pigmented linings to their bodies. If these black surfaces acted as heat sinks there would be a real danger of over-heating, but by preventing the entry of UV rays during basking after a meal, the coloured internal lining gives protection to the organs of the body.

Newts, Puffer fish and Anaesthesia

Amphibians don't have sharp claws or teeth with which to defend themselves. However, the majority do produce bitter-tasting secretions, especially from glands in their skin. The large parotid glands behind the head of many toads and salamanders are particularly noticeable. These glands have evolved at the point where a predator such as a cat or dog would be most likely to bite the amphibian during its capture.

Collectively, the chemicals released by amphibians in this way are known as *bufotoxins*. Even though the first amphibian to be caught by a predator might not be saved by its unpleasant taste, the hunter

will learn from the nasty experience. Other amphibians of the same species (and their look-alikes) probably won't be attacked in the future.

If a dog does pick up a toad in its mouth, it will usually salivate profusely to rinse away any lingering essence of the amphibian. Cases of temporary paralysis of the jaw muscles of predators have also been reported because bufotoxins can act as anaesthetics. It is for this reason that the very attractive orange-brown Californian Newt (*Taricha torosa*) has been used for applied biological research. *Taricha* contains the poison tetrodotoxin in its skin, muscles, blood and eggs.

Puffer fish, particularly those belonging to the family Tetraodontidae, also contain tetrodotoxin. In September 1774, while on a voyage in the South Pacific on the sloop *Resolution*, Captain James Cook ate a meal containing puffer fish. After a very short time he was suffering from weakness of muscles and temporary loss of feeling in his limbs.

This event, and other cases of puffer fish poisoning, have been investigated. Tetrodotoxin acts as an anaesthetic by altering the outer structure of nerve cells. This prevents nerve im-

pulses travelling from one part of the body to another — hence muscles can't be instructed to contract. Further research is underway to identify the "active" part of the tetrodotoxin molecule which alters nerve cell structure. A local anaesthetic — much more powerful than cocaine — will then be synthesized commercially, modelled on this newt (and fish) extract.

The protective secretions produced by amphibians in captivity give two special reasons for caution:

(i) Preferably, amphibians should only be examined using a net with fine mesh. This will avoid stress from hot, dry hands. If handling must occur, first moisten your hands with cool, clean water. After touching an amphibian — wash your hands thoroughly. Rubbing your face with fingers covered with only traces of amphibian skin secretion will cause irritation to the eyes, even painful swelling.

(ii) Don't mix amphibians and reptiles in the same vivarium. Water in which amphibians have bathed will be tainted with secretions from their skin. These toxins will poison lizards, geckos and skinks which subsequently drink this water.

NEXT MONTH

Ending the year on a high note, our packed December issue has some super articles with something for everyone.

- Book and gift ideas for Christmas in **Product Round-up**, including an introduction to Italian **Euraquariums**, the latest, elegant complete systems to hit the UK.
- **Nigel Caddock** (whose "evolution" we traced in October), presents his personal and colourful **Koi Review of the Year**.
- Journalist **Ben West** recounts some of the highs and lows he experienced as he ventured into the **Exciting World of Fish**.
- **Fish Philately** — how to get hooked... and where to go for it(!), care of **Derek Pluck**.
- How to keep and breed those incredibly beautiful **Arrow Poison Frogs**, with dedicated hobbyists **Robert and Valerie Davies**.
- **John Walton** on his successful search for the **Ultimate Marine Aquarium**.

Plus our unmissable **Regulars**, of course, as well as our usual crop of specially commissioned features. Join us in December and end the aquatic year in the best possible style.

Spotlight

SEA APPLES

There's a lot more to Sea Apples than their humble name suggests, as Dave Garratt reveals. (Photograph: Max Gibbs — The Goldfish Bowl, Oxford).

Sea Apples, like the one featured in our **Spotlight** photograph, belong to a large and very diverse group of marine animals that are known by a host of common names such as Sea Cucumbers, Sea Slugs, Sea Apples or even Gherkins!

Not all are as beautiful as our featured species and many are, indeed, very drab and slug-like. The species that are more colourful and possess a more oval/rounded body-form and a circle of feeding tentacles are the ones usually associated with the term Sea Apple. Collectively, whether "apple or slug", they all belong to the phylum Echinodermata and, as such, are related to the Starfish, Brittle Stars and Urchins, although when considering their external appearance, this is not obviously apparent. All of the Sea Apples, Slugs, and Cucumbers belong to the class Holothuroidea, commonly known as Sea Cucumbers, which numbers well over a 1000 species.

Many Holothurians have become elongated and lost the five-sided external appearance of other Echinoderms such as the Starfish. However, they all have five internal muscle bands and often have their tubular feet arranged in five rows.

Diversity

The Holothurians are an extremely diverse group as the next few characteristics should serve to illustrate. Size ranges from a few centimetres to a massive 2 metres (over 6ft); they are found from inter-tidal levels to great depths; some are burrowing, sand-sifting scavengers, while others possess filter-feeding tentacles. They have a global distribution and form an important link in the food chain due to the large numbers of larvae they produce through sexual reproduction.

Such a diverse group is bound to have its oddities and the Sea Cucumbers are no exception. There is a species that allows the *Carapus* fish to take up residence in its anal opening! This has obvious protection benefits to the fish, but it is difficult to see what the Cucumber gains from the situation.

Holothurian Defence Mechanism

The defence mechanisms of the Holothurians are unusual enough to examine in a little detail. They possess special defence

organs, the *Cuvierian Tubules*, which the animal can discharge through its anus when attacked or irritated. Once discharged these organs become long, extremely sticky threads in which a predator will become entangled.

A similar, but more startling, defence mechanism exists in other species. When attacked, these Cucumbers can discharge their entire intestinal tract through their anus and such a discharge can be accompanied by a toxin release that is lethal to fish. This toxin, in some species, is able to be discharged through the body wall without the gut being discharged. The cucumbers are then capable of regrowing a new intestinal tract.

The Sea Apple species that are usually kept in home aquaria are capable of this intestinal tract discharge, called evisceration, and this obviously has implications for their aquarium upkeep, as will be seen later. The toxin appears to be harmless to man; indeed, Sea Cucumbers are prepared into a delicacy in countries such as China. Occasional cases of gastric upset and conjunctivitis have, however, been reported following contact with toxin-polluted water.

Sea Apples

The photograph opposite shows the creature that most aquarists would identify as a Sea Apple type of "Cucumber." The species is a *Paracucumaria* and is the one that is most often seen offered for sale by the aquarium trade. It is widely distributed in Malaysian, Phillipine, N. Australian waters and, as such, is regularly imported via Singapore. Other imported Sea Apples of similar beauty and appearance belong to the genera *Paracucumaria*, *Cucumaria* or *Pseudocucumaria*.

All these beautiful Sea Apples are brightly coloured, with vivid contrasting markings. They have slightly elongated bodies and are crowned with a circle of strikingly coloured feeding tentacles encircling the mouth. These tentacles trap food particles and then gracefully curve inwards to transfer them to the mouth of the Sea Apples.

Unwanted water and waste material pass out of the anal opening at the opposite end of the animal's body. Five rows of brightly coloured tubular feet are controlled by internal water pressure to give the animal a slow creeping locomotion.

Like all Holothurians, the Sea Apples

contain microscopic calcareous plates under the skin and these give rise to a firm rubbery feel to the body, but, nevertheless, allow a high degree of flexibility.

Aquarium success

As with many other invertebrates, the key to success lies in a stable environment. Sea Apples will not tolerate fluctuations in water parameters or water quality. Temperature and, particularly, specific gravity, should be kept constant. High aeration and good water circulation are also necessary.

Sea Apples have been known to exude toxin, or even to eject their entire intestinal tract, when kept in adverse aquarium conditions. This would, obviously, lead to dire consequences for the health of the aquarium. However, Sea Apples are relatively undemanding and, if good aquarium maintenance is carried out, they should present no problems and can easily survive up to 4-5 years.

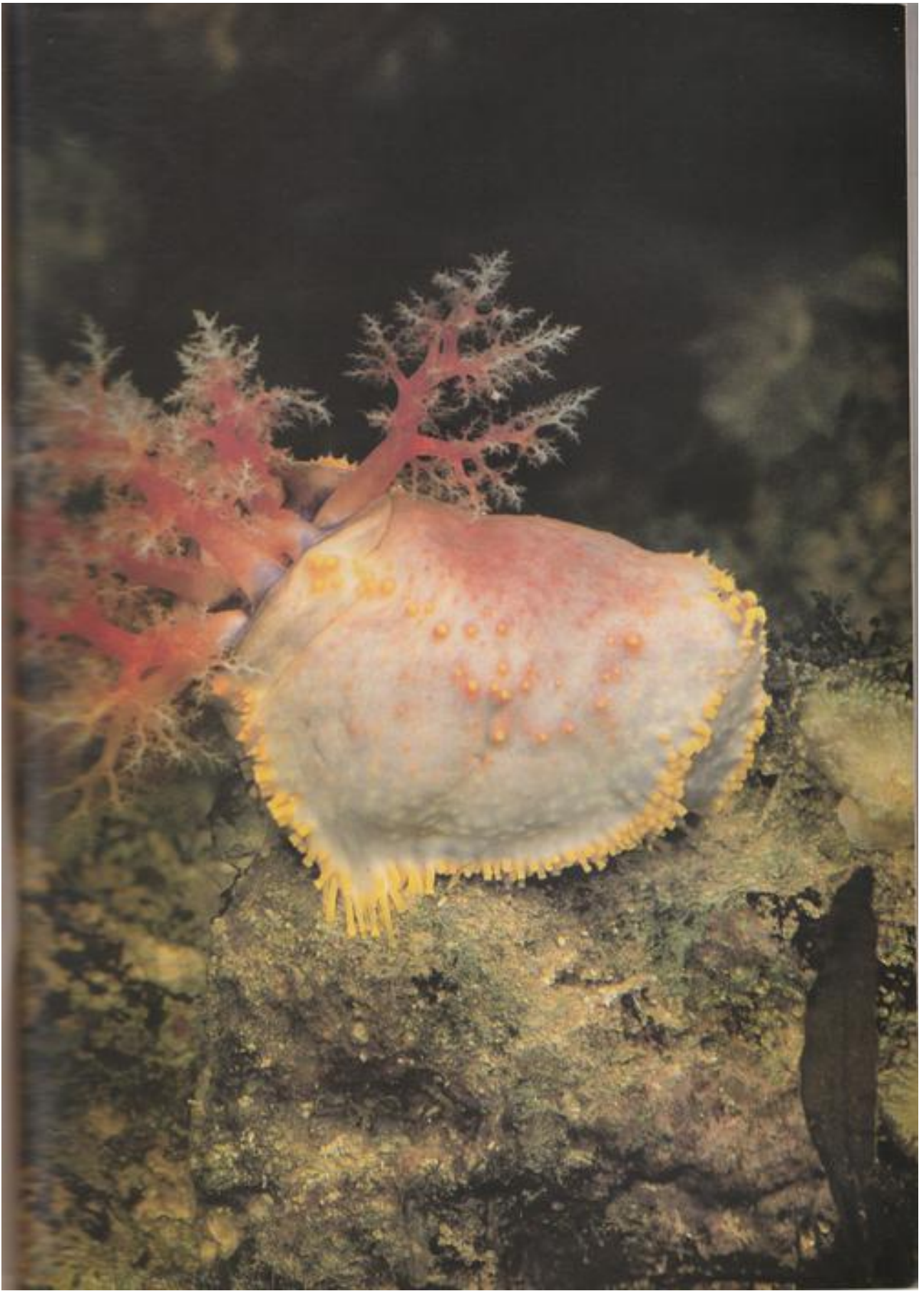
Feeding is easily catered for, with the wide range of food available today for feeding filter-feeders. Liquid invertebrate foods or emulsified mussel, squid, cockle, clam etc. are all readily taken. As with all such foods, care must be taken not to overfeed the tank.

I have observed the importance of good water circulation in my own tank which has housed a Sea Apple for the past 18 months. It will always position itself opposite the outlets of either my internal power filter or the air-operated skimmer.

If these outlets are re-positioned, the Sea Apple will slowly crawl to a new position until, again, it is opposite one of the outlets.

I have had a good chance to observe this species, which is, incidentally, identical to the **Spotlight** photograph, over the last 18 months and have found it to be an undemanding but very colourful addition to my invertebrate tank. It does not bother anything else in the tank and, likewise, it is not harassed by any other of my invertebrates or small fish.

The choice of tank inmates really follows commonsense, with aggressive inverts and/or large fish being avoided. For example, do not keep alongside large crabs, Batfish, large Angels, Triggers, etc. The price of a Sea Apple is usually within reasonable enough limits for it to be a good invertebrate for the beginner to try his/her luck with.



FAVOURITE BUTTERFLIES

Gordon Kay chooses his favourite "aquarium" Butterfly species, using ease of maintenance as a primary consideration.

To me, the Butterflies (Chaetodonts) are the archetypal coralfishes. They are totally suited to life in the hurly-burly of a coral reef (witness the fact that there are some 114 species in the family), and they make the most striking — if not the easiest — of aquarium inhabitants. So, before I look at individual species and their suitability for aquarium life, I'll take a look at their biology in an attempt to understand why they have become the ultimate survivors.

Chaetodonts are found in tropical seas all over the world — some species even occur in cooler temperate regions. The Indo-Pacific region plays host to 90% of all the Butterflies, with the remaining twelve species living in the tropical Atlantic. The Red Sea and Gulf of Aden have seven species between them which are endemic (this means that they appear nowhere but in this particular area). The Hawaiian Islands have four such species. All this is positive proof that Butterflies are among the most successful families of fishes in the sea.

Natural habitat, behaviour and colours

Most Butterfly fishes are found in shallow waters where live coral is plentiful. They rely on this coral for both food and shelter, usually staying within the bounds of their relatively small area, but travelling extensively through it foraging for food. There are a few species which are territorial, inhabiting areas of only a few square metres and guarding it vigorously. In most Butterflies, however, fighting is quite rare, although there are periods of squabbling at dusk and dawn when defence of resting places is paramount.

All the feeding activities end at dusk, when Butterflies retire into their own particular coral head or other crevice. Many Chaetodonts take on special night-time colours, patterns, or both. Usually, this consists of a fading of the original pattern, but sometimes manifests itself by a darkening around the dorsal region of the body, with maybe a spot or two appearing. At 'bed-time', some species return to the same spot every night, while others just nip into the most convenient bolt hole they can find.

There are many differing opinions on the colours and patterns of reef fishes. Some believe that they act as a sign to others of the same species to keep their distance, thus preventing aggression for the available food in any given area, and so ensuring food for all. Others believe that coloration and patterns are means of communication during courtship; while others, still, are of the opinion that they are there to warn predators of nasties such as sharp spines or poisonous flesh.

There is one pattern form, however, which leaves very little doubt. Almost without exception, the Chaetodonts possess a stripe — or other mark — which masks the eye. They then have either a corresponding mark or false eye near to the tail. This confuses predators which, at best, mistake the false eye for the real one or, at least, are confused as to where the real eye actually is! Put yourself in the fish's place; which would you rather lose, your head or your tail?

Two other attributes which Butterflies possess are a flattened body, which allows them to dart in and out of the coral, and usually, a small elongated mouth (sometimes even a long snout), eminently suitable for poking into crevices for food.

Aquarium selection

When we know all this it is easy to see why Chaetodonts are so successful. Their aquarium existence is another story altogether.

Unfortunately, Butterflies must surely head the list of fishes most abused by the aquatic hobby. They are caught and exported in huge numbers — sometimes indiscriminately; there are, on occasions, species brought into the country which have no chance of survival, even in the hands of an expert (but see our recent reports on the OFI ban on the Rainbow Butterfly); and then a great proportion of Butterflies are bought by beginners who know no better and slowly kill them through ignorance.

However, while no Butterfly species can honestly be described as easy to keep, there is a wide choice of species which, with care and attention, will prove no great headache. Here are some of my favourite 'keepable'

Butterflies, followed by some guidelines to successful Chaetodont culture.

The Vagabond Butterfly (*Chaetodon vagabundus*) is the ultimate first Butterfly. Notice I did not say 'beginner's Butterfly', as that could be open to misconstruction. It loses nothing by being so tough, as it is also one of the most beautiful of Chaetodonts. *C. vagabundus* comes from the Indo-Pacific region, as far east as Australia, where it is one of the most commonly found species, living in all types of habitats. Its natural diet consists mainly of coral polyps and algae but in the aquarium it will become tame enough to eat flake from your fingers.

As a guide to how hardy this fish can be, I personally know one Vagabond that shares a home with Puffers and Triggers (very naughty!) but is fat and healthy. In fact, my own Vagabond is the boss in its tank. A closely related, but less frequently seen, species is *C. decussatus*, the **Indian Vagabond Butterfly**.

Another superb species for inclusion in that first Butterfly collection is *Hemichus acuminatus* — the **Wimplefish** (sometimes called the **Long Finned Bannerfish**). Note that this species does not have the generic name *Chaetodon*.

However, it is still a Butterfly and is not related to the **Moorish Idol**, which looks remarkably similar to the Wimple. Of all the members of the *Hemichus* genus, this is the most common and the most popular — it is also probably the easiest to keep.

The Wimple grows to around eight inches (c.20cm) in the wild but is usually seen at around two to four inches (5-10cm) in the shops. Its basic colour is white with two broad black stripes and a similar black 'half stripe' running through the eye. The anal, pectoral and dorsal fins are yellow. The most striking feature of *H. acuminatus* is the fabulous dorsal filament from whence its common name comes. This fish keeps its basic coloration throughout its life, but the filament gets longer as the fish matures.

The Wimple lives in small shoals when young, with adults living either in pairs or alone. Because of this, it is wise to keep a small group of three or four individuals in the aquarium. Indeed, single specimens can become rather shy and edgy. Happy *H.*



acuminatus will prove to be quite hardy, accepting almost every food available. Occasionally, other members of this genus can be seen in the aquatic shops, but very little is known about their care.

Chaetodon lunata, the **Raccoon Butterfly**, makes a lovely addition to any seawater aquarium because of its unusual green colour and handsome markings. It is also

The Red-tail Butterfly (*C. paucifasciatus*) is a rarely seen species from the Red Sea.

one of the tougher Chaetodonts.

Although the Raccoon retains its basic green body colour throughout its life, its markings as an adult differ considerably from those of a juvenile. Both wear the

wonderful 'Raccoon Mask' of a black band around the eyes and a white one behind. In addition, the young Raccoon has a large black patch, edged with white, on each shoulder, with another, smaller, patch between the mask and the start of the dorsal fin. There is a black eye spot near the tail, the caudal peduncle is black, the tail itself has a black stripe, and the dorsal and anal

From researching nature

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Tetra



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JOHN DAVIES

fins are edged with black.

The adult, however, has lost the eye spot completely, replacing it with a dark greenish band along the bottom of its dorsal fin from its tail to around halfway along its back. The black stripe on the tail has been replaced by a brown one which also runs through the dorsal and anal fins. The black patch on the shoulders has become a wide band running up to the dorsal fin, and the black spot on the forehead has extended to meet it. The white edging has also become a yellowish green.

The adult reaches a length of eight inches (c.20cm) in the wild though, of course, nothing like this in the aquarium. This is another *Chaetodon* which will be happy to eat anything, including flake, after a very short time.



JOHN DAVIES

Above, elegant, large . . . and expensive: the Golden Butterfly (*Chaetodon semilarvatus*).

The Raccoon has a very close cousin, *C. fasciatus*, which is endemic to the Red Sea and, as such, is very rarely seen. Its popular name? The Red Sea Raccoon.

The Yellow Long Nosed Butterfly — *Forcipiger flavissimus* — looks as though it should be very demanding and fragile. In my experience, it is anything but! This species is as easy to describe as it is to keep — it's yellow with a long snout! The top half of its head and snout is black, the underside being silver, and there is a black eye spot on the anal fin, immediately below the caudal peduncle. The dorsal, anal and pelvic fins are yellow, but all others are clear. *F. flavissimus* is very beautiful.



CORAL WORLD — PHAI

Above, *Meniochus acuminatus* — a superb addition to any Butterfly tank.

Above left, *C. auriga*, the Threadfin Butterfly, adapts well to aquarium life.

...naturally better foods!

TetraRuby

Enhances the colours of your fish... nature's way

Tropical fish in aquaria tend to lose the brilliance of their colours because essential naturally-occurring substances are absent from their diet. But TetraRuby actually contains those natural pigment-enhancers, and puts the colour back! Its regular use will restore and intensify the vibrant natural colours of your fish. TetraRuby is a complete diet too — based only on foods found in their normal habitat to provide all the vitamins and trace elements vital to keep your fish active and healthy.

It's yet another example of the intensive Tetra research and development programme that is unsurpassed in the world.

For further information, or assistance with any fishkeeping problems, contact the Tetra Information Centre, Mitchell House, Southampton Road, Eastleigh, Hants. SO5 5RY.

Always ahead with the best ideas... naturally.



Another greedy-guts, this species also has a cousin — *F. longirostris* — which is so rare, even in the wild, that it is unlikely you will ever see one in captivity. I have, myself, seen only two in aquaria, and one of those in my own tank! Seen individually, only an expert would be able to tell which was which. Viewed together, though, it is easy to see the much longer snout of *F. longirostris*. There are other minute differences (ie. *longirostris* has ten or eleven dorsal spines whereas *flavissimus* sports twelve), but the snout is the easiest way to tell them apart.

The final member of my favourite group of Butterflies is something of an enigma. It is incredibly beautiful, incredibly rare in the aquarium trade, incredibly expensive and yet, incredibly easy to keep. *Chaetodon semilarvatus* — the Golden (or sometimes) the Addis Butterfly — comes from the Red Sea and is endemic to that area. Like all Red Sea species it is seldom (if ever) imported into Britain, and so, most marine aquarists have probably never seen them in the flesh, with the result that when they are available, the buyer will need a second mortgage with, prices of above £100 not being unheard of.

Of all the fishes in the world's oceans, this is my all-time favourite. *Semilarvatus* is a golden yellow all over, except for a greyish cheek portion.

There is also a series of fine, darker golden stripes running vertically along the whole length of the body. This *Chaetodon*

reaches dinner-plate proportions in the wild, where it lives in pairs or groups of twenty or so individuals. Anyone lucky enough to own a *C. semilarvatus* will find it to be totally undemanding, except for first class water quality. It will eat anything offered and will live for years.

The above *Chaetodons* are only my favourites, but there are many others which adapt well to aquarium life (I also have further favourites, but this article is only about the "easier" Butterflies). Others to consider are *C. klanni*, *C. capistratus*, *Hemitaurichthys zoster*, *C. miliaris*, *C. punctifasciatus*, *C. auriga*, *C. melanota*, *C. paucifasciatus* and *C. multicinctus*; the list goes on.

Basic rules

All have the same basic requirements, so here are a few simple rules which will stand you in good stead:

1. Do your homework on every species before you buy.
2. Never buy Butterflies which are exclusively coral feeders as they will prove very difficult, if not impossible, to tempt into accepting substitutes.
3. Butterflies need plenty of swimming space, so keep a few specimens in a largish aquarium. Zero nitrite should go without saying, but nitrate above twenty parts per million will also result in losses.
4. Decorate the tank so that there are plenty of nooks and crannies for the fish to hide in, poke their snouts into, and in which to sleep.

5. In the wild, Butterflies roam around all day long looking for food, unlike predatory fishes which take one big meal every other day or so. Their feeding regime in the aquarium should reflect this, with small meals at frequent intervals. Three or four times a day would be ideal, and twice should be considered minimum, with only as much as the fishes will eat in two minutes.

6. Remember that *Chaetodons* are grazers and have only small mouths. Feeding them with whole Cockle or Lancefish would be a waste of time. Offer a wide range of small foods such as brine shrimp, bloodworms, *Daphnia*, lobster eggs and *Mysis*, and wean them onto flake food as soon as possible. One large food item which is very successful is mussel — frozen, gamma ray irradiated, but not fresh from the fishmongers. Fresh mussel will cause pollution in the aquarium in a very short space of time, due to the fact that, in the wild, mussels are filter feeders, ie. they take in vast quantities of water and filter food from it. This results in all sorts of pollutants being trapped in their bodies and these will be released into the aquarium. The whole mussel should be suspended in the tank by a fine thread, where it can be picked at by the fishes.

Nothing can be more rewarding than the successful rearing of Butterfly fishes and, by combining the skills of buying the right species, good aquarium management and proper feeding techniques, this is something which is within everyone's grasp.

News

Lahaina moves to Dallas

Dallas, Murrayshire that is... not Dallas, Texas — though the former apparently was responsible, in some way, for the latter adopting the same name.

As from 28 September, Lahaina Aquarium Systems Ltd (change in company name to go with the change in location), have moved to a new factory which allows for diversification and expansion of the company's already substantial range of activities.

In addition to the further development of the Lahaina home aquarium systems, including the introduction of part acrylic remote filters, the company is undertaking the manufacture of double-glazed aquaria fitted with chillers to cater for hotels and restaurants specialising in lobsters and live shellfish.

Power-driven (Hagen Aquaclear 400 and 800) venturi protein skimmers have also recently been developed to fit both home-type wet/dry remote filters, as well as commercial models (the latter measure 5ft in height).

All these projects, added to Lahaina's expanding exports to America, plus Chick Holland's plans to open an exclusively marine public aquarium exhibiting both tropical and marine species — under a separate company, Highland Marine Life Centre — are the main reasons for the company's move to the new site. Production will continue as usual, enquiries are welcomed at Lahaina Aquarium Systems Ltd, Kellas, Elgin, Murrayshire, Scotland. Tel: Dallas (034 389) 209.

F.B.A.S. Golden Jubilee Dinner & Dance

The Federation of British Aquatic Societies is pleased to announce that its Golden Jubilee Dinner and Dance will take place at:

The West Pavilion Suite, Twickenham Rugby Football Ground, Twickenham, Middlesex on Saturday 12th November 1988.

Tickets are £17.00 per person and include the Dinner, Dance, Commemorative Menu and Cabaret. Enquiries and reservations from:

F.B.A.S. Public Relations Officer, C. Richards, 3 Up-lands Avenue, Chesham, Buckinghamshire HA5 2EA. (Tel: 0494 772552).

Derek

"At c'mon Derek! There's not a hybrid fish alive that I've not seen at some time or the other."





With teeth like these, there's no mistaking the carnivorous habits of the Pike Top Livebearer (*Belonesox belizanus*).

FEEDING TROPICAL FRESHWATER FISH

Dr David Pool of the Tetra Information Centre, takes a look at tropical freshwater fish and their feeding habits and requirements.

A flick through any aquarium book, or a browse in an aquarist shop, will quickly reveal the large number of different fish species which can be kept in a tropical freshwater aquarium.

In the wild these fish feed on a very wide range of different food items, ranging from microscopic algae to whole fish or pieces bitten out of land animals. In their natural surroundings the fish tend to congregate where there is abundant food (given that the other conditions are suitable). If there is insufficient food, or it is of the wrong type, the fish move to other areas or, if this is not possible, they may die.

In an aquarium the fish rely on us to provide the correct food in suitable quantities. Fortunately for the fishkeeper, there is a wide range of dried foods available which

allows the natural diet of the fish to be recreated, and results in healthy, lively fish.

But which foods should be given to which fish? — and why?

An indication of which of the many dried foods should be given to a particular fish can be obtained by considering what the fish's natural diet is comprised of. On the basis of their diet it is possible to divide all fish into three broad categories: herbivores, carnivores and omnivores.

Herbivores

Herbivorous fish are those which consume mainly plant material and include species such as the Java Flying Fox (*Epalzeorhynchus isanensis*), Tinfoil Barbs (*Barbus schwanenfeldii*), "Plecostomus" (*Hypostomus* spp.), etc.

These fish have a number of character-

istics which allow them to feed on plant material. One of these is their intestine, which may be up to 2-3 times as long as the body and has no recognisable stomach. The long intestine allows the fish to make maximum use of the plants, which are very difficult to digest. Despite the long intestine, herbivores need to feed more or less continually in order to obtain the necessary nutrition. This behaviour can be seen by anyone keeping Mollies or Sucking Leaches (*Gyrinocheilus aymonieri*). These fish can be seen to graze continually on any algae growing in the aquarium.

In order to keep herbivorous fish, it is important to provide a diet which is rich in vegetable matter. There are a number of commercially available vegetable-based flake or stick foods which make an ideal base for the diet. These can be supplemented with fresh vegetables such as lettuce, peas, algae or excess plants from other aquaria.

Carnivores

Carnivorous fish are those which eat meat. They can be subdivided into **Piscivores** which feed largely on fish (eg

Piranha, Pike Cichlids and Pike Top Live-bearers) and **Insectivores** which feed on insects and their larvae (eg Hatchetfish, Discus, Angelfish and Neon Tetras).

Compared with the herbivores these species have very short intestines, often only as long as their body, and they have a muscular stomach. The shorter intestine is all that is required to digest and absorb a diet which is rich in proteins. Unlike herbivores, carnivorous fish do not tend to feed continually. Instead they feed for short periods and then remain inactive for several hours, or even days, while the meal is digested. The muscular stomach is essential in this process, as it expands to accommodate and store the occasional large meals until the food can be digested and absorbed.

It is possible to distinguish a piscivorous fish just by looking at it. These species are adapted to catch fish, and so have large mouths with numerous teeth to stop their prey escaping. They also tend to have most of their finnage towards the back of the body enabling them to accelerate suddenly and catch a fish.

The insectivorous fish also have teeth (even Neon Tetras), but these are less obvious than in the piscivores.

Carnivorous fish require a diet which has a relatively high protein content so that it can be digested in their specialised intestines. Foods rich in vegetable matter may well be eaten, but are not digested and absorbed efficiently, resulting in much waste. There are a number of suitable flake, stick and pellet foods produced specifically for carnivorous fish, which contain the essential nutrients in a form in which they can be absorbed.

Omnivores

The omnivorous fish account for the largest proportion of all fish and are those which are opportunistic; that is, those fish which feed on a range of food items as they are available, including both plant and animal matter.

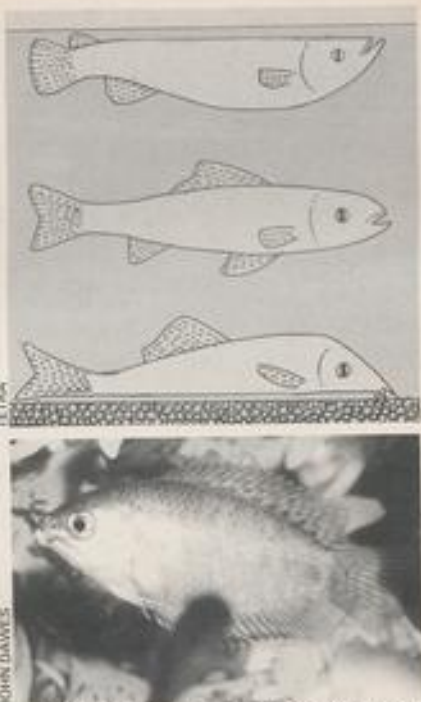
In fact, we should place all fish into this group, particularly if the food consumed throughout their lives is considered. Piranha, for example, are an ideal example of a carnivore, and yet, Piranha fry may feed on algae when they first hatch (= herbivore?). In complete contrast "Plecostomus" adults feed largely on algae and other plant material (= herbivore), but the young fry may feed on zooplankton (= insectivore?).

Obviously, the groupings are based on the main diet of the fish, with true omnivores being those which feed on a mixture of plant and animal matter.

Most of the common community fish (eg Guppies, Barbs, Corydoras and Tetras) are omnivorous. They should, therefore, be offered a diet which contains both plant and animal matter. The 'staple' flake and tablet foods provide a good basic diet containing all of the essential nutrients. This can be supplemented with freeze-dried foods and vegetable-based flakes for variety.

Food size

In selecting a suitable diet for our fish we not only need to consider what type of food



Top, the main physical characteristics of surface, midwater and bottom feeders.

Above, the majority of fish are opportunistic feeders (ie omnivorous). Included in this large group are all the popular Gourami species (this is a young, robust *Colisa fasciata* female).

Right, many herbivorous species have down-turned mouths armed with numerous tiny scraping teeth like this *Euclichthys guentheri*.

a fish eats in the wild, but also what size the food should be, and where it should be given in the water.

The size of the food which is eaten by a fish is largely governed by the size of its mouth. If the food is too large, the fish will either break it up or ignore it. On the opposite end of the scale, large fish will often ignore small particles of food, or cause many of them to sink and pollute the water. Obviously, big-mouthed fish need big foods, and small fish small foods.

Fish fry are the smallest specimens which are kept in aquaria and they should be given specially formulated powdered or liquid fry foods. These foods are not only small enough to be consumed by the fry, but also contain the high protein level necessary to encourage rapid development.

Flaked foods, either crumbled or fed whole, are ideal for small and medium-sized fish. The flakes may be eaten on the water surface, as they sink, or from the bottom, depending on the fish species concerned.

Large fish (greater than 4 inches (10cm) long) are best offered stick or pelleted foods. These foods are in bite-sized pieces, with no small particles which may remain uneaten and pollute the water.

Position in the water

The fish which are commonly kept in aquaria feed at different levels within the water, with some preferring to take food

from the surface, others from mid-water and others from the substrate.

Fish which normally feed on or near to the surface, can be identified by their upturned mouths (eg. Guppies, Mollies, Swordtails and Hatchetfish). This allows them to feed while remaining almost horizontal in the water. Such behaviour provides an obvious advantage if danger threatens, when they can swim quickly away without having to straighten up first. Floating foods such as flakes, sticks and freeze-dried particles are the best choice for these fish.

Bottom feeding fish tend to have down-turned mouths for the same reasons as the surface feeders. Foods on or near the bottom, such as tablets or sunken flakes, are required for these species.

Most of the remaining fish feed in midwater, but can also take food from the surface or substrate. These species tend to have forward facing mouths and have to point up or downwards when feeding at the surface or substrate. All types of foods can be given to these fish, although those which float, and then sink slowly are, perhaps, the best.

Having set up a tropical aquarium and introduced a range of different fish species, it is up to us to ensure that they receive a diet which will allow them to develop and behave normally. Hopefully, some of the points raised in this article will enable you to give your fish a better and more natural diet.



FEEDING COLDWATER FISH

Interpet's Development Manager, Adrian Excell, provides a comprehensive year-round guide to coldwater fish nutrition.

In the UK the category "coldwater fish" encompasses, predominantly, members of the Cyprinid family which includes in its ranks Goldfish, Koi, Orfe and Rudd. This article examines nutritional physiology and how nutrition varies with water temperature and the fishes' age and condition. A deeper understanding of the nutrition of the fish we keep, will help us to meet their dietary requirements more fully, which in turn, can only lead to healthier and more rewarding fish.

Nutritional Physiology

The Cyprinid family of fish are categorised as omnivores. Their natural diet consists of crustaceans, molluscs, zooplankton, insect larvae, oligochaetes (segmented worms) and some plant matter. These food items are taken from all levels of the water column.

The Cyprinids' mouthparts are suited to exploiting small to medium size food particles varying in diameter from 250 micrometers to 3.4% of the fishes' own body length. Carp and Goldfish are very adept at sifting these food particles from the detritus of the pond bottom. Although Cyprinids lack true oral teeth they do possess a very powerful crushing mill made of pharyngeal teeth which are situated at the back of the mouth. This structure allows Cyprinids to exploit relatively hard food sources, such as shelled molluscs, and make short work of hard food pellets.

The Cyprinid digestive system differs from, say, that of carnivorous trout in that it lacks a stomach. The stomach's usual role is to provide an acidic environment for protein digestion and to retain large food particles to prolong enzyme contact time.

Unlike their less-fancy counterparts, Orandas are generally kept in aquariums all year, thus avoiding hibernation but, as a result, requiring an adequate diet throughout the winter months.

The Cyprinids have, instead, an entirely alkaline digestive system and have evolved special high-activity protein digestive enzymes which work in this alkaline environment.

Cyprinids also have a significantly longer gut than carnivores, being between 6-24 times their own body length in comparison to that of the carnivorous trout which is 1% times its body length. This feature compensates for a slightly lower digestive enzyme activity, and allows processing of more difficult-to-digest plant matter by giving a longer duration of food contact with the enzymes to break it down into useful products which are then absorbed.

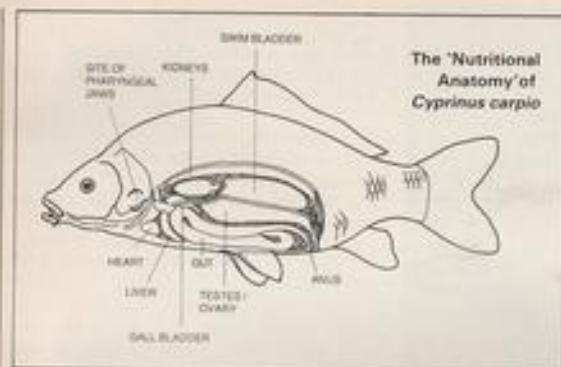
A longer gut is also a feature of fish which take in a high proportion of detritus with their food, like the bottom-feeding carp. Fish without stomachs also exhibit an increased number of gut fillings per day, feeding to satiation every five hours in nature, which, again, is associated with the amount of useless material taken in with the food and the lower digestive efficiency. This fact lends weight to the old advice about feeding pond fish little but often.

Cyprinid gut physiology varies during their development in response to an altering dietary emphasis. The gut of a juvenile carp, for instance, is less than half as long as that of an adult fish. This can be traced to the fact that a juvenile carp's primary food source is zooplankton. The higher proportion of more-easily digested animal protein, and the lower proportion of detrital and plant matter in the diet, means that a shorter enzyme contact time is required. This explanation is further supported by the fact that a small carp's food retention time is a third that of an adult's. Faster food processing means that juvenile carp eat more food in a day than adults, a carp of 100mg-3gm (0.004-0.1oz) weight has an optimum daily ration of 10-15% of its own weight, in comparison to 2.2% for a 90gm (3.2oz) fish. This emphasises the fact that maximum rapid growth of fish fry can only be achieved by more regular feeding.

Protein digestion is also different in juvenile fish, occurring throughout the gut, in contrast to adults where less than 12% of protein enzyme activity occurs in the hind gut.

Nutritional Requirements

Food matter is made up of a number of essential components namely, protein, fat, carbohydrate, minerals and vitamins. Each species of fish has requirements for different proportions of these components in their diet. The nutritional requirements of omnivorous Cyprinids and carnivorous fish differ less than their very different physiology would suggest. This surprising similarity reflects the fact that, although the two fish categories are exploiting different food sources, they do so in an effort to achieve the same basic aims within the same demand-



DIETARY COMPOSITION OF TWO CYPRINID NATURAL FOOD SOURCES

Composition	Zoo-Plankton	Benthic (bottom-dwelling) invertebrates
% crude protein	48	47.7
% crude lipid	21.3	13.8
% crude carbohydrate	4.4	22.9
% crude fibre	7.7	4.0
% ash	12.4	9.2
Gross energy Kcal/gm	4.86	4.89
Crude Protein: Crude lipid ratio	2.3:1	3.5:1

ing environment.

A carp's natural diet contains as much as 50% protein, and in scientific tests, optimum growth at 27°C (80.5°F) is achieved on a diet containing 38% protein, in comparison to the carnivorous trout which is 40-46%.

During enzyme digestion, proteins are broken down into the various amino acid building blocks of which they consist. Certain combinations of these amino acids are then built back up into fish tissue (protein) for body repair and growth. Any amino acids left over can be further broken down to provide a source of energy, producing as a by-product, waste in the form of ammonia. As has been mentioned, the Cyprinids' natural diet contains a high proportion of protein and a relatively small amount of carbohydrate and fat which are the most usual energy sources.

As a result of this natural diet Cyprinids and many other fish have evolved to utilise protein as their main source of energy, assisted by the fact that they can remove the ammonia waste very easily through the gills. The implications of this state of affairs to the fishkeeper is a potential deterioration in water quality. However, carp are actually quite capable of exploiting fats and, to a lesser extent, carbohydrates as an energy source. It is therefore possible, by careful formulation of artificial diets, to substitute fats and carbohydrates for some of the protein and ensure the protein sources included contain only the amino acids necessary for repair and growth. For example, the optimum protein level can be reduced in carp to 29% by increasing the lipid content up to 18%.

Vitamins and minerals are both essential for many life-giving processes. Fishes' vitamin requirements are, in general, higher than those of mammals, while mineral requirements are complicated by the fact that some, such as calcium, can be absorbed directly from the aquatic environment. Cyprinid vitamin and mineral requirements are relatively well known and will be present in sufficient quantities in most good proprietary foods.

Factors affecting nutrition

The nutrition and general physiology of fish is directly and significantly affected by the temperature of the water in which they live. In the high latitudes of Northern Europe, this means that Cyprinid nutrition

varies both in quantity and nutritional components with the changing water temperatures of the seasons.

The feed consumption of carp is at a maximum in water temperatures of 26°C (c.79°F), at which 40.75mg of food are eaten per gram of a fish's body weight. Food consumption falls rapidly with decreasing temperature reaching 3.87mg/gm of body weight at 14°C (c.57°F) and eventually ceasing altogether at 5°C (18°F).

Increasing food intake with rising temperature is related to the fact that metabolic energy consumption doubles with every 10°C (18°F) rise in temperature, which obviously requires a corresponding increase in fuel requirement. Higher food intake is also a function of more frequent feeding bouts, resulting from a greater ability to digest material and an increased rate of food passage through the gut. Lower temperatures decrease food intake and the speed of food passage. However, food conversion efficiencies, that is, the ability to convert protein in the diet to fish body weight, increases from 2-4:1 to nearer 1:1*. These facts can assist the fishkeeper to assess the quantity of food to feed his/her fish at different times of the year, although the fishes' appetite is always the best guide.

In higher latitudes during the winter when temperatures fall below 5°C (41°F), Cyprinids go for considerable periods of time without food. There are reported cases of carp surviving 159 days of complete starvation. This ability to last without food is a result of fishes' ability to mobilise energy from carbohydrate stores around the heart and liver, as well as by breaking down a proportion of their white muscle which makes up the bulk of the fishes' muscle content (but this method is only used in emergency bursts of swimming).

Higher temperatures above 30°C (86°F) also inhibit appetite, since energy requirements for digestion and assimilation of food may cause an overload, at a time when the metabolic rate and, hence, energy demands, are very high.

* A food conversion efficiency figure of 2-4:1 means that out of every 2 to 4 grams (or ounces . . .) consumed, only 1 is converted into body tissue. A figure near 1:1 indicates that almost all the food eaten is converted into tissue.

Low oxygen conditions can also reduce food intake. Carp are, again, very capable of coping with these conditions, by mobilising the carbohydrate stores mentioned earlier to provide energy without using oxygen.

Temperature also affects the actual requirements for different components in a fish's diet. Enhanced enzyme efficiency in summer's warm water temperature means that protein synthesis is much higher, with twenty times more protein synthesised at 20°C (68°F) than at 10°C (50°F). Vegetable matter is also more difficult to digest, but can be utilised in warmer water temperatures. The proportion of vegetable matter in a carp's natural diet increases to around 20% during the summer. In the cooler water temperatures experienced during the early spring and autumn, carbohydrates and lipids are more digestible than proteins, and therefore, play a more significant role in a fish's nutrition.

Nutritional requirements are further affected by the natural demands of the various seasons. In autumn, for instance, fish need to build up their energy resources for the long winter starvation period. In spring, the fish need energy to build the energy stores back from their low ebb after the winter starvation period. During this spring period, high quality, easily digestible protein is required for the replacement and repair of body tissue. Just prior to the spawning period early in the summer, a large amount of protein is required to build up the gametes (egg and sperm) levels in the mature adult fish.

The optimum level of food components also varies with age. For instance, optimum dietary protein requirements are higher during a fish's early high growth stages, e.g. a Grass Carp at 0.2gms (0.001oz) requires 42% protein in its diet, while, at 8gms (0.3oz), 26.5% is optimum. The fishkeeper should therefore use higher protein foods for rearing young fish through their rapid growth stages.

In recent years fish nutritionists have made significant advances in the understanding of fishes' dietary requirements. As a result of the increasing volume of information available from such research, a range of good-quality commercial foods have been developed to meet the needs of different species of fish of all ages throughout the year.



The Octopus is an intelligent carnivorous invertebrate which takes its food in chunks.

INVERTEBRATE DIETS

Dr David Ford, Head of the 'Aquarian' Advisory Service, investigates the dietary requirements of marine invertebrates kept in aquaria (Photographs supplied by the author).

Marine hobbyists usually keep coral fish in an aquarium decorated with bleached (i.e. dead) coral. Most eventually decide to add an invertebrate, if only an Anemone, for the Clownfish to wallow in. A few marinists choose an invertebrate aquarium with either no fish, or just planktonic feeders like Seahorses or Pipefish, which is very wise because the coral reef is an underwater jungle and to try and include all its creatures in the confines of an aquarium would mean many becoming a rather expensive meal.

Even invertebrates (or inverts as we aquarists call them) have to be chosen with care. Add a Fire Worm *Hermodice carunculata* to a tank of living coral and polyps will all be rapidly eaten, leaving a skeleton that is only suitable for adding to the bleached coral decoration.

Feeding Types

The inverts can be classified into plankton eaters, carnivores, herbivores, scavengers and detritus feeders. You must take note of

which type your chosen invert is before purchase and installation, so that the necessary diet can be available. Note that the main differences in feeding types are mechanical, because all the inverts are part of the special food chain of the coral reef.

Do not feed human or pet food, which are part of a very different food chain. The nutritional components are discussed elsewhere in this feature, but, to take just two examples, protein and fat: we humans prefer the richness of foods high in protein and fat, but it is accepted that these are bad for long-term health. The once maligned carbohydrate-rich foods should form the major part of our diet, especially if unrefined, and so, high in fibre. The coral reef food chain is very different, being only average in protein and with virtually no fat as we know it.

Protein

It is stated in many books that fish require a very high protein diet, but this is based on improper evidence. Analysis of a fish's natural food (crustacea, insects, algae etc.) can give a high nitrogen value that

calculates as 'protein' by the food chemist's technique of purely mathematical interpretation of the data. What really matters is what does the fish make of its diet? The following data are revealing:

Composition of oily fish

Fillet	
20% protein	10% fat 40mg calcium
Whole	
10% protein	5% fat 15mg calcium

(Dictionary of Nutrition and Food Science, A. Bender, Butterworths Ltd)

Composition of white fleshed fish

Fillet	
16% protein	0.5% fat 25mg calcium
Whole	
7% protein	0.2% fat 11mg calcium

Most coral inverts feed on the same foods as these fish, or the fish themselves or their carcasses, so a diet with this nutritional balance is what they should receive from you. Not beef or beef heart, liver, chicken etc. or, worse still, the processed human foods of hams, sausages and Sweet and Sour Chicken!

Fat

Oils and fats are properly called lipids. Marine lipids are very different to mammalian ones. Imagine a Cod swimming in Icelandic waters... if it had the type of fat found in a beef cow it would be as solid as a candle stick! The differences are due to the state of the carbon atoms in the chain of molecules. Carbon can react with 4 other atoms, and if these sites of reactivity are taken up, the chain is called saturated, but if (mainly) only two sites are taken, the carbon is said to be unsaturated. This is why nutritionists talk about saturated and unsaturated fats. Marine oils are almost totally unsaturated and so have lower melting points (hence the Cod is not frozen solid), but the available reactive sites means it is less stable in air. Hence, fish oils soon go 'off', whereas lard and butter can keep for years.

The consequence of this chemistry is that we should prepare invert feeds from marine foods that are fresh or stored deep frozen. Mammalian foods like pet food, meat and meat offals are not suitable because of their fat content.

Plankton Eaters

These include Tubeworms, Stone and Horny Corals, some Sea Cucumbers, Bivalves, a few Crustaceans and Ascidians. In the wild they feed off the minute plankton that just drift by. Fish have a brain and so are capable of being trained, which means they can be taught, for example, to accept flake food, but plankton-

feeding inverts can't be trained to do anything! You have to reproduce that natural feeding method.

Prepare the plankton texture by placing the food in a kitchen blender (it may be necessary to buy one for your exclusive use!) to homogenise it. Save surplus in feed size portions in the deep freeze (an old ice cube maker is useful). Blend whole fish, fish fillets, shrimp, prawn, crab, mussels; in fact, any marine food. Saltwater from the aquarium can be added to water the mixture down to the right consistency. The texture should be like yoghurt.

In emergency, earthworms, slugs and snails can be used, or even egg yolk, but not, of course, mammal meat and offals. It is good practice to add some flakes of a good-quality flake food, especially a marine flake, so that the necessary vitamins and minerals are included. In the wild, the marine animals are eaten alive, so the vitamin content is higher than is present in carcasses.

Take the emulsified food and drip-feed the plankton eater with a pipette. A chemical pipette fitted with a rubber teat is ideal because it is long enough to approach the Tube Worm or Coral Head without the animal being disturbed. An eye dropper is often quoted as a good feeder, but these are so short and 'squirty' that the plankton feeder decides to retire! Even a drinking straw is better (especially the larger MacDonald's type!).

Turn off the filter while feeding and siphon out any surplus before switching it back on. If the tank is full of inverts, aeration that is not part of the filter system (e.g. air-operated undergravel) can be left on to help circulate the 'soup'.

An excellent natural feed for plankton eaters is freshly-hatched Brine Shrimp, but use immediately. The frozen form is best added to the blender. There are also, of course, commercially prepared plankton feeds which come complete and ready-to-use, along with full directions.

Carnivores

Instead of blending the marine animals, the same chunky food can be fed to carnivorous inverts such as Crabs, Lobsters, Shrimps, Starfish, Anemones (see later) and Octopi. Again, feed a little flake food for essential trace elements too. If the animal will only accept chunky food, then make a small cut and insert a flake into the food first. If the water conditions are perfect, all the carnivores are very easy to feed; they usually rip the morsel from you immediately it is sensed.

Herbivores

Sea Urchins are almost all herbivorous; many Molluscs and a few Sea Slugs are also vegetable eaters. In nutritional terms, there is less difference between the land vegetable and the sea vegetable than marine or land animals, so it is not actually harmful to feed lettuce or spinach. Don't overdo the spinach, though; it is rather high in toxic oxalic acid.

Aquatic plants should be included where possible; not expensive aquarium plants of



Tube Worms (this is *Sabellaastarte indica*) are plankton feeders which can prove difficult to keep in aquaria.



Lobsters are powerful, colourful, scavengers.



Starfish share the label of scavenger with other invertebrates such as Lobsters — but their feeding strategies are quite different.



Clownfish and anemone in harmony.

course, but cheap and "too-plentiful" Blanket Weed from the pond. Some Seaweeds in the diet may also be essential. The Health Food Stores sell Seaweeds such as dried Kelp that can be used. Blend the Kelp with a gel (such as gelatine from the Supermarket) for chunky feeding. Some inverts, such as Slugs, will not eat lettuce leaves until they are almost disintegrating, so do not be impatient to remove them. If you are worried about nitrite levels, the ageing can be carried out in a goldfish bowl filled with seawater.

Scavengers and Detritus Eaters

Many mobile inverts sift through the coral sand continuously looking for tidbits. These can be fed with shredded marine foods placed before them and all will happily take high-quality fish flakes. Shrimps are excellent at scavenging bits of food in nooks and crannies.

Some inverts such as Sea Cucumbers are detritus feeders, eating coral sand and excreting it, minus any organics, just like garden worms. These are difficult to feed in the new marine tank. It is therefore best to delay owning such inverts until a layer of detritus (or mulm) has built up on the base. Sea Cucumbers are useful inverts to keep in the tank with plankton feeders because they scavenge the surplus food.

Anemones

The Anemone must be the most popular of all the inverts, and even a mariner with a fish-only tank should include an Anemone if he/she owns Anemone Fishes. (Nothing is as sad as a lonely Clownfish shimmying in space!)

Pea-sized pieces of mussel, shrimp, prawn, fish, even cleaned earthworm, need to be fed twice weekly to the Anemone. Make sure it takes the food in its tentacles — do not drop directly into the mouth and remove any piece it won't wrap around immediately. Some Anemone fish will feed the Anemone but many steal its foods, so do watch events!

Regurgitated food should be removed with a dip tube as soon as it appears. A wandering Anemone is often a hungry one, so increase feeding once it is back in the preferred position. Stop feeding if it goes into the resting stage of retracted tentacles and shrinking body. Feed again immediately it blossoms.

Aquarium Conditions

Many inverts, such as Living Corals and many Anemones, require bright lighting as part of their nutrition because the polyps, or cells, contain photosynthesising algae. All the food in the world will not replace the role of these algae, so do ensure that lighting in the invert tank is adequate. If it is a coral fish aquarium with just one Anemone, it can be catered for by fitting a spotlight over a glass-covered tank.

How often to feed inverts depends on the type; as stated, twice weekly is sufficient for Anemones. Small plankton feeders will need a daily dose, but detritus feeders can be just left to it. Inverts are not easy to keep in captivity; in fact, some require skill and devotion on the part of the mariner, but if the basic diet is marine animals, it is unusual for losses to be caused by nutritional problems. It is nitrite or ammonia that kills instantly, and metals such as copper that kill slowly. Inverts are also much more susceptible to water chemistry changes than the fishes, so check the pH and SG, and do not allow them to drift. A happy invert has a healthy appetite, so if the right food is offered, rejection usually means something more is wrong than just the diet.

LIVE FRY SELECTION

Despite the existence of a widely available range of excellent commercially-produced fry foods, many aquarists believe in variety being "the spice of life" and, consequently, like to include livefoods in the diet they provide for their young fish. *A & P* editor, **John Dawes**, selects some of the best fry livefoods on offer and suggests suitable sources and culture methods for them.

Fry and juvenile fish differ from adults, irrespective of size, in that they are growing. Because of this, they require a higher level of protein than their mature counterparts (about 35% or more, and less than 30%, respectively).

Commercially prepared dry foods take this into account and, accordingly, reflect the varying needs in their formulae. When it comes to live foods, though, the actual protein/fat/carbohydrate content of each type is outside human control.

On average, livefoods contain between 70 and 90% water, the rest being made up of the other vital ingredients of a fish's diet, plus some indigestible material.

Although the top commercial foods are widely accepted as providing an adequate diet for young fish, many aquarists still maintain that the best approach is to offer their fry a combination of dry and live

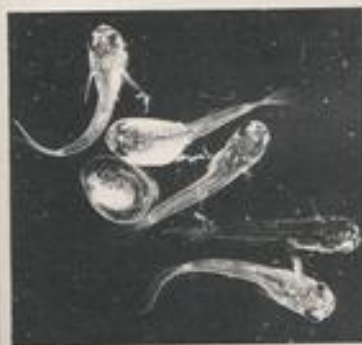
components.

And, if the way in which fish energetically chase livefoods and gobble them up is anything to go by, there might well be some truth in this belief. Personally speaking, I, like so many others, prefer to give my fish a combination, incorporating variety in my "menu" to ensure that no essential component is overlooked.

RANGE OF FRY FOODS AVAILABLE

Gone, thankfully, are the days when livefoods for fry consisted just of sifted egg yolk and infusoria, and even then, calling egg yolk livefood meant having to stretch the imagination somewhat! Nowadays, we have a wider range of suitable foods — and it's getting wider.

Here are brief details of a few of the more common types:



Left, Above, baby Guppies (seen here hatching from artificially incubated eggs) can take a wide range of small livefoods from the outset.

Above, *Daphnia* of mixed sizes. If this culture is sifted, the smaller specimens can be fed to young fish.

Left, these newly-hatched Angel fry will have to absorb their yolk sacs before they are ready to eat even the smallest infusoria.

1. Infusoria

This term covers a range of organisms whose main shared characteristics are that they are microscopic and aquatic. The best known and, consequently, the one most commonly used as a first food for fry, is the protozoan (single-celled animal) *Paramecium*, the Slipper Animalcule.

There are various methods of culturing infusoria, the following being the three most popular ones:

a) Lettuce, turnip, hay, potato or banana skins are squashed and/or boiled and added to a jar of aquarium water. After a few days in a warm environment, the water turns cloudy (and smelly!). Individual drops will show a profusion of microscopic organisms which can be fed with a pipette to fry as soon as they consume their embryonic yolk sacs and become free-swimming.

b) There are liquid fry food preparations widely available which can be added directly to the fry-rearing tank or to the infusoria culture. If added to the fry tank, some of the liquid food may be eaten directly by the fish themselves. The rest is consumed by the infusoria which, consequently, multiply and, in so doing, provide the fry with a regular supply of food.

c) Apple or Mystery Snails (*Ampullaria*) are large aquatic snails with appetites to match. They will eat virtually anything, animal or vegetable, but tend to leave most species of healthy aquatic plants alone, preferring, instead, dead or dying leaves and algae. Their usefulness from the fry-rearing point of view is that their faeces contain substances which stimulate the growth of infusoria. The snails can either be introduced into the tank shortly after the fry have hatched or, better still, they can be cultured in a separate tank from which infusoria-rich water can be drawn on a regular basis.

Infusoria cultures can also be obtained either for "growing on", or for feeding direct, from some specialist sources.

2. Micro-algae

Often collectively termed "green water",

micro-algae can be used either directly, as food for fry, or indirectly as food for zooplankton or infusoria, which are then eaten by fry.

Naturally occurring sources of this type of water, often containing the green, flagellate *Euglena* in vast quantities, abound, particularly during summer months. The main danger with such sources, though, is that they can hide predatory organisms which can make a meal of the fry which were supposed to feed on the algae instead.

However, the problem is surmountable if the water is passed through a fine net or, at a price, from specialist suppliers. The great advantage of obtaining supplies from a professional source is that the cultures are pure, you can select your species (either for marine or freshwater conditions) and you can buy micro-nutrients with which to keep the cultures going.

3. Rotifers

Rotifers are multicellular microscopic organisms which are highly nutritious and are present in many samples taken from ponds or other natural bodies of water.

The same potential problems outlined for micro-algae, of course, also apply to rotifers. Again, as with micro-algae, mono- or mixed cultures are available commercially, along with all the foods and directions for sustaining them.

While, in theory, it is quite possible to keep cultures of both micro-algae and rotifers going indefinitely, in practice, this requires fairly constant attention to detail. Such foods are, therefore, not ideal for the lazy hobbyist who wants to set something up and then forget about it. They have, however, proved their immense worth in the rearing of difficult marine fry, such as those of Clowns and Damselfish.

4. Newly-hatched Brine Shrimp

After the first week or so, most fry are too large to exist and grow entirely on a diet of infusoria or micro-algae. For some species, in fact, infusoria are too small from the moment of birth (livebearer fry fall into this category). One of the best alternatives is provided by the newly-hatched larvae (nauplii) of *Artemia salina* and allied species of Brine Shrimp.

Hatching kits, which include eggs, hatchery, salt and a fine sieve, are universally available. Alternatively, the eggs may be bought and hatched in a wide-necked bottle using a well-aerated solution made up of approximately 20 gms (one teaspoonful) of rock salt in one litre of water. Many brands of table salt contain additives which inhibit hatching. These should, therefore, be avoided.

At a temperature in the region of 25°C (77°F), the eggs will begin to hatch after about a day. The turbulence created by the airstone will, obviously, keep the larvae and their empty shells (except in the case of shellless varieties, of course) in suspension. However, if the air supply is stopped several minutes before feeding, the shells will float, while the larvae will sink. These can then be siphoned into a fine sieve by means of a rubber/plastic tube. The water is returned to the culture bottle and the Brine Shrimp are given a light rinse in



Top, *Euglena* — one of the main components of green water.

Above, all young fish, including these *Neolamprologus brichardi* (shown feeding on Microworms) react very positively to the introduction of livefoods into their tank.

Right, Rotifers are highly nutritious microscopic organisms which are helping us solve the problems of rearing the fry of some otherwise difficult species.



tapwater to remove traces of salt prior to feeding to the fry (not necessary in marine aquaria, of course). It should be remembered that *Artemia* live in saline conditions and will die in a freshwater aquarium after a few hours. Care must therefore be exercised in the amount offered at any one time.

5. Microworms

These small *Nematodes* (*Anguillula nitida*) are also variously known as Microceels or Eelworms. They are even smaller than Whiteworms or Grindal Worms and are suitable for feeding to the fry of egglayers which are very small at birth, e.g. most Gouramis, once they are about two weeks old. Large egglayer fry, such as those of many Cichlids, as well as livebearer fry, can easily take Microworms as soon as they have absorbed their yolk sacs.

The culture medium consists of moist oatmeal in a shallow container (a medium-sized plastic flower pot is ideal). The culture of Microworms is simply mixed in with the medium, covered by a sheet of glass or plastic and left in a warm place (c.25°C/77°F). The worms multiply very quickly and will climb up the sides of the container, remaining just above the culture medium. They are then removed with a small brush and fed directly to the fish. Since oatmeal goes sour after a short time, the best way to avoid problems (and foul smell) is to start a series of cultures every few days and discard old ones every 10 days or so.

6. Vinegar Eels

These tiny worms (*Turbatrix aceti*), as both their common and scientific names indicate, thrive on acetic solutions, such as diluted vinegar itself, or cider (once it

begins to go vinegary).

Once a starter culture is inoculated into the medium, it just goes about its business and, in no time at all (about one week at around 70°F — 25°C) will start yielding harvestable amounts of "eels". The addition of a small piece of fruit (small means about the size of a pea) will work wonders for the culture.

Because of the nature of the culture medium, it should not be poured directly into the tank housing the fry. A very fine net (a Brine Shrimp sieve is ideal) should be used and the "eels" lightly rinsed before being fed to the fish.

7. Other Foods

The above represents no more than a small selection of livefoods for fry and small fish. Space does not allow treatment of numerous others, such as the newly-hatched larvae of mosquitoes, midges or Glassworms, baby *Mysis* shrimps, small Bloodworms, Grindal Worms, *Cyclops*, baby *Daphnia*, wingless Fruitflies (*Drosophila melanogaster*), and others.

In addition, there are the myriad tiny organisms that inhabit any body of fresh or salt water ... all packed with nourishment for fry ... and some harbouring unseen dangers for them ... and all consisting of anything between 70 and 90% water, thus making the oft-quoted "feed little-but-often" rule a golden one when livefoods are used in place of, or as supplementary to, their commercially-produced "cousins".

NOTE

The text of this article is partly based on **Feeding Livefoods Ensures Healthy Fry** published in the American trade journal **Pets Supplies Marketing** in September 1988.

OUT AND ABOUT

with John Dawes

B.A.F. '88

by
Adrian Blake

The early date of September for this year's British Aquarist Festival proved more comfortable for the visitors who travelled any distance. The weekend was lovely and sunny, which helped to make getting to the G-Mex Centre and parking, less of an ordeal.

The 37th Festival was, as usual, well stage-managed by the Federation of Northern Aquarium Societies. Good attendances on both Saturday and Sunday kept the trade stands very busy. New this year were several pumps and filters including the new Atlantis 'S' series pumps and 'Power-flow' internal filter, as well as the new 'Eheim' internal filter launched by John Allan Aqua-

riums Ltd. Fish for sale included large Clown Loaches @ £39.00 each; large Red Oranda @ £19.00 each; large Silver Sharks @ £19.00 each; Turquoise Discus @ £130.00 each and some really large Koi, about 15-18in long, @ £55.00 each. The most expensive specimen was a Red-tailed Catfish @ £229.00 which, for this type of fish, was a very reasonable price.

New trade stands included Yorkshire Brine Shrimp selling large tins of shrimp at the excellent price of £74.99 for 1.7kg. Also new to the show this year was John Brittan, a magician who kept the hundreds of children entertained every 2 hours with his own brand of magic.

On the display side, 27 tableaux (the prizes being sponsored by *Aquarist & Pondkeeper*) were exhibited, and the most striking feature (to me) is



A true Champion of Champions — Mr Lumb's impressive *Acanthicus hystrix*.

that these displays are getting smaller. Gone are the days of the 30ft square oil rigs and large stage coaches, etc, built by clubs to exhibit their members' fishes — I suppose it must be the high cost of doing it these days.

Bradford A.S. gained first place in this competition with a very nice Gypsy Caravan; 2nd place was *Scorpion A.S.*, 3rd *Tongham A.S.*, 4th *Hucknall*

and *Bulwell A.S.*, and 5th *Wombwell*.

The Champion of Champions stand only had 18 exhibits and Mr. Lumb of the Catfish Association of G.B. took the award with a fantastic catfish with the tongue-tying name of *Acanthicus hystrix*.

"Koi 88" — A Huge Success

Report by
Nigel Caddock

After many months of planning, the last few of which were extremely difficult, the UK's premier Koi event was held on the weekend of 20 & 21 August 1988 at Billing Aquadrome, Northampton.

1988 has been a very difficult year for Koi shows in the UK, as *A&P* readers will no doubt have been following, due, in no small part, to the emergence of SVC, an extremely dangerous virus that affects Carp and Koi. Spring Viraemia of Carp (SVC) is an extremely virulent infectious disease that causes commercial Carp producers serious problems from time to time. In 1988 this virus has been identified in some Koi in the UK, and on all occasions, the source of the infection was imported European fish which passed the virus onto a few

Koi.

In view of the 1988 outbreak of SVC, it was clearly not appropriate to stage a National Koi show, which more than any other UK show is truly "national" and attracts Koi from all over the country, on the new "Japanese" style of Koi show, as this could increase the risk of the spread of the virus. There are still few facts about the spread and transmission of SVC, but it would clearly not have been prudent to have tempted providence at such a high profile event as "Koi 88."

At one stage cancellation was a serious option, but fortunately for UK Koi-keepers, the organisation committee of "Koi 88", under the leadership of John Beattie, decided to turn this potentially serious problem to the advantage of British Koi-keepers.

For the first time ever in the UK, the highly prestigious

BKKS national show was turned into a non-competitive display of Nishikigoi belonging to hobbyists, judges and professional dealers, and because of the revised nature of the event, many of the Koi seen had never previously been exhibited.

Each exhibitor was allocated a specific vat for his/her Koi, thus removing the possibility of any infection being passed from Koi to Koi. It is appropriate to note that the exhibitors at "Koi 88" represent some of the top Koi people in the UK, both private and professional, and all were happy to exhibit their Koi in the format of "Koi 88" with no fear of problems from SVC, or anything else.

This special "Koi 88" show format was decided on because the Japanese style of show requires varieties of Koi to be mixed together, irrespective of owners, and while it is possible to allocate each competitor a

separate vat, this makes accurate assessment of Koi, and the most equitable judging results, very difficult as direct comparisons are not possible using this type of show format. This is possibly acceptable at smaller shows, and even larger local events, but the National is the UK's premier event and is an extremely high-profile event. It will be excellent to return to the Japanese style of shows throughout the country in 1989, as there really is no comparison between the old and new show formats. This is graphically underlined as the quality of Koi in the UK continues to improve and the judges task becomes increasingly difficult.

The 20 show vats at "Koi 88" contained some of the finest Koi in the world and the standard and quality of the 200 exhibits was truly stunning.

I have compiled a portfolio of photographs cataloguing some of the superb exhibits

B.A.F. MAJOR AWARDS

TABLEAU: (HARRY PENHALL MEMORIAL TROPHY)

(Prizes sponsored by Aquarist & Pondkeeper)
 FIRST: BRADFORD
 SECOND: SCORPION
 THIRD: TONGHAM
 FOURTH: HUCKNALL & BULWELL
 FIFTH: WOMBWELL

EXHIBITOR WITH HIGHEST POINTS:
 Bernie Baldwin
 (Sandgrounders)

BEST FISH IN SHOW:
 Mr. & Mrs. B. Walsh (Darwen)
 with an African Leaf Fish
 (*Polycentropis abbreviata*)

CHAMPION OF CHAMPIONS:
 FIRST: Mr. Lumb (C.A.G.B.) with an *Acanthicus hystrix*
 Mr. & Mrs. Thompson (IND)
 THIRD: D. Sidebottom (Oldham)

F.N.A.S. SHOW LEAGUE:
 FIRST: Sandgrounders
 SECOND: Runcom
 THIRD: Merseyside
 FOURTH: Skelmersdale
 FIFTH: Wrexham

The Best Fish in Show award went to Mr. Brian Walsh of Darwen A.S. with a *Polycentropis abbreviata*, a

superb African Leaf Fish.

The Exhibitor with the Highest Points was, once again, Bernie Baldwin from Sandgrounders A.S.

Besides the F.N.A.S. stand, another innovation this year was to encourage other aquatic organisations to take space at the show to allow the visitor to see the whole spectrum of the hobby in the U.K. The marine/livebearer/cichlid and catfish societies all had stands as did the Association of Aquarists and the Federation of British Aquatic Societies.

'Tetra' had their usual (and very busy) Information Service answering aquatic queries, as did 'Aquarian' with their Advisory Service. This is one area of the show which I always find most stimulating (I was even called on to answer a few queries myself!). Many people commented that, although the venue is really superb, the Hall seems too large for this type of show, as the hubbub and noise seems to be lost, creating a lack of atmosphere.

For myself, I enjoyed it once again, although I would have liked to have seen more to attract newcomers to our hobby. There is a certain amount of tradition with BAF, especially after 37 years, although it was only(!) my 18th visit.



A never-ending queue made all the effort involved in mounting the exhibit worthwhile.

DAVID FORD

The Town & Country Festival

By Dr D. Ford, 'Aquarian'

The Town & Country Festival is held each August Bank Holiday Weekend at the Royal Agricultural Centre, Stoneleigh in Warwickshire. Around 150,000 people visit the Festival over the three days. It is the area's major family show with, obviously, a strong agricultural content, from the judging of poultry, horses and cattle, to sheepdog trials and show jumping. However, many other events cater for every taste: Eddie Kidd stunt riding, escapologists, the Duke of Kent's Regimental Band, Rock & Roll concerts, trampoline displays, a complete Motor Show section... even Roland Rat!

There are literally hundreds of exhibits on every conceivable subject, from Meccano models to Corn Dollies, and innumerable stalls selling everything from German Hot Dogs to Double Glazing.

In the huge agricultural buildings there is a section called World of Pets featuring cats, dogs, budgies, grooming competitions, a large rabbit run and, even, a mouse town.

Midland Koi Association attend each year with a small pond of large Koi, but it was pointed out by the organisers that the only 'pet' missing from the show was aquarium fish. Hence, 'Aquarian' were invited to bring their 'Learning Maze' and Advisory Service from the 'Aquarian' Fishkeeping Exhibi-

tion at Sandown Race Course.

Accepting the invitation, it was decided that the 'Maze' should be modified to suit the family audience at the show, most of whom would be non-aquarists. Eight four-foot tanks were sited at standing eye-level in a square building with a central ninth tank to give rotation of people from entrance to exit.

To interest the visitors who passed through the stand, the first two aquariums each contained red Common Goldfish and Fancy Goldfish including Moores, Orandas, Bubble Eyes and Sarasa Comets. The tropical tanks contained the Top Ten community fish, a selection of Livebearers and a Catfish tank with 'Plecostomus', *Corydoras* and giant Shark Catfish. A Cichlid tank contained a shoal of Oscars and the Marine tank housed small and large Coral fishes. The fish were selected specimens donated by Britain's Aquatic Superstore of Bolton. The central 50 gallon tank contained 20 young Koi. Although rather crowded, the water quality was maintained by partial water changes at the start and end of each day's show times of 9.30am to 7.30pm.

Despite the logistics of putting up a 20ft x 36ft x 12ft high building, transporting 2 tonnes of equipment, making 40 electrical connections and installing and decorating 9 aquaria, the 50,000 people who passed through the exhibit made it all worthwhile, because most will now (hopefully) become aquarists...

that graced "Koi 88" to enable those who were not fortunate enough to attend to see the best that UK Koi keepers have to offer, and to remind those who did attend just how good those Koi were.

The BKKS national show has developed into a complete Koi event which is a must for all Koi enthusiasts, and with a weekend accommodation package enabling Koi-keepers from all over the country to meet friends and discuss Koi in an informal atmosphere, it makes a memorable trip — all this and 200 of the world's finest Koi!

It was a delight to behold such a depth of quality of exhibits; it also demonstrated that there is always an alternative and that, although serious problems can arise, the resourcefulness of hobbyists overcome adversity to share their Koi will continue to ensure a very bright future for the hobby.



The quality of the fish on show was truly outstanding, as this magnificent Taihuo Sanku owned by Ian Stewardson clearly demonstrates.

THE SVC DEBATE — A PERSONAL VIEW



Dr Martin Jaffa presents his personal view of the recent SVC outbreak — and suggests some controversial solutions.

The August editorial of *Aquarist and Pondkeeper* focusses its attention on the problems of SVC — Spring Viraemia of Carp. 1988 will undoubtedly be remembered as the year of SVC, but as it is already November and we start our approach to 1989, will we have learned anything to stop a major recurrence of this problem in future years?

In the editorial, John Dawes asks for documented evidence in order to provide his readership with a fair and balanced view of the disease and its implications. He has said that such information is hard to come by, and so it is. The reason is that little hard fact exists, and that which does, is usually covered by confidentiality. This is why newspapers have had to resort to the scare-mongering headlines which appeared earlier this year.

In an effort to clarify the current situation and to put the disease into some form of perspective, I would like to take this opportunity to review the problem as I see it. However, I must stress that these are my own personal views.

It has been said that SVC was first identified in the UK during 1973. It would have been difficult to do so prior to that date as the causative agent of the disease

was only identified in Continental Europe during 1971. The virus concerned was named as *Rhabdovirus carpio*, but its discoverers had quite a job to convince others that, in fact, it was responsible for the disease. The reason is that the disease had been thought to be of a bacterial nature. The symptoms of the disease can include ulcers, haemorrhages and lesions. Alternatively, there may be no symptoms at all, just death of (often) over 50% of a population.

Possible causes of 1988 outbreak

Since 1973, SVC has been identified on four separate and isolated occasions. But why should it become a major problem in 1988? There are two main reasons for this, in my opinion.

The first is that the winter of 1987/1988 was extremely mild. This means that Carp, which usually hibernate through the winter months, were most likely active. Yet, the water temperatures were not high enough to induce feeding. The result of this was that Carp emerged from the winter in a more weakened state than usual and became even more susceptible to attack by disease than they normally are.

The second reason which, I think, has compounded the problem is that there are many more cyprinid fish in British waters than there ever has been, and so, the likelihood of the disease has increased. These fish are stocked, not only to satisfy the ever-growing demands of the angling fraternity, but also for table purposes, as well as (increasingly) to provide fish for the aquarist.

It is fish for the aquarist which are being blamed for the recent problems and, although this may be the case, it is equally possible that the virus has been in the UK for years, and only the combination of large numbers of fish and a very mild winter has brought on the disease at this scale.

The truth of the matter is that no one really knows where and when the disease came into the UK. The problem is that the disease is here and now everything should be done to ensure that it does not recur on the same sort of scale as this year.

Legal control measures

The Government has been aware for many years about the problems of fish diseases and their spread throughout the country. SVC is only one of a number of diseases which are endemic in several countries on the European Continent. Like terrestrial problems such as rabies, legislation has

been formulated which is aimed at keeping these diseases from our shores.

In the case of fish, the relevant legislation is the Diseases of Fish Act, 1937. Because of the upsurge of fish farming during the 1970's, this was re-enforced by the Disease of Fish Act, 1983. In essence, these two pieces of legislation control the spread of disease by:

- 1, making certain diseases notifiable, as in the case of SVC. (Bear in mind that, should your fish have, or be suspected of having, SVC, then you are legally obliged to notify MAFF who, if they confirm the disease, will demand that the fish be destroyed.)

- 2, controlling the importation of live fish and the eggs of certain fish.

- 3, the registration of fish farms.

It is the section which controls the importation of live fish which, I would suggest, now urgently requires review. Under the present legislation, in order to import fish, it is necessary to apply to MAFF for an importation licence. This is done using form DOF 7. This general licence is valid for one year and can be used at all ports of entry into the UK. To import fish and eggs of certain species, a health certificate from the country of origin is also required. Some of these species are: Carp (Common, King, Mirror and Crucian), Grass Carp and Wels Catfish. Most other British native species are also included.

Obtaining a health certificate for these species is, however, almost impossible, as the exporting farm has to be certified disease-free for at least two years before it can issue a valid health certificate. As most farms experience some disease, it is virtually impossible to issue a health certificate. This fact alone means that the importation of most freshwater fish into the UK is effectively banned.

Weakness link in the regulations

When this legislation was formulated, almost all the freshwater fish species imported into Britain were intended for re-stocking natural waters, or for providing stock for farms. The legislation was designed to prevent diseased fish from entering natural waters within the UK. It was therefore felt that it was not necessary to include ornamental fish species, as these were primarily intended for tanks and garden ponds, and that the possibility of fish ending up in the natural water system was remote. Despite this it must be borne in mind that Koi are

identical to all the other forms of Carp, the only difference being that they are coloured. They are susceptible to the same diseases, they can interbreed and they have the same life cycle.

Within the last fifteen years, we have seen a massive rise in the keeping of ornamental coldwater species. It is only necessary to look back at old editions of the *Aquarist and Pondkeeper* to see how the hobby has changed. In 1971, two advertisements mentioned Koi and one of these had to explain that these were Japanese coloured Carp. In the August 1988 issue, a whole supplement was devoted to Koi alone. To meet the demand for these fish, imports have risen many-fold, and even the Ministry who controls the licences for these imports, cannot have any real idea of the number of fish coming into Britain.

The problem is that the scale of importation is so large that it is inevitable that a small number of people will take advantage and abuse the system. For the first time, the Fish Diseases Act of 1937 was used to prosecute a dealer who claimed to be importing ornamental Koi. The shipment was also found to contain Common Carp, Perch, Roach, Tench, Catfish and, at least, one 15kg Mirror Carp. The truck carrying the tanks of fish was returned to France and the dealer and the exporter who was delivering the fish were each fined £500, with £400 costs. It is this dealer, who is, in some circles, being blamed for the current SVC problem, but my own personal feeling is that he is only at the tip of the iceberg. It is only necessary to see how many dealers are advertising Welsh Catfish and Grass Carp to see how the law is being abused. To be fair, in many of these cases, the fish concerned are destined for the aquarium and not for the open waters, as it was in the specific case mentioned.

Hype doesn't help

To some extent, the problem of fish importation is being exacerbated by the massive hype which is applied to ornamental Carp. The stories which abound about individual fish which are worth excessive sums induces some people into believing that if they become involved in the Koi business, then they will make their fortunes.

I think that they will find this not to be the case, but, despite this, more and more specialist Koi centres are opening, as well as garden centres developing fish outlets. To meet the demand for fish to stock these establishments, it is now common practice to bring in large quantities of small fish and grow them on in the UK.

The cost of the importation of a box of fish is standard, irrespective of the number of fish contained within. Therefore, if for example, the cost per box is £80 and the box contains one large Koi, then the transport cost will be borne by that one fish. If, however, there were 250 smaller fish in the box, then the transport cost will be shared between every fish. If the fish are then grown on, the overall costs can be reduced.

The worrying aspect about this is that, in some cases, imported Koi are being stocked



JOHN DAVES

out in natural waters where they are left to grow. A year or two later they are then harvested and sold to the pondkeeper. It is this route which can lead to the spread of diseases such as SVC if the fish were previously infected. Under current legislation, Local Water Authority consent is required to introduce any fish into natural waters, but it is simple to do without such a consent, even though, of course, the offender is liable to prosecution under the Salmon and Freshwater Fisheries Act, 1975. This can be avoided by stocking the fish into an existing fish farm since farms are currently exempt from these consents.

What does all this mean?

Simply, that in order to control further outbreaks of notifiable diseases such as SVC, present legislation should, in my view, be strengthened. This could be achieved in one of two ways. The simplest, but most controversial, would be to extend the current legislation to all coldwater freshwater fish. This would mean that all coldwater fish would require health certification, no matter what they were, or from where they came. As the current list of fish species is subject to amendment, it would not be difficult to enforce. This would effectively ban all coldwater fish imports for at least two years while health certification was established, and would be the most effective way of controlling disease. However, for the aquarist, it certainly is not the most practical. Even so, this course of action is bound to be sought by some sectors of those with an interest in stopping the spread of disease.

In order to overcome such suggestions, the aquatic industry needs to have an acceptable alternative, and the best way that this can be achieved is by having a more effective licensing system. Since the majority of people who import fish do so as a

business, I would think that it would only be fair to expect them to pay a realistic sum for their licences, the income from which could be used to finance the appointment of a Fish Inspector. His/her role would be to ensure that anyone applying for a licence had the facilities to hold all fish imported for a predetermined quarantine period. During this time, fish should be properly acclimatised to UK conditions prior to sale. The Inspector could also spot-check the facilities after the licence had been granted.

Some people may consider that this is an unacceptable invasion of one's business, but as the alternatives are disease problems such as SVC, or a prohibition on the import of these fish, then I consider that this is an acceptable compromise. While this legislation would be directed at coldwater species only, I feel that it should be extended to all fish imports. This would ensure the welfare of all fish species and can, in the long term, be only good for the industry.

In order to ensure that potentially diseased fish did not reach our native stocks, new legislation should be enforced to stop the introduction of imported fish into natural waters, no matter what the species, unless accompanied by a valid health certificate and given Local Water Authority approval.

Only a sensible approach to fish importation will ensure that, not only our native wild stocks of fish, but also those which are imported for our pleasure, remain disease-free. We must accept that SVC is now present in the UK, but to prevent more frequent attacks, possibly on a much larger scale, then action must be taken now.

Books

The Completely Illustrated Atlas of Reptiles and Amphibians for the Terrarium

By: Fritz Jürgen Obst, Klaus Richter, Udo Jacobs, et al
Published by: T.F.H. Publications, Inc.
Price: £68.00

This latest blockbuster is a giant in more senses than one. For a start, it is 831 pages long, contains around 2,000 illustrations and, correspondingly, weighs half a ton! Therefore, it is not the sort of book that you can easily "just pick up for a quick read". Its price, £68.00, is also somewhat impressive. Yet, in the hands of a "less-self-contained" publisher than T.F.H., this figure would have been higher still. My feeling is that, even at £80.00, this massive book would represent an excellent buy.

The main reason for saying this is that the *Atlas of Reptiles and Amphibians* provides what appears to be the most comprehensive work of its kind in the world, is written by a team of specialists in their field, and is edited (following translation from German) most competently by Jerry G. Walls. The result is that you get both quantity and quality in abundance on every page.

True, not all the black and white photographs are reproduced to maximum effect and, at least, one of the colour illustrations (page 487) seems to have been printed on its side. Further, at least one other shot (on

page 16) is incorrectly captioned (the locusts in question are not mating, as the caption states — the female's abdomen would be differently orientated if this were the case — as anyone who's kept these creatures for even a single day, will vouch for).

Do you know how to tell a Boa apart from that other giant South American snake, an Anaconda? I really didn't before I saw this book and, despite there being separate entries for both these magnificent reptiles, plus one on their family, the Boidae, I am still not too sure.

I think that this type of difficulty arises more as a result of the strict alphabetical scientific approach to nomenclature adopted (and which gives the book an undoubted aura of respectability and credibility) than to anything else. Nevertheless, it would have helped enormously if there had been several entries dedicated to the differences between, not just Boas and Anacondas, but frogs and toads, newts and salamanders, lizards and gekkos... and so on.

If I am a bit critical about such matters, it's simply that the book is so superb in other departments. It even (thankfully!) includes an alphabetical listing of common names which greatly facilitates the tracking down of otherwise difficult organisms.

The *Atlas of Reptiles and Amphibians* deserves to be as great a success as its sister volumes on freshwater, tropical and marine fishes. I have no doubt that this will prove to be the case — it is, after all, a must for every herpetologist.

John Dawes

Tanganyika Cichlids

By: Ad Konings
Published by: Verduijn Cichlids
Price: Around £29.50
ISBN: 90 800181-1-2

First of all, a sincere vote of thanks to John Ferguson of the British Cichlid Association for making the necessary arrangements for me to receive a copy of this excellent book direct from the Dutch publishers. Reportedly, the video produced in conjunction with this volume had also been posted to me at the time of going to press. However, owing to the long-running after-effects of the postal strike which hit us in September, it had not arrived by our copy deadline for this issue of *A & P*. I will, of course, report on it when/if I eventually receive it. So, watch this space!

If the video is anywhere near as good as the book (and the short clip I saw at YAF back in July indicates that it is), then the publishers have come up with a great double feast for cichlid hobbyists.

Don't expect *Tanganyika Cichlids* to

be a guide to the aquarium care of these fish. That, it most certainly isn't and, in any case, that kind of information is available elsewhere. Instead, the author, Ad Konings, has followed his natural leanings towards fish behaviour and has produced a magnificent, profusely illustrated account of the lake's cichlids in their natural habitat.

In addition to a brief preface, there are chapters on the lake itself, the cichlids in general, the surge (presumably "surf") habitat, the rocky habitat free of sediment, the rocky habitat covered with sediment, the shallow rocky coast, the intermediate zone, the sandfloor, the mudfloor, the open water column, a bibliography, an index and, of course, a closing acknowledgements page. Together, these combine to provide a text that is thorough, informative and very interesting, and is liberally peppered with useful, fascinating details.

For instance, we are told where the various races/morphs of certain species are found, as well as about their feeding and breeding behaviour (including the "cuckoo-type" relationship between some of the cichlids and the catfish *Synodontis multipunctatus*), and a great deal more besides.

The index deserves special mention in that it represents an up-to-date alphabetical list of all the known species of cichlid found in the lake, along with the names of their authors and the dates of the original descriptions. The one difficulty I found is that, in the case of species such as *Lamprologus brichardi*, whose name has been changed to *Neolamprologus brichardi*, only the latest currently valid name is given. As a result, some hobbyists may experience a few problems tracking down a particular fish in view of the many updates that are constantly taking place in the fast changing world of cichlid nomenclature and taxonomy.

This aside, the only other minor criticism I have is that the publishers seem to have followed the pattern set by so many other foreign companies and have not availed themselves of the services of either a German/Dutch-speaking British translator or a British proof-reader/editor. Instead, they've gone for English-speaking Dutch or German equivalents, with the result that the text is not quite as free-flowing or grammatically correct as it could be.

This does not, of course, detract from the inherent value of the book in any way. *Tanganyika Cichlids* is a major landmark in our understanding of these colourful and interesting fish and is, almost certainly, the only book in existence that carries at least one photograph of every cichlid known to live in the lake.

Tanganyika Cichlids is available from aquatic retailers or from B.C.A. Sales, Brandy Hall, Bradshaw Lane, Bradshaw, Halifax (write for details).

John Dawes



Dr Chris Andrews of London Zoo Aquarium reports on his busy, informative and enjoyable week in one of the Mediterranean's best-known hot spots.

A two-hour flight from London to Nice, and a ten-minute helicopter 'hop' along the Cote d'Azur took me to Monte Carlo. I was exchanging some very warm February weather in England for some even warmer weather in Monaco, to attend the Second International Congress of Aquariology, and to visit the Oceanographic Museum and Aquarium.

Monte Carlo is the capital of the tiny Mediterranean Principality of Monaco, situated in the south of France, close to the Italian border. Here, for one week in February 1988 over 200 of the world's professional aquarists gathered, from as far afield as North America, Australia, Korea and Scandinavia. Over 50 lectures, slide and video presentations, and round table discussions took place on a very wide range of subjects.

Support for Aquaria

Several papers highlighted the run-away popularity and high educational value of modern public aquaria, with presentations by staff from Monterey, Boston and Baltimore in the USA, and from the Dusseldorf Aquazoo in West Germany. The Monterey Bay Aquarium, arguably the finest public aquarium in the world, first opened its doors three or four years ago, after a six-year intensive design and construction period. Dave Powell and 'Chuck' Farwell gave lectures on some of the highly individual displays in the Monterey Aquarium, which attracted nearly three million visitors in its first year.

Attendances at the Boston and Baltimore Aquarium are now in excess of one million per year, and such facilities have played a major role in rejuvenating previously run-down inner city areas. Attracted by the spectacle and 'family-fun' approach to



General view of the harbour at Monte Carlo.

A WEEK IN MONTE CARLO

education in a modern aquarium, the public come, spend money, enjoy themselves — and go home better informed about aquatic life and its conservation.

In fact, according to John Prescott (Director of the Boston Aquarium), no less than 30 U.S. cities are each planning to spend up to 50 million U.S. dollars on building new public aquaria or renovating existing ones. One example of the support provided to such institutions by industry and commerce is the donation of \$200,000 to the Baltimore Aquarium by 'McDonalds' (the fast-food chain) to renovate just one of its exhibits! Not that the success of the modern public aquarium is limited to North America, as new aquaria have opened (or will be opening) in France, Portugal, Japan and even Cuba, and the recently-opened Aquazoo in Dusseldorf attracted a staggering 300,000 visitors in its first three months.

Research and development

Other interesting papers at the Congress discussed the capture techniques used by a South African research institute and



A large Nurse Shark at Monaco Aquarium.



CHRIS ANDREWS



CHRIS ANDREWS

Left, one of the large tanks in the Aquarium. Note the comprehensive graphics surrounding the display.

Above, the Aquarium's turtles are very popular with visitors.

aquarium to obtain reef fish, sharks and dolphins. *Dipterex* (=Dylox, Trichlorfon) was commonly used to treat skin fluke problems of sharks, and a study on the stress-related blood chemistry changes in recently-captured sharks suggests such changes may be alleviated using saline drips direct into the blood circulatory system of the fish.

Still on the subject of sharks, Marty Wisner (Steinhart Aquarium) gave a very interesting paper and video presentation on his recent work on Black-tip Reef Sharks. As a result of the overall suitability of this species for display in public aquaria, Wisner investigated the growth rate of the species under captive conditions over a two-year period. It was found that, by limiting food

intake, the growth of the sharks could be controlled quite accurately, with no adverse side effects to the animals in question.

Filtration — new findings

More relevant to the home hobbyist were the papers on filtration and water chemistry. As part of the renovation of the Paris Aquarium, Michael Hignette has been installing a range of different filter systems. It appears that installing UV sterilisation tubes at the end of an out-of-tank filter system (before the water returns to the display tank) may give rise to elevated ammonia levels. As a result, Hignette uses UV before biological filtration, thus eliminating any possible ammonia problems. In the systems

used at the Paris Aquarium, zeolite (normally used for ammonia absorption in freshwater) is used as a high-surface area medium for out-of-tank biological filtration in some seawater systems.

Red Sea facts

Dieter Jauch from the Stuttgart Aquarium reported on a field trip to the Red Sea. This provided some information of particular relevance to marine hobbyists interested in the very diverse fish and invertebrate fauna from the area. The following water quality characteristics were obtained: temperature 21-28°C, salinity 40-41 parts per thousand, with no detectable nitrite, nitrate or phosphate. At 12 noon the dissolved oxygen concentration was 6-7 mg/l, with a pH of 8.35. The light level on the reefs was found to be quite startling: 120,000 Lux, at the surface, 50,000 Lux at 50 cm depth and 15,000 Lux at 10 m depth.

To attempt to duplicate these conditions in the aquarium is quite daunting, although at Stuttgart they have had some success (with fish and invertebrates) using under-gravel filtration and protein skimming, with extra water pumps for circulation and turbulence, and by illuminating a 1,000 litre tank with 2,000 watts of metal halides! The corals then appear to thrive on a diet of live *Artemia* nauplii and rotifers, with occasional use of dry foods. Keeping fish numbers low also seems to be the secret of a successful marine invertebrate tank!

Novel approach to fish farming

A very interesting report was made on a tropical freshwater fish farming project in Belgium. Solar energy is used to heat the insulated, energy-efficient building, with computer-managed water recirculation through biological and mechanical filters.

At any one time the facility holds around 50 kg of fish and 80 kg of *Ampullaria* snails. Although only small scale at the present, the results seem to indicate that such endeavours may be economically viable — even in chilly northern Europe!

Exploitation of coral reefs

One of the most lively discussions centred around an open session on the exploitation

of coral reefs. As a result the following guidelines were put forward by the delegates.

Despite a very full Congress programme, and occasional expeditions to sample the local cuisine and hospitality, I also found time to visit the Museum and Aquarium. The Museum displays a range of fascinating exhibits on the exploration and exploitation of the sea. These range from the ancient to the very modern, and feature much of Jacques Cousteau's pioneering work. Captain Cousteau has, of course, had a long association with the Museum, and took time to visit and speak at the Congress.

The Aquarium, like the Museum, dates back to 1910, but much has been done in recent years to bring its displays up-to-date. Featuring primarily Mediterranean and tropical marine fish and invertebrates, the Aquarium houses something like 4,000 fish in 90 or so display tanks. The displays are clean, well maintained and very attractive, with some beautiful specimens on show. All the tanks have information panels, often comprising of easy-to-read back-lit labels and transparencies.

Being right on the shore of the Mediterranean, clean sea water is continually fed through many of the displays, with additional filtration to ensure good water conditions and clarity. A wide range of lighting techniques ensure that the displays are both attractive and varied. Open most days from 9.30 am to 7.00 pm (or 9.00 pm in mid-summer), the Museum and Aquarium are well worth a visit — next time you are in Monte Carlo!

Guidelines for the exploitation of fish and other animals for the aquarium trade

"The principle of sustainable utilisation of living resources is a cornerstone of conservation, as expressed in the World Conservation Strategy."

Exploitation of fish and other animals for the aquarium trade represents a challenge in relation to conservation, especially in respect of coral reefs and tropical rain forests. If such exploitation is not sustainable, it will contribute to the destruction of these ecosystems.

If sustainable, it may play a positive role in conservation, since long-term conservation is only practical if it benefits local people.

Both coral reefs and tropical rain forests are not easily exploited in a sustainable fashion. Destruction for short-term profit is therefore often encouraged or accepted, in spite of long-term negative consequences.

For example, coral reefs are important as nurseries for commercially-exploitable products and are often important for coastal protection, but are threatened by siltation and pollution, by dynamite-fishing and by mining for lime.

Available data suggest that, in general, the exploitation for the aquarium trade only represents a small fraction of the productivity of the area, but that some species in certain areas are over-exploited.

For these reasons the following recommendations are given:

1. Collection from the wild must be controlled and should be based on a realistic assessment or estimate of the productivity of the area so that it represents a sustainable yield.

Different species have different productivities, so that the sustainable yield will differ from one species to the other.

2. Rare and endangered species in an area should not be collected for commercial purposes.

Consequently, the use of poison and other similar destructive collecting methods must be totally abandoned. The greatest care should be taken during holding and transport, and species not suited for maintenance in aquaria must be avoided.

3. The trade must not cause undue suffering, mortality or damage to the collecting sites.

4. A licensing system for exporters should be established.

5. Importers should actively pursue the principle of these guidelines by importing them from dealers which comply with them, and avoiding those that do not.

In this respect, Public Aquaria have a special obligation and must actively support the implementation of these guidelines, and explain them to their constituency."

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Czechoslovakian aquarist and herpetologist **Jiri Palicka** introduces this almost totally aquatic and easy-to-keep amphibian (Translated by *Andreas Bialek* — Photographs by the author)

Amphibians form a transitional group between water and land animals. These vertebrates, most species of which have adjusted to life on land, breathe oxygen from the air, but where reproduction is concerned, are still, as a rule, dependent on water. The frogs represent the best-known and most widely distributed group of amphibians. Another group, at present less widely distributed, of amphibians are the salamanders. Salamanders are usually divided into four sub-orders and eight families, of which the family Salamandridae is, probably, the best-known. Some of these animals are used for laboratory experimental purposes but, from an economical point of view, they are of no great importance or practical use.

In more recent years there has been a noticeable reduction in the numbers of salamanders in their natural environment, something that is probably directly connected to their requirement for cleanliness of their surroundings. Therefore these animals have been declared protected species in some localities, and, as such, it is prohibited to collect them from the wild. The fate of these animals will soon lie in the hands of terrarium hobbyists, and the survival of some of the species will depend on success of reproduction in captivity.

The breeding of some species in unnatural surroundings is extremely difficult. In contrast to this, there are species which acclimatise very quickly in captivity, and where reproduction is relatively easy. To the last group, besides the Axolotl from the genus *Ambystoma*, one can add an interesting species from the family Salamandridae, the Ribbed Salamander, *Pleurodeles waltl*. This amphibian lives on the Iberian Peninsula and in the western part of Africa, in Morocco. It attains a length of up to 12 inches (30 cm). At this length, this makes it one of the largest amphibians in Europe.

Basic details

The basic coloration is olive green on top, sometimes turning to black, with dark spots. The bottom half of the body is light. The coloration is very changeable and dependent on the mood of the animal and its surroundings. The skin of the body is granular, even warty in parts. On the flanks there is a row of prominent warts, which are dark yellow to orange-yellow in colour. From the cloaca to the end of the tail there runs an orange-yellow band, which becomes darker with increasing age.

The body, as the photograph shows, is in the shape of a cigar, which ends in a flat tail

KEEPING AND THE RIBBED S



Top left, an adult pair of *Pleurodeles waltl*. The larger and fuller specimen nearest the camera is the female. Above right, the male (almost upside down) manoeuvres in his attempts to clas

provided with a flipper edge. The head is flat, the mouth relatively wide and equipped with jaws and teeth. The differences between the sexes are clearly defined in adult specimens. The males show a wider, flatter head, longer limbs, a smaller and shorter tail and, in comparison to the females, are of smaller build. *Pleurodeles waltl* spends most of its time, in captivity, in water and

will crawl onto land at night.

Captive breeding and general care

For breeding, the most suitable set-up is a glass aquarium which, if possible, should be planted. The depth of the water should not be too great, and a cork or polystyrene tile that can be used by the animal when it

BREEDING SALAMANDER



the female. Above left, top right, in these shots the (slimmer) male is swimming underneath the female clasping female.

wants to crawl out of the water should be placed on the water's surface.

More suitable for this amphibian would be a tastefully furnished palludarium, with bogwood and roots which reach out of the water, since this salamander likes climbing onto these. It is possible to keep several specimens together as they get on with each other.

The basic nutrition of these animals is flesh-based. They will also eat, with great relish, Tubifex, mosquito larvae and earthworms, as well as pieces of fish or meat. I have also observed an adult specimen devouring water snails.

The amount of food consumed by salamanders is dependent on the temperature of their surroundings. It is advisable to increase

their temperature at the times of breeding, depending upon the time of the year, as it has to be considered that there may be a drop in temperature at night time. In the summer the temperature can rise to 86°F (30°C) for short periods, but in the winter time, it is recommendable to keep the temperature at about 41°F (5°C), as at this time of year, the salamander will go through a period of hibernation. Overwintering can be carried out in cool water or out of water, in moist moss or peat.

In the spring, when outside temperatures start to rise, the temperature of the salamander should be also raised, slowly, and the animal should then return to its normal lifestyle. At this time of year, also, sexual activity will increase, and this is the time when the animals will want to mate.

The mating embrace consists of the male clasping the female from below and locking his front legs into the female's front legs, thus ensuring that he is not thrown off. The male will then deposit his sperm which is collected by the female with her cloaca which is specially designed for this purpose. The eggs will then be fertilised just before they are deposited. The female is able to hold onto the sperm for as long as she needs to, as the eggs are laid in stages, at differing intervals. The eggs first appear, usually, the second day after mating and, once fertilised, these are then laid onto plants or stones to which they stick. Sometimes the eggs are just deposited on the bottom by the female. The numbers of eggs laid is variable and can range from about 100 to several hundred.

The development of the embryo is dependent upon the surrounding temperature and will take between 5 to 20 days before they hatch. The most suitable temperature at this time seems to be about 68-70°F (20-21°C). The larvae, when hatched, measure 0.25in (6mm). In the first days of their life they will just lie on the bottom, and will develop gills behind the head. After 4-6 days they are free-swimming.

Rearing the young

In the first few days it is preferable if young tadpoles are fed on fine foods like the nauplii of *Artemia salina*. After the first week finely chopped threadworms or Tubifex can be given. Growth rate is relatively fast with an adequate diet. Feeding should take place several times a day and the larvae will grow at a rate of 1mm per day.

After three weeks their front limbs will be visible. The back ones do not grow until 10-14 days later. As they develop further, the tail will shorten, the head will take on a different shape and, slowly, the outer gills will reduce. After about three months the first gill-less specimens will be seen (but larval development is uneven, even with large amounts of food).

At this stage they begin to fight among themselves and can inflict serious damage as they can even bite off limbs. However, these will regenerate themselves in due course. It is, clearly, advisable to sort and size the young salamanders at this stage. Sexual maturity will be reached at about 8 or 9 months.

Your questions answered

Having problems? Send your queries to our panel of experts who will be pleased to be of service. Every query receives a personal answer and, in addition, we will publish a selection of the most interesting questions and responses each month. Please indicate clearly on the top left hand corner of your envelope the name of the expert to whom your query should be directed. All letters must be accompanied by a S.A.E. and addressed to:

Your Questions Answered, The Aquarist & Pondkeeper, c/o Dogworld Ltd, 9 Tufton Street, Ashford, Kent TN23 1QN.



TROPICAL
Dr David Ford



COLDWATER
Pauline Hodgkinson



PLANTS
Barry James



KOI
Roger Cleaver



MARINE
Graham Cox



DISCUS
Eberhard Schulze

Koi

Plants and Koi

I have been told that I cannot have plants in my Koi pond. Is this correct, and if so, why?

What you should have been told is that Koi, being omnivores, are quite likely to eat any plants which are put in their ponds if they can get to them. Having said this, there are ways in which plants can be kept in ponds with Koi.

The most commonly-seen plants in Koi ponds are Water Lilies and Water Hawthorn. Provided these are planted in quite large containers to prevent the Koi from turning the container over, and a layer of large cobbles (often called Duck Egg Pebbles in the building trade) is placed over the top of the container to prevent the fish digging the plant out, they should be alright.

Marginal plants can be used as well, providing the baskets are secured to prevent the Koi from moving them. They are usually best if the basket is secured at water level as this stops the Koi from digging in the basket.

The only plants that are real problems are the oxygenators, such as *Elodea*. These are very soft plants and Koi seem very fond of them. Even if they do not eat them they tend to break the plants into little pieces. As

yet, no one seems to have come up with any answer for this type of plant.

Plants

Scentsless Water Hawthorns?

Most books say that Water Hawthorn has a delicate scent. I have grown this plant for years and have yet to detect its perfume. Are the books correct?

Indeed they are, *Aponogeton*



Water Hawthorn is a popular, scented deep-water surface pond plant with attractive white blooms.

distachyon (Water Hawthorn) has a strong scent most easily detectable on still summer evenings.

It is possible, I suppose, that like many roses, your stock is derived from a seedling which has a genetic aberration resulting in your plant being scentless.

Discus

Troublesome start

We recently purchased seven Discus, two 3-in Brown Discus and five 1 1/2-in Blue Discus. After only a week one large Discus completely lost its balance and bobbed about on its nose. This lasted a couple of days and then it died. The other large Brown Discus frequently "milks" and turns almost black.

Two of the small Discus also became ill after only a week, losing their balance and being carried up in the airstream, etc. One died and the other is still unwell. We purchased the Brown Discus from one dealer and the others from another.

The tank is 48 x 18 x 12in and has an external power filter that filters 800 litres an hour and contains Irish moss peat, sponge and ceramics. There is no gravel in the tank; only two potted Amazon Swordplants; the temperature is at the moment 90°F, as recommended by our dealer. Previously, the temperature was maintained at 85°F. We have provided extra aeration using a pump with airstone.

Please tell us what we are doing wrong. Our hope is to raise the small Discus to adult size and, hopefully, breed them.

We have been feeding the fish three times a day on live Daphnia, frozen bloodworm and frozen Tubifex. At first they ate well but are now completely disinterested.

We added some Tetra General Tonic to the tank, also on the advice of our dealer. This seemed to help the colour of the large Brown Discus within 24 hours, when it went from black with closed fins to a more normal colour with all its fins open. We are still at a loss to know what went wrong. We have carried out frequent partial water changes and are using Aquasafe in all raw water. We have tried to follow the advice of the books we have read.

Sometimes, it is very difficult to pinpoint exactly why Discus turn black, show no real interest in any food offered and behave in the way you have described.

There are several possibilities: for instance the fish you have purchased, even though they came from two different suppliers, may have been sick, or were housed in an aquarium with unsuitable water conditions. Reasonably healthy Discus will be able to stand some abuse for a little while before any signs of discomfort or stress manifests itself.

Most imported Discus carry certain internal or external parasites and other ailments and ought to be dosed with Discus-specific medicaments. Did you notice whether the fish were breathing unusually fast, or were scratching themselves against objects in the aquarium, i.e. the Amazon Swordplants or, even, the glass? Was the mucus peeling from their bodies?

However, the fact that the remaining large Brown Discus showed some improvement after the addition of Tetra's

General Tonic suggests that, possibly, the water conditions were not what they could have been. General Tonic is usually used to rid the aquarium of a mild bacterial infestation. More serious cases of disease should be treated with something like CQD, a Discus-specific remedy.

You also state that the turnover of your power filter is 800 litres per hour. As your aquarium only holds approx. 160 litres of water, this turnover is much too much for this size of tank. I am not surprised that the weakened baby Discus were carried in the upstream of the water! Discus need only a gentle current in the water; to filter the aquarium twice per hour would be ample. What is important, however, is the size of the filtering container; a large container will hold more filtering material, making it more efficient and longer-lasting. But, since power filters have a container size in relation to the turnover of the pump, you would be better advised to go for a smaller pump (300 to 350 litres per hour) and install a second container (without the pump) in sequence to increase the filtering material capacity.

Perhaps in future you should also only purchase Discus which are already somewhat larger — 2½in upwards — because really young fish are always more troublesome, and are really only for hobbyists who are able to give them specialist attention.

Tropical Going brackish

I intend to "wean" one of my freshwater tropical tanks over to brackish water. I overheard someone say that all tropical tanks should have salt added anyway. Is this so?

No, it is not correct to say that all tropical tanks should have salt added. One should always strive to reproduce the natural waters from which the fish originated. For most freshwater species this may be soft or hard, neutral, acid or alkaline, but rarely salty, unless true brackish water species are involved. The usual community species of tropical fish were chosen for their tolerance of different water chemistry, so,

although most accept some salt, it is not essential.

A small salt content is around 1 tablespoon per 10 gallons (45 litres) and most species will accept this... except the soft, acid water fish such as Discus and some Tetras. Brackishwater fish, however, need around 1 tablespoon per gallon (4.5 litres, S.G. of 0.007). This is very different water chemistry and you should keep either brackishwater fish or freshwater fish, but not mix both under such conditions.

Coldwater Tench health and habits

Last year I bought two small Tench which I keep in a 24 x 12in tank with two Koi and a few Comets. Would you please enlighten me on Tench health and habits.

The Green Tench (*Tinca tinca*) can be found in our native waters and can grow quite large (70cm-c28in). Golden Tench is a cultivated variety and is the one usually kept by aquarists.

June, July and August is the time of year when Tench choose to spawn. A female can shed in the region of 500,000 eggs, depending on her size, but, of course, only a small percentage



The Tench (*Tinca tinca*) — this is a Green, wild-type specimen — is sometimes, misleadingly, called the "Doctor Fish".

will survive. The eggs are about ½in in diameter, green in colour and adhesive. Usually spawning takes place in clumps of weed where the eggs stick, awaiting hatching.

Tench are members of the carp family (Cyprinidae) and have a short barbel at each corner of their mouth. Feed as you would Goldfish, though it is also important to feed them plenty of livefoods, such as earthworms, to keep them happy and in robust condition.

EHEIM

3580 AUTO-FEEDER

This clever battery* operated device allows slow and regular feeding of your fish by means of an in-built programmer that can be set to provide any number of feeds from 1 to 24 per day. Each adjustable pre-set amount of feed takes approximately 20 minutes to dispense, thus ensuring optimum use of feed and water free of contamination.

This simple, compact and reliable unit is easily fitted to the aquarium lid where it will automatically feed your fish for as long as four weeks.
*Battery included



John Allan

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Please send free leaflets on Eheim filters and accessories

Name

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Seaview

by Gordon Kay

Day/night Butterflies

My affection for Butterflyfishes is well known among my friends, and my enthusiasm for them is due to many aspects of their biology.

One thing I find truly amazing is the coloration many of them assume at night. This is usually a darkening along the flanks, or even black blotches appearing, but my Black Pyramid Butterfly is really something else. Basically, during normal daylight hours it is black fore and aft with a white middle section — tipped with yellow on the dorsal fin — and a white tail. During the night, however, it is almost totally black, with just a tiny white blob on each side. When the lights go on, it comes out of its little cave all black and yet, almost within seconds, it is back to its normal black and white self. Absolutely wonderful!

Benefits of lower salinity

You may remember a passing reference to my running my aquarium at a lower salinity these days, when I told you about the Damselfish I used to have, and which spawned in their new home. I decided to do this after reading so much about lower Specific Gravities meaning less of a load on the fishes' metabolism and being far less desirable for many aquatic parasites.

When I set up my aquarium at the new house, therefore, the Specific Gravity was set at 1.018 and has been thus since (two months at the time of writing). So far, I have noticed absolutely no difference in the fishes on a day to day basis, but I have bought a couple of fish since I moved and I have noticed that they seemed to settle in immediately. It does take rather a long to acclimatise them (I do it in a small aquarium over about two hours) but when they finally do get into their new home they just swim off for a look around.

I have also noted that I am doing rather better with *Cassiopeia* than I've done before. All this may just be coincidence, or



CORAL WORLD — ERAT

it could be something to do with the Tunze filtration system which I am using for the first time, or it could just be — possibly — that a low Specific Gravity does really help.

There is one positive result of a lower S.G. — I still use 1 kilo of salt mix every week, so I am changing even more water than I used to. It works out at near enough 10% per week that it makes no difference.

Pesticide threat

The Marine Conservation Society recently issued an alarming report which I feel merits inclusion in this page.

It seems that Scottish salmon farmers are risking both human and marine life by their indiscriminate use of a pesticide called Nuvan 500EC, used for killing Sea Lice which feed on the skin and blood of the salmon.

The company which manufactures the chemical says that it is not hazardous if handled properly, but the MCS report says that the company fail to print sufficient instructions on their product as to what 'proper handling' actually is.

Apparently, the fish should be treated by isolating the fish farm cages with tarpaulin and then removing the contaminated water after treatment. However, with the lack of sufficient instruction, the chemical is simply poured into the sea loch on an outgoing tide which washes it through the cages and out to sea.

The report says that the Authorities are reluctant to reveal the true danger of Nuvan and reminds us that this is contrary to the Government's commitment to reducing marine pollution. It ends by outlining the Society's call for immediate control on the use of Nuvan, brought about by its application being carried out by fully equipped operatives in the prescribed manner. The

Corals (seen here feeding) produce mucus which some species of Butterfly feed on. Could this be the key to the survival of some difficult-to-keep Butterflies?

Society also calls for a programme of research to provide alternatives to Nuvan, with a firm date for its ban.

For my own part, I would ask just one question. When will we start to take care of the planet of which we are merely custodians and which we share with so many other beings for which we are — ultimately — responsible?

The report claims that thousands of litres of the stuff are poured into Scottish sea lochs every year, which — the experts fear — could have a devastating effect on marine life. Laboratory tests have shown that crustacea die within thirty minutes of exposure and a decline in edible crabs is being blamed on Nuvan's use.

The report also says that the implications of the toxicity of Nuvan on plankton — the base of the food chain — is cause for alarm. MCS say that the Health and Safety Executive has also voiced concern about the harmful effects on humans. They say that workers exposed to Nuvan have become unconscious, while its possible carcinogenic effects are being investigated in America. Indeed, a recent television documentary showed the effects of organophosphorous chemicals (of which Nuvan is one) on humans.

Plankton Snippets

1. Plankton consists mainly of unicellular diatoms — the Phytoplankton. Like higher forms of plant, these manufacture food from the light energy in the upper layers of the sea. Phytoplankton are eaten by Zooplank-

ton — microscopic animals such as copepods and minute larval forms of countless animals.

2. Plankton migrates to and from the water surface as the density of light changes through the day. Such migrations mean that plankton — which cannot travel far under its own steam — gains transport to pastures new in the faster surface currents.

3. When a Lump sucker (*Cyclopterus* sp.) devours a dozen large Comb Jellies (*Beroe* sp.), the *Beroe* will have eaten 3500 smaller Comb Jellies (*Bolinopsis* sp.) to attain its size. These in turn will have eaten 100,000 copepods, and the copepods will have grazed upon untold millions of phytoplankton. This does my head in!

4. No bigger than a grain of rice, *Calanus finmarchicus* is still one of the largest planktonic copepods. It feeds by sweeping water through filter chambers, extracting tiny food particles from it.

5. Many planktonic carnivores are armed with claw-like grasping organs — some having no parallel on land. The pelagic siphonophores trail long transparent tentacles which retract toward the mouth when prey is stunned and captured.

6. The Planktonic animals known as Salps can, if conditions suit them, grow by 10% every hour. This, also, does my head in!!

Other Snippets

1. The Great Barrier Reef could provide enough limestone to build EIGHT MILLION replicas of Egypt's largest pyramid. (yet another fact which does my head in... what a headache!). It is also home to some THREE THOUSAND species of animal.

2. Young seahorses, emerging from their father's pouch, make straight for the surface to swallow air to fill their swim bladder.

3. It has been shown that the mucus which is produced by corals has a high nutritional value. Maybe this is why those Butterfly species which are exclusively polyp feeders in the wild die, even if eating substitutes, after very short times in captivity.

Until the next time...



Cynolebias nigripinnis is one of the most outstanding and popular of the annual fishes.

SOUTH AMERICAN PEARLS (INCUBATION AND HATCHING)

John Skillcorn's occasional excursions into the fascinating world of annual Killifish continues with an insight into egg development and hatching.

In preparation for incubating eggs, I use the following method. After about three weeks of allowing the fish to spawn, they are removed temporarily, and placed in a small container with some of their own tank water. Then, by using a medium sized fish net with fairly fine mesh, I scoop out the peat and, while it is still in the net, I firmly squeeze almost all the water out with cupped hands.

The technique is very quickly learned —

just imagine you are trying to squash a raw egg between your hands. You may be putting a lot of effort into it, but you don't really want to do it! The end result is peat which is damp but not wet. The peat is then crumbled into a polythene bag and labelled with the date and species of fish.

Before bagging the peat, I generally make a quick check just to see what the fish have been up to for the last few weeks. The eggs are quite large, tough and easy to spot when

fresh, and appear as amber beads among the dark substrate. When the eggs are nearly ready to hatch, with a well developed embryo inside, they're much more difficult to see. They appear almost black, except for the golden eyes of the baby fish inside. With a good, prolific species, it is not uncommon to find the peat riddled with eggs.

After removing the egg-laden peat, the parent fish are replaced and some fresh peat is put into the tank, after boiling and washing it carefully, of course. I may also change a quarter of the water as well. Once you have the peat containing the eggs, the tricky bit begins!

The eggs have to be stored in the damp peat for a shorter or longer period of time, depending on the species being maintained. Some fish need only a few weeks, while others may need up to five months storage time, and the correct time for each is, I'm afraid, a matter of great controversy. I have been told, for example, by some obviously very successful breeders, to store eggs of this or that species for a given length of time, only to find that, by the end of this time, the eggs were not fully developed, or else hopelessly over their time limit. I can say nothing more than try for yourself with an educated guess based, of course, on advice given by the breeder from whom you obtained your eggs or fish.

TEMPERATURE EFFECTS

Whatever length of time is involved, temperature can affect hatching. Most hobbyists incubate eggs at a temperature of 24°C (75°F), and I have found nothing to go against this, although there are theories that lower temperatures can bring about development at a faster rate. Reasoning this out, in a cool summer in the natural habitat, water would not evaporate as quickly as it would during a hot summer. Water would remain, providing continuing conditions for survival, and so faster developing eggs would be best suited to exploit this unusual event. The lower temperature, therefore, could be a signal to the developing embryo that good conditions still prevail and no period of dormancy is required, or at least, a very short one.

A few years ago I tried to test out this theory, using eggs of *Cynolebias alexandri* and *Cynopocilia melanotaenia*. I placed eggs of each species in the refrigerator in my laboratory in school, where the temperature was around 8°C (46.5°F). I intended to leave for them for only a short time, but due to examinations taking place at that time of year, they were left for some three months. On examination they were found to be fully formed, but, on random inspection, they were found to contain a very high percentage of deformed embryos. Some had no eyes, or no mouth, and one was a complete Siamese Twin. The purpose of this experiment was not to produce freaks, but it does give an insight into how embryos develop. This state of affairs was probably caused by some of the enzymes failing to work properly due to the low temperature at which the eggs were kept.

Normally, I examine the eggs in the peat,



CYNOLEBIAS ALEXANDRI ♂



CYNOPOCILUS MELANOTAENIA

JOHN SKILLCORN

Excessively long periods at low temperatures produced a very high frequency of deformed embryos in my unintentionally extended experiment with these species.

perhaps, every week, and when I see a predominance of apparently fully formed young fish curled up inside the eggs (this is quite easy to see), then I wet the eggs and hold my breath. If I have judged the time correctly I am rewarded within the hour by the sight of tiny fry swimming round looking for food.

They can be seen by gently disturbing the peat with a glass rod or knitting needle, and appear as tiny dark splinters dashing for cover as you disturb them. They are free-swimming at once, and any which flop around the bottom (and there may be many of these) in my experience never become normal swimmers, despite what books may say to the contrary. They do mature, however, and if it is a very rare species, all may not be lost. I have reared healthy fry from belly slider parents, although, normally, the practice is not to be encouraged as it could damage stocks for the future.

STUBBORN EMBRYOS

Sometimes I am troubled by a batch of eggs, obviously fully developed, but which just refuse to hatch. One case in point was a batch I received from a friend in Uruguay, of the species *Cynopocilius melanotaenia*. I received them one Saturday morning, and seeing that they were ready to wet, and having the whole day to watch over them, I decided to hatch them at once.

If I have a lot of peat containing many eggs, I wet the eggs in a small aquarium. However, if the eggs have been sent to me through the post, invariably they are packed in only a small amount of peat, and number only about twenty or so. In this case, then, I use a large margarine tub which has been scrupulously cleaned out. First of all I try half fresh cold tapwater and half aged aquarium water, but on the occasion in question, nothing at all happened. The fully formed fry remained inside the eggs and refused to make their exit. Faced with this problem, there are several steps which can be taken.

The first is to drain the peat and eggs, repack them, and try again in a week's time. This may work, as some eggs require more than one wetting in order to hatch. This would safeguard them in nature against hatching when only a slight shower of rain has fallen, when the pond would once again dry up, killing the baby fish.

Secondly, with fish of the *Cynolebias* groups (except for the clearly tropical species), I put the eggs into fresh, cold tapwater. The sudden drop in temperature

very often stimulates hatching. With some species I normally use this method as a matter of course. It will horrify you the first time — until you see that it really does work! If you think about it, it doesn't seem all that unreasonable when you consider that it's winter time in their natural habitat when they're hatching, often with very low temperatures.

Having just come back from Peru, I was very surprised to find that in Lima, twelve degrees south of the Equator, during the winter we had air temperatures as low as 11°C (52°F). Quite mild for England, but Lima is in the Tropics! The Amazonian rain forest, however, was another story!

Getting back to hatching the eggs, you may have to do nothing more to produce your young fish. In the case of the species in question, *Cp. melanotaenia*, though, they still refused to hatch, and the fry continued to peep out at me coyly through the egg membrane. Now came plan number three.



Top, fully eyed eggs of *Cynolebias mabeis*. Soaking for as little as one hour can result in a successful hatch. Above, Siamese Twins (these are newly-hatched Mollies) and other abnormalities were quite common among my cold-treated *Cynolebias* eggs.

In nature, newly wetted mud containing much organic material produces a lot of carbon dioxide due to bacterial respiration, which disperses into the water above. It has been discovered that this rise in CO₂ level stimulates the hatching enzymes in the eggs of many species.

How, then, does this information help us? Well, on this occasion I blew a steady stream of bubbles into the hatching water in the tub, using a short piece of air line tubing. This worked a treat, and within half an hour I had thirty baby fish swimming about! Carbon dioxide from my lungs dissolved into the water, simulating what would have happened in nature. From then on they weren't the least bother, and grew at lightning speed, feeding on Brine Shrimp and then on *Tabifex* worms, etc.

Apart from incubating eggs in damp peat, I have had some success incubating eggs in water. This does, in fact, happen in the natural habitat, as many bodies of water simply reduce in size and do not dry up completely. Any eggs laid here would water-incubate. In this instance, bringing about hatching can be achieved by one (or a combination) of the methods just outlined above. I have kept eggs in small plastic tubs under an inch or so of water, observing them regularly to see whether all is progressing satisfactorily. When a fully formed embryo can be seen, then is the time I attempt hatching.

Once I have the fry out of the eggs, I have found that they invariably are very easy to rear. I start them on newly-hatched Brine Shrimp, and find this to be the very best of foods for baby fish. Many hobbyists use Micro-worm, but in my opinion, this is inferior to Brine Shrimp. They grow at a remarkable pace, and are able to take chopped *Tabifex* worms after a week or so.

After four weeks, many species are quite sexable, and may be spawning in another two weeks! Feeding is no longer a problem, bearing in mind that you will need to feed either livefood or frozen food, and you may even get them to take beef heart in small amounts.

I hope you have success with your attempts to breed some of the beautiful *Cynolebias* fishes. They have given me enormous pleasure for many years now, and some still provide challenges for even the experienced fish breeder. A few aren't that easy! In my next article, I'll introduce you to those species which have proven most interesting to me — and not just the ones I've been successful with, either!

JOHN SKILLCORN

JOHN DAVIES

PRODUCT ROUND UP

BY DICK MILLS

AUTOMATIC FISH FEEDERS

Although nothing quite replaces the close intimacy of the fishkeeper and fishes at feeding times, there are occasions when we wish things could look after themselves. It may be that we don't relish the trek down the garden to the fish-house with inches of snow on the ground, or it may be that we're away on holiday or business and, being a bit obsessive about our charges, prefer not to trust anyone else with their welfare.

Automatic fish feeders have been a reality for some time now but hobbyists seem reluctant to use them. One reason could be that some physical modification is necessary to the hood and/or cover-glass to facilitate the feeder's operation; another might be deterioration of the stored food due to condensation problems. It is fair to say that these are the only apparent drawbacks, although the three commonly available models on the market have all tried hard to overcome or minimise the latter problem in particular.

Basically, fish feeders are mechanical devices which deliver a 'dose' of food at pre-set intervals throughout the twenty four hour period. Naturally, all designs incorporate a reservoir, or hopper, in which the supply of food is stored, but the methods by which the individual feedings are actually delivered to the aquarium vary. Again, an obvious requirement is that the food should drop into the water without assistance from the hobbyist, and so, all designs must be mounted on the top of the tank, but again methods differ.

EHEIM

The EHEIM 3580 FEEDING APPLIANCE is a neat device that is designed to sit on the tank hood where it will be less prone to condensation risks than if sited on the cover glass. Powered by a battery, feeding times can be 'programmed in' by means of small pegs inserted into the partially visible time wheel. Six programming pegs are provided with the feeder, and more are easily obtainable from your Eheim dealer. The amount of food fed at each

Programmable automatic feeder from Eheim.



delivery can be adjusted but, as with all mechanical feeders, the size of flakes used should not be too large.

The battery is said to last one to two years, but the prudent fishkeeper will keep an eye on the battery contacts to make sure no corrosion occurs, especially in humid fish-house atmospheres. Some users have found that keeping the cover off the feeder solves any condensation problems, but conditions from fishkeeper to fishkeeper are also unknown variables!

Details from **JOHN ALLAN AQUARIUMS LTD**, Eastern Way Industrial Estate, Bury St Edmunds, Suffolk IP32 7AB (Tel: 0284 755051).

HOBBY

HOBBY'S AUTOMATIC FISH FEEDER is, again, battery driven and has a variable amount adjustment. The unit can be mounted either clamped on to the top edge of an all-glass tank or simply positioned over a hole or the edge of the cover-glass. The delivery tube acts as an efficient condensation guard.

Feeding time occurs twice every twenty-four hours but one feeding can be cancelled if required; additionally, by adjusting a small control the 'feed time' can be advanced manually.

Details from **UNDERWORLD PRODUCTS**, Units 1 & 2, Belton Road West,

Rena's combined feeder and timer will handle filtering, lighting, heating and feeding.



Loughborough, Leicestershire (Tel: 0509 610310) (Note: This is a new address).

RENA

The RENA AUTOMATIC FEEDER D50 works on a slightly different principle and, like certain French cars, has some very innovative ideas.

Instead of a rotating distributor, the food falls from the hopper under gravity and is let into the tank through an opening which is controlled by a solenoid-driven piston. The solenoid is energised by electricity fed at timed intervals from the necessary RENA EL21 TIMER (which also controls lighting

and filtering, again, with manual over-rides).

Special thought has been given to overcoming condensation problems: the food hopper and the delivery area have airline connectors so that a continuous flow of air can be fed through to prevent food clogging. The feeder's reservoir of food can be extended five-fold with the use of extra hoppers. An adhesive-backed pad anchors the feeder in position and prevents any vibrations from the operating solenoid reaching the aquarium.

Details from **RENA UK LTD**, Bury Farm, Pednor Road, Chesham, Bucks HP5 2JU (Tel: 0494 786759).

SLOW-RELEASE BLOCKS

While not strictly in the same category of the above sophisticated devices, there are other ways of administering foods to your fishes during any enforced absence. 'Holiday' or 'Vacation Blocks' are solid blocks of nourishment that will gradually release food into the water over a period of time, thus ensuring that your fish do not go hungry.

Some cautious measures should be followed when using these types of foods in your absence: leave a dim light on over the tanks to encourage the fish to feed; keep aeration and filtration going to make sure the block dissolves correctly (blocks may not dissolve in cool or highly alkaline waters); remove uneaten portion on return.

Additionally, there are slow-release remedies and algicides which can also be classed as 'automatic' in their action. As there are so many sources of these, I hope manufacturers will forgive the necessary brevity of coverage of their relative products in this particular area.

ARMITAGES — WEEK-END, VACATION FOOD and POND BLOCKS.

ARMITAGE BROS PLC, Colwick, Nottingham NG4 2BA (Tel: 0602 614984).

BETTER WATER GARDENS — BWG POND

BLOCK (Slow-release Algicide).

BETTER WATER GARDEN PRODUCTS, Blagdon Water Garden Centre Ltd, Bath Road, Upper Langford, Avon BS18 7DN (Tel: 0934 852973).

ROLF C. HAGEN — NUTRAFIN HOLIDAY FISH FOOD and NUTRAFIN WEEKEND FISH FOOD provide a continuous supply of food (freeze-dried mosquito larvae and *Daphnia* for instance) for up to 10 and 3 days respectively; water is purified and the pH neutralised at the same time. Separate slow-release NUTRAFIN HEALTH NEUTRALISERS for water quality control are also available.

ROLF C. HAGEN UK LTD, 275 Kirkstall Road, Leeds, West Yorkshire LS4 2BZ (Tel: 0532 796566).

HYKRO — WEEKEND, VACATION FOOD BLOCKS.

Details from **INTERPET LTD**, Vincent Lane, Dorking, Surrey (Tel: 0306 881033).

JMC AQUATICS — AUTO-FEED BLOCK; MED-BLOCK (Water Conditioner and low-concentration, low-stress parasiticide); MED-BLOCK P (as previous, but for Pond use); POND BLOCK (Algicide); PLANT BLOCK (Plant Revitaliser); TONIC NEUTRALISING BLOCK (Neutralises acid water).

JMC AQUATICS, 59 Stubley Lane, Dronfield, Sheffield S18 6PG (Tel: 0246 415275/410412).

KING BRITISH — WEEK-END AND VACATION FOOD BLOCKS, REVITALISER BLOCK.

KING BRITISH, Haycliff Lane, Bradford, West Yorkshire BD5 9ET (Tel: 0274 573551).

WARDLEYS — WEEKEND AND VACATION FOOD BLOCKS.

FANTASY PET PRODUCTS LTD, 11 Ormside Way, Holmethorpe Industrial Estate, Redhill, Surrey RH1 2PX (Tel: 0737 68311/2).

Finally, if you tend to be either heavy-handed or unfortunately unsteady-handed, then **HYWARE'S** new **AQUA-FEED FISH FOOD DISPENSERS** will help you to feed the correct amount of food both accurately and safely.

Of identical design and operation, these literally hand-held containers have an easy trigger action which delivers a set amount from the built-in hopper which contains either Tropical Flakes or Goldfish Flakes. The spring-loaded hatch at the bottom and the snap-on top seal nicely to keep the food fresh. The price is £2.99 for either Tropical or Goldfish Dispenser and Food cartridge. Additional refill cartridges are available at £2.68.

Details from **HYWARE LTD**, Mosley Common Road, Worsley, Manchester M28 4AJ.

NEW PRODUCTS

In the September issue of *A & P* we brought news of two major distributorships acquired by the then newly-established **Globalcustom Ltd** of Winchester. We now bring you details of the products.

AQUARIUM MUNSTER has a long pedigree in the aquatic trade, beginning some 70 years ago. More recently (well, 20 years ago) they moved on from being a Wholesale Tropical Fish Supplier and Distributor to produce their own remedies and treatments. Rather than flood the market with an extensive, and often duplicated, range, the aim remains to market quality products that they have exhaustively tested in their own fish-houses. Like the business itself the remedy range has remained one of Europe's 'best sellers'.

Many novices often lack confidence when it comes to using remedies; fears of overdosing through miscalculations or under-dosing through caution are all understandable. Using the broad-spectrum remedy **FURAMOR P** could not be simpler, it could even be regarded as a 'cure in the bag' — the remedy is contained in a porous bag which is hung in the aquarium water. No further checking or dosing is necessary and, over the next eight days or so, the active ingredients are released into the water at precisely calculated rate. Its unique active formula both heals and protects, and is effective against all clear bacterial infections such as Chilodonella, Columnaris Disease, Dull Skin, Fin Ulcers, Fungi, Ichthyophthirius, Inflamed Skin, Sores and Wounds. **Furamor P** costs £4.35 and each packet contains four sachets.

Fin Rot, Fungus and Neon Tetra Disease are all distressing to see and require immediate attention. **DESSAMOR** attacks the bacteria involved in these ailments and is also highly recommended when used as a preventative. Available in 10ml, 20ml and 100ml sizes, **DESSAMOR** costs £2.48, £4.10 and £18.45 respectively.

FAUNAMOR is an effective yet harmless remedy against White Spot (*Ichthyophthirius multifiliis*), usually eradicating the infection within 24-36 hours without harming delicate fish or plants. Separation to a hospital tank, or increases of temperature, are not necessary. Like **DESSAMOR**, **FAUNAMOR** is available in similar sizes and at the same prices.

Freshwater 'Velvet Disease' (*Oodinium pillularis*) and the marine version, *Oodinium ocellatum*, can both be treated successfully with **ODIMOR**. Available in two sizes, 20ml and 100ml, **ODIMOR** costs £4.80 and £21.56. A recent reversion to the original formula means **ODIMOR** is safe for use in mixed fish and invertebrate marine tanks.

As with all products, manufacturers are constantly striving for improvement in results while staying within the lethal limits of any remedy — a very tricky tightrope to tread indeed. With this in mind, do read the instructions carefully (there is likely to be very little margin for error) and there is, in fact, some disparity between the information shown in earlier publicity material and the instructions included with the most recently improved remedies.

For perhaps the one tank-owner, the problem of using frozen foods quickly enough once opened has been circumvented quite neatly by **HSP GAMMA-IRRADIATED FOODS**. Each of the 18 'flavours' (of various insect and other aquatic livefoods) is presented in blister packed 'mini-blocks' for convenience and economy of use, the remaining unopened portions being unaffected as they are quickly returned to the freezer. As the foods are all irradiated with gamma rays, there is no possibility of introducing water-borne disease organisms either. An additional freeze-dried 'meal' of whole fish (Lanocfish) is not mini-block packed. Each costs £1.38.

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ON THE MOVE

As from 3 October 1988, **Tetra** has moved to Lambert Court, Chesham Avenue, Eastleigh, Hants.

CORRECTION

We regret we underrated the efficiency of **WetPet's** New Reverse Flow Osmosis Unit Water Purifier. It will remove 90% plus of water hardening salts, not 50% plus as stated in the company's advertisement in October's *A & P*.

AQUA-SOIL

A most aptly named product, **AQUA-SOIL** is a specially formulated medium of five soils and slow-release fertilisers for the growing of pond and bog plants. Eye-catching marketing ploys, such as the bright, single colour, clearly-worded front of the package, is literally backed up with "WHAT IS IT?" and "HOW TO USE IT" information on the reverse. This obviates the need for the potential customer to ask sales staff, and this accelerates turnover.

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THE ART AND CRAFT OF BUYING KOI

If you are just beginning with Koi, there's quite a bit to learn (all easy!) before you can be reasonably sure of buying good, healthy fish, as John Cuvelier explains.

So your dream pool is completed and clean pure water is merrily issuing from within your filter? Now you are ready to rush out and empty your wallet in a mad spending spree, clearing your local dealer of most of his/her stock of Koi! Well, just draw breath for a few moments, long enough to read the following and you could save yourself a lot of heartache.

This article is not aimed at the wealthy connoisseur prepared to pay many hundreds of pounds for a fish simply because it bears a patch of red in precisely the correct position, but at the ordinary 'common' Koi-keeper, like myself, as well as at the out-and-out beginner, who merely wishes to while away the hours admiring the riot of colour provided by the so-called 'pond fish' of the Koi world. What I would like to do is look at a few simple precautions we should all be aware of when buying our Koi, be they purchased from a local garden centre or from one of the specialist Koi dealers.

Koi from several countries are now appearing at trade outlets; America, Israel, Singapore, China, and of course, Japan. The country of origin should not deter you from purchasing any fish, assuming the vendor is willing to impart this knowledge. The overriding reason for buying a particular Koi should be that you like it and phooey to what anyone else thinks!

What you do need to be as certain about as possible, is the health of your prospective purchase. Logic tells us that a specialist Koi dealer is more likely to have healthy fish in stock than, say, your average garden centre. (No disrespect to garden centres, but they do not normally have either the knowledge OR the facilities to treat "poorly" fish).

Getting Koi to the UK from their country of origin

From being 'harvested' by the breeder, to appearing in the vendor's showtank, Koi have a pretty thin time on the whole, being shunted from breeder to market, market to wholesaler, wholesaler to exporter, exporter to importer, etc. etc., although some British importers do buy direct, thereby cutting out some of the intermediate steps.

The worst trauma is experienced by the Koi in actually getting to the UK. They are first starved to avoid polluting the travelling container, then placed into a polythene bag containing water with (perhaps) a small amount of an anaesthetic compound and

oxygen to tranquilise them, and loaded on to a 'plane for the journey.

Don't get me wrong, there is no cruelty involved, there just is no other way to travel the distances involved. It's little wonder that, by the time Koi reach their final destination, they are more than a little 'punchdrunk', and inevitably, some will be the worse for wear.

It is at this stage that the caring dealer will let them recuperate for several weeks while, at the same time, treating any scrapes, etc. sustained during the journey. Inevitably, some fish will have external parasites on them, Anchor Worm, Fish Lice etc., and these will also be removed during the recuperating period. All imported fish will have a population of Gill and Skin Flukes, both of which will respond to treatment prior to sale.

Purchasing precautions

Unfortunately, there are some retail outlets where fish will go on sale without any of the above precautions, and, in such cases, it has to be a case of 'Buyer Beware'. What, if anything, can the novice do to protect his/her investment? First and foremost, do try to be accompanied by an experienced Koi-keeper when buying your Koi, as they will, by experience, know what to look for and, more important, the places to avoid!

Should this not be possible, then use your own senses. Are the premises clean, having an appearance of good housekeeping, with no dead fish floating in the tanks or thrown on the floor? Is the water in the show tanks clear and well aerated? Is the vendor prepared to spend a bit of time with you, sharing his/her knowledge and answering your questions, even to the extent of losing a sale should (s)he not think your pool suitable? If all these requirements aren't met go elsewhere.

Having satisfied yourself as to the *bonafide* of the vendor, what about the Koi? What should you look for? The GOOD signs of health to look for in Koi are, erect fins, regular gill movements, a purposeful swimming motion, no blemishes visible from above (more on this later), a nice regular shape with no 'hollowness' behind the head, and an eagerness to feed.

The BAD signs to watch out for include, a tendency to swim away from the rest of the fish in the pond, or to skulk on the bottom or in a corner, flattened fins, listlessness, one gill being used more than

the other, rapid gill action, very slow gill action, erratic swimming motion, ANY sores spot or broken and/or split fins.

Remember, YOU are the buyer and it's YOUR privilege to pick and choose. Don't be persuaded that 'such and such' will clear up in a few days; it sometimes won't. Having selected your fish, the vendor will place it in water in a polythene bag.

Before this bag has oxygen added and is sealed, grab this last chance to examine your purchase. Hold the bagged fish up to the light and look closely for any blemish on the sides and underneath the body. Check for parasites (you can see Anchor Worm and Fish Lice). Should any be seen, put the fish back, unless you are confident and have the facilities to treat the problem. Failing that, and you badly want the fish, ask the vendor if (s)he will accept your deposit on the fish, and to retain it while (S)HE treats the complaint. Most dealers will accommodate you. If not, you know the remedy!

Unseen problems

Having passed all the above, you might think you're home and dry. What about all the possible UNSEEN problems? There can be many there, just waiting to explode. In an ideal world, every Koi-keeper would have a duplicate pool and filter system just for quarantine use, where newly-purchased fish could reside for six months or so.

One alternative, although not the best, is better than doing nothing. Having floated the bag of fish on the pool to equalise the temperature (shading it from the sun), fill a jug with ONE PINT of pond water and add 1 OUNCE of Cooking Salt, stirring until dissolved. Add this mixture to the bag and wait for five minutes, or until the fish shows some sign of distress, when it can be introduced to the pool. (I am assuming there is already about a gallon of water in the bag. For lesser quantities reduce the salt). This treatment should halt the onset of fluke problems, but long-term quarantine is the only sure method, although you could quarantine a fish for six months and the day after, it could break out in anything.

It's all a bit of a lottery really. Nevertheless, if you can rig up temporary quarters for your new fish, do so. It is folly to introduce new fish to an established pool with a healthy population of fish, unless, at least, elementary preventative measures have been taken, as fishy epidemics can spread quicker than you can close your wallet!

Right, always take a close look at your potential purchase from above to check that everything is as you would like it.



ROGER CLEVER

Right, below, once the fish is in the bag, close examination from the side will show up any imperfections not visible from above.



ROGER CLEVER

Below, safely bagged and "boxed", with an ample supply of oxygen, this Koi is almost ready to start its journey to its new home.

Bottom, wrapping the bagged/boxed fish in a blanket will minimise temperature losses and will also help reduce stress levels.



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Letters

Koi MOT's — the Author's View

I read with interest Peter Scott's letter (Oct '88) commenting on my recent article MOT's for Koi (*A & P*, Aug '88). As we all know Peter is one of the few vets who have a detailed knowledge of Koi and the problems relating to them. It is, unfortunately, my experience that the vast majority of Peter's colleagues not only do not have his specific knowledge of Koi but, in fact, have NO idea whatsoever of Koi-related problems and their diagnosis and treatment.

This is a fact that will be borne out by Koi-keepers up and down the country who have had similar, and, in some cases, much worse experiences than I, when consulting the "professional". I am afraid that no amount of encouraging rhetoric will change this fact.

The simple fact is that, unless one lives close to a Peter Scott, or a Helen Bentley, you are on

your own. This was why the article was conceived.

As with many "professionals" in their hasty efforts to defend what they consider to be a bastion of their sole expertise, a modicum of misinterpretation enters the fray. So, before proceeding further, I would like to clarify a few points.

1 Despite Peter's rather confusing statements, IT IS totally LEGAL for anyone to treat Koi, as Koi are NOT covered by existing legislation.

2 My article advocates daily PASSIVE inspections and ONCE A YEAR "routine" anaesthesia for a detailed inspection. The words were chosen very carefully and I would suggest that my article be read properly before making statements based on misinterpretations.

3 As a Koi-keeper, I feel well qualified to say that... quote, "on welfare grounds", undetected and untreated Koi problems cause infinitely more



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stress than any amount of MS222 or Benzocaine. It is my experience that if Koi need treatment but do not get it, this usually results in the most stressful condition of all — ACUTE DEATH!

4 It is quite proper — I would suggest, essential — that Koi-keepers should all develop whatever skills they require to help keep their Koi fit and healthy. This includes the administering of treatments, as in my not inconsiderable experience, serious hobbyists have a better knowledge of Koi and appropriate treatments than many vets.

5 It is disappointing to read that Koi-keepers are playing "doctors & nurses" or are "DIY Dr Kildares", but I am sure that no suggestion of any vested interest may be at the source of these highly "unprofessional" comments. As Peter suggests: "It cost time, effort and money to learn more than the very basics about fish problems and

there needs to be a demand" I suggest that one can't have it both ways.

6 I would offer readers the opportunity to judge for themselves, based on the facts, one of which is that ALL Peter's basics for keeping Koi healthy are dealt with in the various excellent articles in the August *A & P Supplement*.

7 In common with many other Koi-keepers I am extremely tired of contributions which are (often) only forthcoming in defensive response to the best

efforts of others to improve people's knowledge, and on the usual misguided precept that the "not-so-humble" hobbyist should stick to pulling drains and digging holes and leave the complicated stuff to the "experts".

In conclusion it is unfortunate that the pages of this excellent journal need to be taken up with such matters, as the ultimate responsibility for the health and welfare of our Koi, and any other fish for that matter, remains with OURSELVES, and we must learn

and gather as much knowledge and information as possible to help us in this quest.

It is very difficult to cure Koi of a serious ailment. By far the best alternative is to PREVENT such problems. The maintenance of good water quality, combined with diligence and regular observations and early remedial action, will give you an edge. This edge may just save your Koi's life! It is with this basic philosophy in mind that ALL my material is written and I stand by every word of it. Nigel Caddock

FRED THE PIRANHA.



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EXPERIENCES WITH CICHLASOMA FRIEDRICHSTHALII

B.C.A. member Stephen Dent experienced only partial success in his attempts at breeding this species, but nevertheless remains a firm admirer.

While browsing through a local dealer's tanks some time ago — for something spectacular for a show tank — I came upon some rather nondescript "Cichlasoma" species. I was told that the fish were, in fact, *Cichlasoma friedrichsthalii*. Fortunately, the dealer also had a large pair in stock. When I saw this "pair" I knew my quest was over. I could not afford these adults but I purchased half a dozen of the juvenile fish.

The aquarium these fish were to grace is situated in the library of the school where I work. But before they went in there, I kept them in quarantine at home for a few days. Quarantine is not really the right word because the tank they were to be put into at school had no other occupants, so they could have gone straight into it. However, I did want to have a good look at these fish first, and this was more easily done in one of my home tanks.

Dither fish

Nearly two weeks later, and nearly a centimetre larger, the six fish were placed in the school tank. They settled in well but spent most of the time hiding in the caves and numerous plants, only coming out at feeding times. For a show tank, this was not such a success. Thinking about this problem I soon realised that, even though these fish are robust Central American Cichlids, what they needed in this four-foot tank were "dither fish", that is, some schooling fish that will reduce their shyness.

Four medium female Swordtails were then introduced to the tank. I watched these fish for over an hour when they were first introduced one evening, and although the cichlids were rather larger than the Swordtails, I thought all was well.

Unfortunately, the next day I was greeted

by a pupil saying "Come quick Mr Dent; there is a dead fish". I went quickly to the scene of the crime and could only see a piece of one Swordtail floating in the tank. However, the six *C. friedrichsthalii* were swimming about in midwater showing off to fine effect — rather a drastic solution, but the problem of shy fish was solved. Later I also discovered one of the female Swordtails had, in fact, survived in the dense plant cover and was quickly removed to other quarters.

Moody fish

All went well for a few months; the six *C. friedrichsthalii* were growing well and started to show the adult colouring. The fish have two distinct colour patterns, which come and go with the fishes' moods. One might even assume that the fish are of two different species at first glance. (For a visual impression compare the photographs of these species in *The Cichlid Aquarium* by Dr Paul V. Loiselle, page 6, with the picture in *Central American Cichlids* by David Sands, page 48).

Partial spawning success

After six months the fish had reached a size of 10 to 12.5 cms (4-5 inches) and a couple of them had started to pair off. One night after school had closed I went down to the library and saw that the pair had spawned on a rock in one corner of the tank. All the other fish were crowded in the opposite corner, with the male fish continually chasing them away. I quickly removed three of the four other fish, but had to leave one in because it was too clever at avoiding my net. I was not too worried as I thought this one remaining fish might act as a "target" fish and so keep the brooding instincts active in the breeding pair. Unfortunately, two days later, the pair ate the

spawn.

The three fish remained happily in this aquarium until the pair spawned again ten days later. This time it was at the weekend and, by Monday morning, the third fish in the tank was dead. However, on this occasion, the pair raised the spawn to the free-swimming stage. The sight of the parent fish with a large brood of youngsters was admired by all the staff and pupils who saw that tank.

Sweet revenge?

This would be a nice ending to the story but this tale does not finish here. Because this aquarium is in a "public" place within the school, there is a feeding tube built into the cover of the tank. This makes it rather difficult to supply the quantity of food to the youngsters when they are "herded" into a corner by their caring parents. This meant that I needed to remove some of the fry at an earlier age than I might otherwise have done. Some were brought home but, due to the lack of space, the others were placed in another school tank. This aquarium contained the female Swordtail — the sole survivor of the adult *friedrichsthalii* attack. This female swordtail shared her tank with Guppies that had numerous young, but two days after the young cichlids had been added there was no sign of the *friedrichsthalii* babies. It would seem that the Swordtail had got her revenge.

Perhaps because their young had been taken too soon or perhaps because they were the only fish left in the aquarium the pair of cichlids took to hiding in the large spawning pit they had dug to house their young. So, once again, the show tank appeared empty. Rather than risk the lives of more Swordtails I decided a change was required and so the fish were taken away and have now been replaced by more "showy", but perhaps less interesting, fish.

Left, the spectacular colours of an adult specimen can be fully appreciated in this photograph.
Right, juvenile specimens, while possessing some of the patterns of the adults, are nonetheless quite drab in comparison.



Coldwater jottings



Stephen J. Smith

Fancy Failure

As ever, many of the topics raised in *Coldwater Jottings* receive a healthy response, and the item in June's *Jottings* regarding retailers' approach to high-quality Fancy Goldfish was no exception.

I was delighted to receive correspondence from Alan Hartley, of Wolsey Bridge Nursery and Garden Centre near Stafford, who, apparently, has found surprisingly little success with the more expensive coldwater varieties.

"We tried stocking larger Fancy Goldfish, albeit for only one season, but found that anything over £2.50 didn't sell."

Surprisingly, Alan told me that he had found the same situation with Koi, and had apparently had little success with tropical fish.

My own opinion is that the demand is there for good-quality, clean and disease-free coldwater fish. One season is not a sufficient period to establish anything of a reputation, so give it time; let people know that specialist varieties — suitable for the show-bench or the pond — are available.

The benefits — for both retailers and the hobby in general — will be well worthwhile.

Tank Mates? . . . 1

A letter from Geoff Smith, whom I was delighted to meet at the 'Aquarium' Fishkeeping

Exhibition earlier this year, highlights a problem which may seem unusual — aggressive Goldfish.

Geoff writes: "My most recent acquisition is a beautiful Hamanishiki, which, when introduced into the main tank, immediately pursued the other inhabitant of the tank: a predominantly white Pearlscale, and proceeded to rip its caudal fins."

I have, myself, experienced a similar problem, involving a Celestial and a Bubble-eye, with the Celestial persistently nipping at the bubbles of its victim, causing both the fish, and me, more than a little concern!

There is never one simple answer to such occurrences. The solution is obviously to house the fish in separate quarters to avoid any further damage, but the cause could be one of a number.

What immediately springs to my mind on reading Geoff Smith's letter is that, as the caudal region appeared to be the main target, the fish were going through the overtures of spawning, which can be quite a vigorous process and often results in fin damage.

Are Goldfish territorial? I would hesitate to say so, and the majority of my own Goldfish certainly know which corner of the tank or pond they are going to be fed, for example!

Alternatively, as in the case of my Celestial, it could be a case of plain bullying . . .

Tank Mates? . . . 2

With a tale of unusual tank-mates, writes Bryan Witherstone from Great Yarmouth: "I have a friendly Bristle-nosed Catfish living quite happily in my coldwater tank along with six Orandas, who have accepted it without any change in their habits".

Continues Bryan, "The temperature of my tank averages around 72° (c.22°C), which I should be able to maintain throughout the winter months. If the temperature should drop for any reason, I know that my Orandas will survive quite well — but what are the lowest temperatures which the Bristle-Nose will be able to tolerate?"



An Ancistras (Bristle Nose) male — Bryan Witherstone's unusual Goldfish tankmate.

Bryan, where do I start? I have come across a number of fishkeepers who seem to prefer their coldwater fish at sub-tropical or even tropical temperatures — and I cannot imagine why.

Goldfish will live quite happily at the temperatures in Bryan's aquarium; but they don't need heated accommodation. In addition, having become accustomed to "life in the Tropics", they will not adapt readily to any drastic lowering of temperatures, and such an eventuality could lead to loss of fish — including the catfish.

My own Goldfish are kept at temperatures in the region of mid 50's° (c.13°C) to early 60's° F (c.17°C). Even the development of fry takes place with only gentle heat, up to around 65°F (c.18°C) maximum.

During the winter, it does no harm to Goldfish (those normally kept at proper "coldwater" temperatures, that is) if they are allowed a "semi-dormant" period — thus imitating nature and priming the fish's "body-clock" in readiness for the following spring. Indeed, I have found that fish which have endured some of the worst of winter often perform much more readily when the spawning season comes round.

Prepare for winter

I wonder how many regular readers will find the following advice somewhat familiar? And I wonder how many actually take the trouble to carry it out? So, I make no apologies for repeating the annual advice: clean your pond out now.

Many of the losses of fish which occur at the end of each winter can be attributed to one

major fact: a mucky pond!

It is not ice during the winter which kills fish, it is the fact that a pond which is frozen over is not able to exchange poisonous gases for live-giving oxygen.

The poisonous gases emanate from rotting vegetation, mulm, and other material which has accumulated throughout the year, and which kill fish. It is one of those quirks of nature that the fish which "gets got" is your favourite/most expensive/show-winner.

So, get to grips. Remove all the fish from the pond and place them in a tank or separate pond (I sometimes use an old bath); along with any aquatic plants.

This is the ideal opportunity to trim dead leaves off the plants, and to split and re-pot them.

If you have a filter, the pump should be temporarily turned off until the cleaning operation has been completed. Having drained the pond, and taking care not to puncture the liner if your pond is lined (I prefer to be barefooted), all traces of muck are removed, using an ordinary household dustpan and brush purchased especially for the purpose, and the pond liner scrubbed thoroughly using nothing but plain water. Do not use detergents or any cleaning chemicals/materials.

Having removed the last of the dirty water, allow the pond to dry out if possible, ensuring that the fish are going to be safe and sound in their temporary accommodation.

Refill the pond with the hose and turn the filter on. Under no circumstances should the filter be shut-down "for the winter". This only causes the loss of valuable bacteria which have been cultivated in the filter throughout the season and which contributed to its successful operation.

I would advise that the pond is left to settle for at least 24 hours, to allow chlorine to dissipate and for the filter to return to normal, before re-introducing the fish.

Then, you can light the fire, put your feet up, and enjoy your winter!