

SEPTEMBER 1993

AQUARIST & PONDKEEPER

CATFISH SPECIAL:
BREEDING
CAT COMMUNITY
STINGING AIRSACS
SURPRISE SPAWNING

**BANDED NEWTS:
KEEPING
& BREEDING**

**SINGAPORE
SHOW
REPORTS**

**PYGMY
SUNFISH**

**BUILDING A
KOI POOL**

**ELECTRIC
SHOCKERS**

**MOVING
WITH
MARINES**



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COVER STORY — Purple Moon Angel

Photograph: Max Gibbs, The Goldfish Bowl, Oxford

The Purple Moon (a name usually reserved for *Araetta aqifer*) is also known as the Half Moon or Yellow-band Angel (*Pomacanthus maculatus*). It is reported as growing to 12-18in (30-45cm) in the wild, where its range extends from East Africa to the Red Sea, taking in the Persian Gulf, Arabian Peninsula and north-western Indian Ocean.

Purple Moons are not normally encountered as often as some of their close relatives within the aquarium trade, although, properly looked after, they are generally long-lived, particularly if acclimatised to aquarium life as juveniles.

As with most other Angels, it is the juvenile stage that is more likely to be found in shops. Again, as is the case with other Pomacanthids, juveniles and adults of this impressive species are very differently patterned.

Editorial

WILD GUPPIES AND BAMBOO

If wild Guppies were made of bamboo, you'd probably need a licence to import them as from 1994/95. You wouldn't need this licence if you wanted them at the moment, though.

The main body responsible for regulating trade in species of animals and plants which are deemed under some form of threat is CITES (the Convention on International Trade in Endangered Species). There are three separate Appendices, two of which relate to threatened or endangered species. Appendix I contains animals and plants whose trade is normally prohibited. Appendix II species can be traded under licence.

A separate body, the IUCN (International Union for the Conservation of Nature and Natural Resources) has its own set of categories denoting varying levels of threat, from Extinct/Endangered at one end, to Insufficiently Known at the other.

The trouble is that, until this year, there appear to have been few wide-ranging attempts at reconciling the CITES and IUCN lists. Happily, this situation has now changed and, following a CITES meeting held in Kyoto, Japan, last year, the IUCN has drawn up proposed criteria for adoption by CITES late next year or early in 1995.

The new proposals are complex and long and will, it is hoped, eventually result in a more universally applicable, and perhaps more sensible and workable set of regulations regarding trade in all threatened species, including some that are known in the tropical, coldwater and marine hobbies.

There are, however, some potentially disturbing grey areas which will have to be thrashed out if serious problems are to be avoided... and the sooner this is done, the better it will be for all parties.

Which is where the bamboo bit comes in. Bamboo is the main (sole?) food source of the Giant Panda. As such, it would be feasible under one of the proposals for Appendix II (b), for the bamboo, while not itself endangered in any way, ending up being listed simply because it is essential for the survival of another species listed under Appendix II (a).

The Panda is not an Appendix II species; it is, in fact, listed under Appendix I, which could make the bamboo's 'candidature' for listing perhaps even more pressing.

Applying the same criteria to fish species, if the wild Guppy were to be regarded as essential for the survival of another (listed) species, then it, too, would be listed. As far as I am aware, though, this is, fortunately, not the case. But what, for example, about those species of cichlid which act as 'hosts' for their scale-eating cousins in the African Rift Lakes? Or, within the marine realm, what about the Sea Cucumbers up whose anus the delightful (?) Pearlfishes live?

Then there are the potentially controversial proposals regarding 'look-alikes', under which any non-endangered species could end up being listed under Appendix I or II, merely because it happens to look "very similar to" a listed species!

What effect will such action have on the aquatic hobby? It could, in fact, have profound effects. Makes you think doesn't it? Thinking may, however, not be enough to prevent some totally inappropriate species from being subjected to unnecessary controls, come late 1994 or early 1995.



John Dawes
John Dawes
Editor

News Desk . . . News Desk . . . News Desk . . . News Desk . . . News Desk . . .

Ocean Voice Helps Philippines Marine Collection

At a recent symposium on the theme *Exploring the Depths of the Aquarium Industry* (June 3/4, Washington DC), Ocean Voice International reported its latest results in training collectors of marine aquarium fish in the Philippines.

According to the report, 600 collectors have been trained to use small fence nets to collect fish instead of stunning them with sodium cyanide (2,000 aquarium fish collectors in the Philippines have yet to be trained). Although many of the collectors continue to use nets, those who don't have nevertheless reduced their use of cyanide.



Philippine diver using a hand dip net to collect an individual fish from within the boundary of a fence net.

A grant received from the Canadian Development Agency via the Canadian Environmental Network will enable training this year, and will also support publication of an educational manual entitled *Save our Coral Reefs*, published in English, Tagalog and Visayan (languages of the Philippines).

Ten thousand dollars worth of fence nets have been shipped to the Philippines this year, and Gary Spiller, president of Ocean Voice International, visited the Philippines earlier in the year to assist the organisation's partner, the **Haribon Foundation for Conservation of Natural Resources**, in taping a video film, a preliminary version of which was shown at the conference, with favourable response.

One version of the video will be used in education in coastal communities, while it is hoped that funding can be obtained for another version, for the North American market, to show how fish can be harvested sustainably using fence nets.

A report was also made to the conference on the progress of the IUCN Species Survival Commission's **Coral Reef Fish Specialist Group**. The group is administered by Ocean Voice International and is undertaking studies for a report on the status of coral reef fishes of the world. Data from maps of 800 coral fish species have been entered into a computerised geographic information system for analysis, so that species-rich areas (hotspots) can be located for conservation purposes.

Ocean Voice International is seeking members and donations to continue its work. Further information is available by contacting Noel Alfonso, Secretary, Ocean Voice International, 2883 Otterson Drive, Ottawa, Ontario K1V 7B2, Canada. Tel: 613 990 2207; Fax: 613 521 4205.

Helping the Environment to Help Us

"We cannot survive without wetlands, yet the survival of wetlands is in jeopardy. However, there is positive action which we can all take to help."

This is the key message from a new campaign called



Wetlands awareness programmes can qualify for the Waterlands Awards for Excellence scheme.

'Waterlands' launched by the **Wildfowl and Wetlands Trust** and sponsored by the **Whitley Animal Protection Trust**.

The trust estimates that 80% of wetlands in England and Wales have been destroyed. According to the trust, families, farmers, schools and companies who are already taking 'wetland-friendly' action by, for example, saving and recycling water and creating and using wetlands, have a chance of winning one of a range of prizes by entering the **Waterlands Awards for Excellence**, the first-ever national competition to reward the wise use of these habitats.

Explained Caroline Aistrop, spokesperson for the Wildlife and Wetlands Trust: "Waterlands aims to highlight the importance of wetlands to our survival, as well as to that of wildlife."

"Ponds, lakes, marshes, rivers, streams, fens, peat bogs, and the seashore, are all examples of wetlands."

The campaign was launched in July at the restaurant Pied à Terre, where guests sampled dishes based on ingredients from wetlands, such as rice, cranberries, peppermint, prawns, shrimps, marsh-

mallow, salmon and herring.

A Waterlands pack has been specifically-tailored for different audiences. Anyone who would like to receive a pack (free of charge) should send a self-addressed envelope (30 x 21cm — 11½ x 8½in) with a 50p stamp and state whether the pack is required for business and industry, farmers, schools, or families and households. The pack contains information about wetlands, a colour poster, case studies of wetlands-friendly practice, the Waterlands Audit and competition details for the Waterlands Awards for Excellence.

For further information, contact Caroline Aistrop, Alison Byard, or Kim Styles, The Wildfowl and Wetlands Trust, Slimbridge, Gloucestershire GL2 7BT. Tel: 0453 890333; Fax: 0453 890827.

Mini-Reef Society Launched

A society devoted specifically to the aims of the reef-keeping hobby has been set up by marine enthusiast Peter Newman.

One of the main objectives will be to establish a breeding programme to reduce numbers of wild-caught specimens of both fish and corals. The first project of the society is to set up a 150-gallon reef system, in conjunction with London Zoo Aquarium, complete with fish and invertebrates, with access to the filter systems and lighting. Peter is appealing for companies who may be interested in becoming involved in the pro-

White spot is the most common disease problem in fish keeping

W.S.3.

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ject to contact him.

Explained Peter: "We intend to provide a beginners' pack to all members new to the hobby, and a bi-monthly magazine. We are looking to the future to promote only quality products, value for money, and to increase the quality of life of fish and invertebrates in our systems."

Further information is available by contacting Peter Newman, The Mini-Reef Society, 55 Burtleigh Road, Frimley, Nr Camberley, Surrey GU16 5LA. Tel: 0276 23728.

Pet Show Celebrates Animal Day

Plans are underway for the next Pet Show which will be staged at Olympia, London, to coincide with, and to celebrate, World Animal Day in October 1994.

The Pet Show will include all aspects of responsible pet ownership and will build on

the success of the event first staged in 1992.

The main arena will feature a series of events, including specialists from individually designated pet areas to answer questions, breeders' clubs, and the Pet Show vet.

Further information, contact the organisers, Barker Brown at 23-25 Eastcastle Street, London W1N 7BP. Tel: 071 637 3313; Fax: 071 436 4658.

FBAS Booklet Release

The Judges and Standards Committee of the FBAS has released a new reference publication in its series *National Show Fish Guides and Technical Information*.

Booklet No 22 contains 25 species of popular freshwater tropical species, including Barbs, Hatchetfish, Corydoras, Killies, Gobies, Archerfish, Scats and Synodontis.

The booklet costs £1.50 and is available from FBAS show stands or direct mail (adding 25p to cover postage)

from FBAS Publications, 14 Upper Dane Road, Margate, Kent CT9 2LX.

NEFAS Show Cancellation

The North-East Federation of Aquarist Societies has announced that the proposed fish festival, to be held jointly by NEFAS and Wansbeck Council for the weekend of 2/3 October (see News Desk, June 1993), has been cancelled.

For further information, contact Harry Kennard, General Secretary, NEFAS, 22 West Park, Morpeth, Northumberland NE61 2JP.

Plea for Help with Fish Film

The Rotary Club of Colombo Central, Sri Lanka, is appealing for assistance in producing a film on tropical ornamental fish farming.

The volunteer organisation is planning to produce such a film under their Vocational Service section, for showing to schools and community centres to help school leavers.

Parties interested in assisting with this project should contact S Sathiamoory, President-elect, Rotary Club of Colombo Central, 96 Barnes Place, Colombo 7, Sri Lanka.

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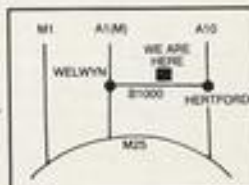
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FOCUS ON: CATFISH

South American Community

A tank primarily for catfish was something I had wanted to achieve for some time. So, when the opportunity arose in the shape of a 39 x 18 x 15in tank (100 x 45 x 38cm) — obtained from Aquariums, Cabinets and Hoods, a local company who supply aquariums beautifully designed to the customer's specifications — I was eager to put my plan into action.

SPECIES SELECTION

I had decided to keep South American Catfishes in this tank, although there were to be two exceptions: firstly, a small shoal of Red Phantom Tetras to ensure some daytime activity, and secondly, an irresistible 3in (c 7.56cm) *Myxocyprinus asiaticus* (Chinese Sailfin Sucker), a very gentle and attractive black and white striped fish which is active during the day.

This last species will, however, only be a temporary resident in this particular tank, as it can attain a length of 18in (45cm) or more and will certainly need a larger tank and, probably, cooler conditions once it begins to grow. For the present, it is lively and friendly and relishes some squashed peas, along with the usual catfish diet.

The Catfish

The South American catfishes consisted of three Flagtails (*Dianema aurostrata*) and three Portholes (*Dianema logobarbis*) both members of the Callichthyidae or Armoured Catfish family which also includes the well-known *Corydoras*. The Flagtails are very striking fish with their boldly striped caudal (tail) fin, from which they get their name. They can attain a length of about 5 in (c 13cm), with the Portholes being somewhat smaller at about 3in (c 7.5cm). These are shoaling fish, best kept in small groups, where they certainly seem to enjoy each other's company within the aquarium.

Two Doradids (*Agamyxus pecnifrons*), also known as 'Talking Catfishes' due to their ability to emit a growling noise, particularly when removed from the water, also inhabit this tank. These are very secretive fishes which prefer to hide away during daylight hours, although they can sometimes be seen, especially in the evening, furtively moving across the tank. They can grow to about 4in (10cm).

A word of warning, however, about these

Catfish enthusiast Janet Marshall has some useful ideas for anyone planning a community tank with a slight difference.

Photographs by the author



My South American set-up . . . with non-South American Chinese Sailfin Sucker. Note the flower pot saucers and the cucumber (bottom right hand corner) clipped by a lettuce holder from Underworld. The fish soon become used to the feeding places.

'cute' little fishes; great care should be taken when handling them, as they can inflict quite a lot of pain by clamping their razor-sharp pectoral ('chest') fins onto the unsuspecting aquarist's finger.

The tank also houses three types of Loricariid or Suckermouth Catfishes: firstly, a beautiful 'Gold Plec', a rich gold-bronze coloured *Plecostomus* which has grown rapidly to a length of 6in (15cm). This is particularly gentle and friendly fish which, along with the other Loricariids, eats algae, cucumber, peas and catfish tablets.

The second suckermouth is a *Hemiancistrus* species, bought as 'Rusty Plec' which will grow to only about 3-4in (c 7.5-10 cm). It is an attractive fish with cream and tan

markings and is visible during the day, as it spends most of its time firmly suckered to the front of the aquarium glass. It is the most territorial of the three types of Loricariid in this tank and regularly chases any other fishes that come too close to its chosen spot on the glass.

The third fishes in this species are a pair of Whiptail Catfishes (*Rineloricaria* species) which can grow to a length of 4in (10cm). They are very peaceful and spend most of their time on the substrate searching for algae and other edibles.

The final inhabitants are six *Corydoras* — three each of *C. melleanans* and albino *C. aneus*. They keep the tank looking very 'busy' with their constant foraging and regu-

One of my Flagtail Cats (*Dianema urostrata*).



Talking Catfish are interesting species for the catfish aquarium ... as long as you avoid their pectoral spines!



A Whiptail Cat (*Rineforicia*) sampling a slice of delicious cucumber.

My gold bronze Pleco has grown rapidly but still remains friendly.



lar breeding activities. These gregarious little fishes, which reach only about 3in (c 7.5cm) are a welcome addition to any community aquarium. They are active and friendly and mix well with other fishes.

AQUARIUM CARE

All the fishes have good appetites and are fed twice a day — the second feed before 'lights out' in the evening — with catfish tablets, sinking granular food, frozen live

foods and occasional chopped prawn. They are all very compatible and share both food and hiding places quite happily.

As there are rather a lot of bottom feeders in the tank, I actually used small unglazed terracotta saucers (normally used to stand flowerpots in) as 'feeding dishes' in order to stop too many food particles from becoming trapped in the gravel. The fishes very quickly catch on to the idea and position themselves in and around the saucers when a feed is imminent.

The tank is filtered by a large Eheim external power filter with the media consisting of ceramic rings, Ehfifix, Siporax and filter wool. There is also a small internal filter which incorporates an aeration (venturi) device.

Lighting is by means of Triton tubes to encourage plant growth, and a Blue Moon tube which is run alone during the evening as it imitates moonlight and encourages increased activity from some of the more nocturnal fishes.

Heating is maintained at 26°C (79°F) with a heater at each end of the tank.

The aquarium is heavily planted with fairly robust plants including *Hygrophila*, Amazon Sword and *Vallisneria*. Several caves, both natural and synthetic, are added, along with some pieces of bogwood for the fishes to hide in and these are arranged towards the back of the tank to allow the fishes plenty of privacy.

Each week a 20% water change is undertaken and, at the same time, the substrate is thoroughly 'hoovered' and any dying plant leaves removed. The pH (acidity/alkalinity) remains stable at 7.4, and the ammonia and nitrite have been found to be nil. The water in my part of the country (Kent) is very hard and, although I have thought seriously about softening the water, I feel that, as the fishes are all happy, healthy and thriving, I will leave things as they are for the time being.

I have been pleasantly surprised as to how lively these catfishes are during the daytime; even with all the aquarium lights on, there are constant flurries of activity. If you fancy a set-up with gentle and unusual looking fishes and a touch of mystery as they appear and disappear throughout the day, I would very much recommend a South American catfish community.



Corydoras trilineatus: an active delightful forager for any aquarium.

KOI CONCRETE POND CONSTRUCTION

Will you win on Aggregate? PART I

Peter Skinner of Koi Kraft offers some thoughts and tips for all Koi keepers considering the DIY approach.

Illustrations by the author.

When you think about civilisation and how we made that huge leap from caves to skyscrapers, it is probably true to say that only a few items were responsible: the wheel, electricity, the plough, concrete, iron and engines. CONCRETE? Yes, concrete.

Just consider what our lives would be like if concrete hadn't been invented. It is difficult to imagine what the urban landscape would have looked like without this marvelous building material. Multi-storey buildings, motorway flyovers, retaining walls, roads, airport runways and Koi ponds. (I got there eventually!). All these can be built with other construction materials, but, invariably, factors such as strength, durability and cost, make concrete a clear winner.

WHICH MATERIAL?

For anyone building a large pond, the choice of main construction materials is fairly limited. The most commonly used material is a flat sheet liner which is quick, cheap and convenient, but there will always be unsightly wrinkles, and there is always the risk of puncture if any sharp objects come into contact with it.

Concrete is the second most popular material, and then there are some new ideas which are being experimented with but which have not been around long enough to prove their durability.

One such innovation is glass fibre reinforced sand and cement laid directly into an excavation, perhaps with wire netting incorporated for extra strength. This mix

will be laid about 1in (c 2.5cm) thick onto the earth and then it will be coated with pond paint afterwards for the final seal. Another method is spraying GRP (glass-reinforced plastic) straight into the excavation.

In theory, both of these methods seem very good but, in practice, site conditions and quality of workmanship will have the final say as to whether or not they will be successful.

I have not mentioned pre-formed GRP or plastic ponds above because most of these are too small or too shallow to be used for Koi, although one or two specialist manufacturers are now increasing their range to include designs to appeal to the Koi keeper.

COST CONSIDERATIONS

If concrete is chosen, it is vital that the design of the pond is formulated even before excavation begins so that a costing can be done. I recommend this because this type of pond will be more expensive than a lined one, and it is better to get the shock over and done with before you have mutilated your lovely garden! This said, though, the durability of a well constructed concrete Koi pond is unrivalled by any other commonly used construction material.

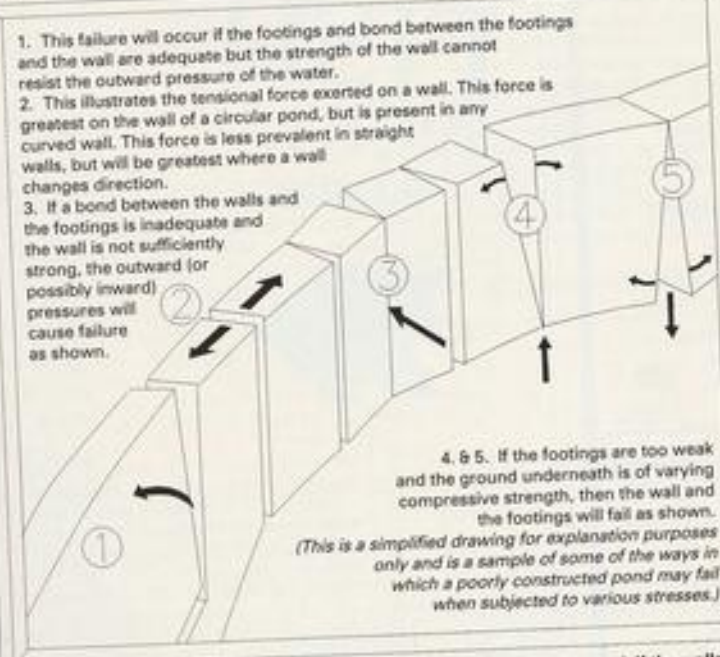
THINK FIRST

One major advantage with concrete is that the pond can be built in any shape you choose without suffering the disadvantages of flat sheet-lined ponds. Extra care, however, must be taken with this construction technique to ensure that the design and material choices are made with structural integrity in mind.

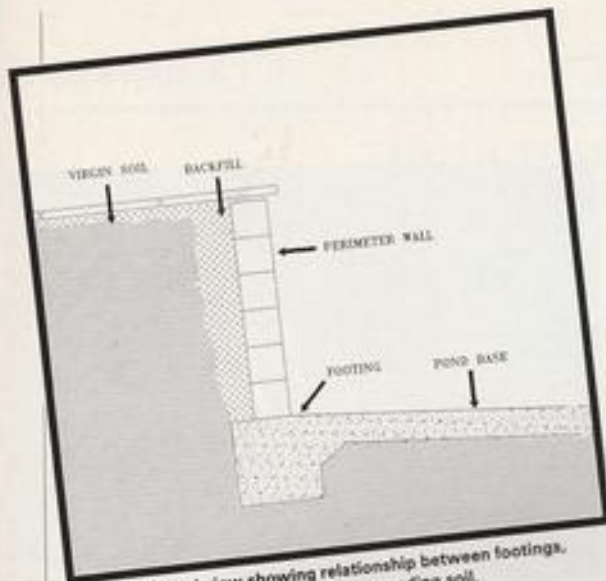
Concrete construction is more expensive than the use of a liner and there is a lot more work involved, so it is vital that the job is done properly. If the walls are too thin, or the footings inadequate so that the pond cracks, the extra money and effort will have been wasted, not to mention the headache of rectifying the situation and, of course, the cost of reinstatement.

I once heard a man say, "I would never build another concrete pond because they always crack". I would suggest that this experience had been based upon ponds made with flimsy construction. Concrete does not crack spontaneously without cause. Material failure occurs only when the stresses exerted on the structure exceed its strength.

Concrete is an excellent construction material for ponds because of its versatility and its enormous strength in relation to its

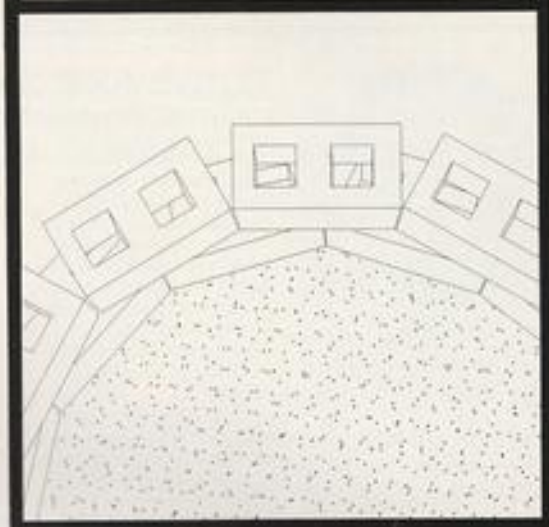


There are many different types of stress loads exerted on the walls of a pond. If the walls and footings are not sufficiently strong, then structural failure will result. Those shown are just a few of the stresses which are most likely to cause such a problem.



Sectional view showing relationship between footings, walls, base and surrounding soil.

This drawing shows how the curvature of a block wall will create irregularities on the inside face which will have to be filled before rendering can be applied.



cost. If, as the aforementioned gentleman suggested, concrete was not suitably strong, then why are motorway bridges built with it?

When building a concrete pond, the most important thing to remember is to ensure that the footings are of sufficient strength and are on sound soil. A footing is constructed by excavating into the ground to a specific depth below the level at which the bottom of the walls will start.

Into this excavation concrete will be poured in one mass so that when it sets, there is a very strong collar around the perimeter of the pond which should never sink or crack.

LOADINGS

The cross-sectional dimensions of the footings will be determined by the loading that will be placed on them. For instance, if the pond contains only 500 gallons (c 2,270 litres) then the footings may be only a few inches thick. If the pond contains 10,000 gallons (c 45,500 litres) then the strength requirement is much greater.

The weight of water in this pond will be almost 45 tons, which will be pressing downwards on the ground and outwards on the walls, not to mention the additional weight of the walls pressing down on the footings.

An extra loading that can place an immense force on a structure, but which is often ignored, is that created if the compressive strength of the soil under the footings varies along the length of the structure. If the soil is hard at one point and soft at another, then a twisting or bending strain will have to be withstood by the structure.

In cases where the suitability of the soil is in question, the thickness of the concrete will have to be increased either by altering to a stronger mix, or by the addition of steel reinforcing. The object of this extra strength

is to create a raft. This means that the structure is designed to withstand all the forces likely to be exerted on it, whether the ground gives even support or not.

For very small ponds, it is usual practice to pour the perimeter footings and build the walls before the base of the pond has been concreted. For larger ponds, particularly those which are being rafted, it is much better to concrete the perimeter footings and the pond base all in one pour. This means that there will be no weak joints; there is also an extra benefit in that the earth oversite will be covered, creating a much better surface on which to work while building the walls.

Do not, however, try to get the base of the pond to the finished contour and very smooth all in one go because you will never do it. It is much better to bring the concrete up to about 1-2in (2.5-5cm) below finished level to allow for a final sharp sand and cement screed at a later date.

For the larger pond, it is also a good idea to

leave steel rods protruding from the footings on a line corresponding with the wall location. The reason for this is that the walls will be built on the footings only after the concrete has set, so the bond between the two is a potential weak point in the structure. The steel rods will remove this risk.

WEAK POINT

When the bottom drain is installed, it is usual to run the pipe directly horizontally away from the drain. If this is done, it is important to consider that the position the pipe occupies may displace some concrete from the oversite covering.

If this is the case, you have a potential weak point which could lead to structural failure. To prevent this it may be necessary to thicken the concrete below the pipe and/or perhaps use some appropriately positioned steel reinforcing.

TO BE CONTINUED

ASP

Inadequate footings will result in structural failure if the compressive strength of the soil is inconsistent.





TECHNOLOGICAL OBSESSION

Do you, like me, ever think to yourself that we, as marine aquarists, are becoming obsessed with technology? I have been musing over this point a lot during the past few weeks, and the latest problem I have received for the **Your Questions Answered** section has prompted me to put my thoughts into words on this page.

Wherever I used to go, people talked to me about fish. Nothing wrong with this, of course, as I do set myself up to a degree as someone who knows a bit about the subject. I write all sorts of stuff on the topic and travel around lecturing about all the different aspects of keeping seawater animals, as well as an issue very dear to me: marine conservation.

I'm always happy when people consider it worth asking my advice, or want to share their experiences with me. In fact, I love nothing more than a good chin-wag about fish and invertebrates, especially my pet subject — Butterflies and Angelfishes.

Trouble is that 'they' don't want to talk fish anymore — 'they' want to talk hardware. All I ever get are questions on filter systems, whether I think that reverse-flow undergravel or a fully integrated 'Miniature Reef' type of system is best. They ask my opinion on which pump to use, or whether the protein skimmer should run before the activated charcoal or vice-versa. I have been drawn into long —

sometimes heated — debates on lighting.

All manner of technological queries come my way, but rarely, nowadays, do I get asked what species of anemones one should buy to ensure that one's clowns will set up residence in it. Why does no one ask what Scribble Angels eat, or even what fish to keep with their Lionfish, anymore? Am I alone in thinking that biology now takes second place to technology?

These questions become even more appropriate when I read about Nancy Aquarium, in France, where they have kept many species of all types with nothing more advanced than sponge filters. Indeed, I know many people who have kept healthy aquariums for years using only the Living Rock in their tanks, an air-pump and water changes: the 'natural system'.

Now, before any of you write me poison-pen letters, I am fully aware that beginners have to talk about filtration and the Nitrogen Cycle. They need to get their heads around what can be a very involved subject. I am also aware that all the terrific strides which have been made in aquarium technology over the past decade now allow us to keep relatively delicate animals successfully.

I should also say that I do not advocate the Natural System. I have never been keen on living on a knife-edge and the Natural System, to me is just that. It's simply that I feel we are losing sight of what really matters — the animals.

By the way, before we put this section to bed, please don't stop talking and writing to me!

Enough of that; now this . . .

SNIPPETS

- The scientific name — some would say the true name — for the Blue Faced Angelfish, *Eupomacentrus xanthurus*. The gorgeous Regal Angel, sometimes called the Empress Angel, is *Pygoplites diacanthus*.



The Regal Angel (*Pygoplites diacanthus*): a great fish for the tropical marine aquarium . . . once sufficient experience has been gained.

- Beginners who see *Pygoplites diacanthus* for the first time could be forgiven for buying it straightaway. DON'T! This species is not for beginners. It is very intolerant of changing water quality, a phenomenon which is prevalent in new aquariums.

Specimens from the Philippines are relatively pale and are usually difficult to feed. Fish which come from the Maldives or Sri Lanka offer a much better chance of success.

- The Cubbyu or High Hat (*Equatus acuminatus*) and the Jack-Knife Fish (*Equagus lanceolatus*) are both members of the family Sciaenidae. They both come from the Caribbean.

This family is also called the 'Croakers and Drums' because they are capable of making sounds by resonating the swim-bladder.

- When deciding on how to heat a tropical seawater aquarium, it is a good idea to buy two heaters, each of half the wattage needed to heat the tank. Not only will this give an even distribution of heat all

around the aquarium, but if one heater fails in the 'off' position, then at least the other would keep things running.

If one heater were set 1-2" below the other, then if one were to stick in the 'on' position, the other wouldn't be large enough to boil the tank's inhabitants.

SAVE THE MCS

And finally, the Marine Conservation Society is at present under severe threat of having to wind up due to lack of funds. I have spoken before about how important this organisation is, both in educating everyone about our marine wildlife — and how important it is that we take care of it — and in the field-work that MCS have done in trying to ensure the survival of everything from sharks to stretches of coastal habitats.

However, all of these projects have drained resources to the point of the society's collapse. The best way to help is by becoming a member. Please write to MCS, 9 Gloucester Road, Ross-on-Wye, Herefordshire. The society is also a tremendous source of books.

Meanwhile, I'll be with you next time.

A Shocking Tale

Human beings have a fairly heavy evolutionary investment in eyesight. Visual input is responsible for a significantly large amount of the information our brains receive. Indeed, it even accounts for what you are doing now, reading this article. Not all animal species, however, rely so heavily on vision.

Imagine for a moment that, instead of using light, you could 'see' electricity. A very strange world would open up before you, as you witnessed the tiny electric fields produced by other people's thoughts and nerve impulses (those small currents doctors monitor with E.E.G. machines).

Air is a relatively good electrical insulator; perhaps, then, it is not surprising that the group which makes most use of 'electric vision' should be the fish, as water (and especially sea water) conducts electricity fairly well.

HEAVYWEIGHT GENERATORS

There are three well known types of 'heavyweight generators': the electric eels of the Amazon, African electric catfish and the electric rays of the world's oceans. These three can release a current large enough to knock out a full grown human, though this is clearly not the primary function.



An Amazonian Electric Eel (a dead specimen) — one of the real 'electric' heavyweights.

Most of the electric species live in murky areas, where sight is of limited use. Releasing controlled bursts of electricity and monitoring the 'reflections' gives these animals a form of radar by which to find their way about, as well as an efficient method of killing their food.

Electric Eels

The Electric Eel, *Electrophorus electricus*, can be kept fairly successfully in captivity, though it is generally a candidate for public,

Dr. Gareth Evans inspects the 'shocking' world of electric fishes.

rather than private, collections. Modified axial and caudal muscle plates generate the current in these animals, which is almost certainly a means of locating, tracking and catching prey, rather than an out-and-out offensive or defensive weapon.

The aquarium at Amsterdam Zoo contains a magnificent example of this species, its tank being wired in such a way as to make the animal's electrical activity audible as a series of clicks — quite a striking exhibit!

Electric Catfish

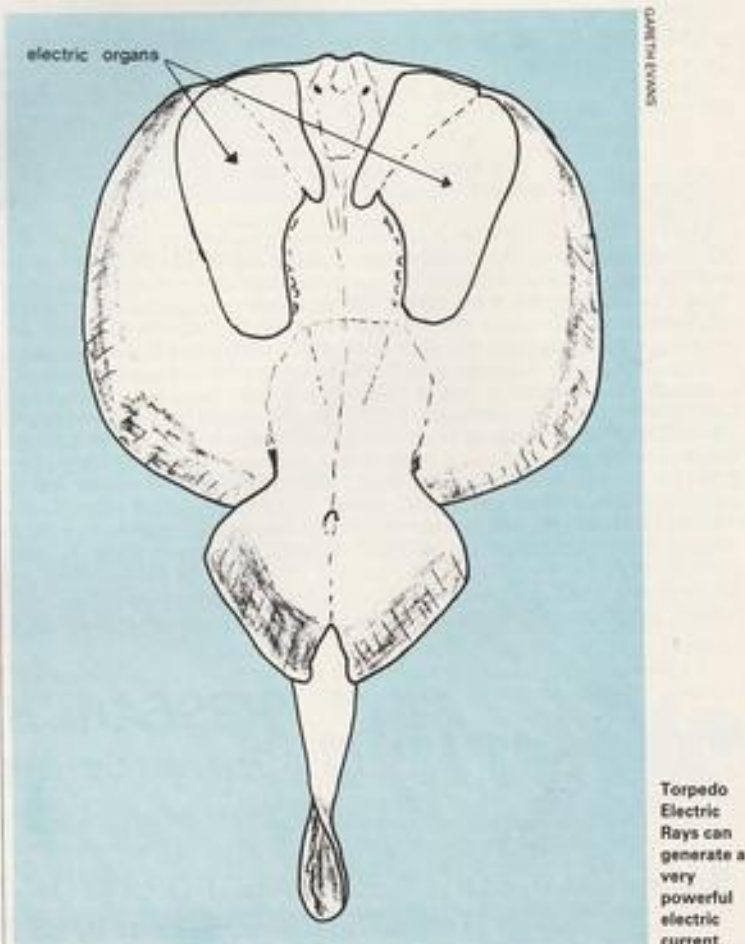
The Electric Catfish, *Malapterurus*, although growing to a large size, is a better

bet for the private enthusiast, being a fairly undemanding species. Best kept singly, this almost-blind fish uses a low current to locate prey, and once 'in range', a larger one to stun or kill it.

Electric Rays

Electric 'Torpedo' Rays are to be found throughout most of the world's seas (two species, *Torpedo marmorata* and *T. nobiliana* off the southern coast of Britain) and were known to the Greeks and Romans, who used their shocks to 'cure' gout. The success or failure of this undoubtedly painful treatment is not recorded.

The electric organs of the ray are a pair of oval tissue masses, located in each wing, at the anterior end of the body. Within these structures are the individual electric cells — discs filled with a gelatinous material and containing many nuclei. The cells are



Torpedo Electric Rays can generate a very powerful electric current.



The Electric Catfish — yet another electrical powerhouse.



Gymnotus carapo is one of the 'lightweights' which does not use its electrical powers to stun prey.

arranged in columns of up to 400, isolated one from another by fibrous tissue. Up to 1000 columns, dependent on species, constitute the mass of the organ.

Producing generally around 40-50 volts, though exceptionally up to 200 volts in a large specimen, the electric current decreases with each successive discharge, gradually running down if used frequently, and requiring a period for recharging before further operation.

LIGHTWEIGHT GENERATORS

Despite the obvious attractions of such 'off-beat' ichthyological power stations, their fast growth rate and large adult size make Electric Rays poor subjects for the home aquarium. However, a few species of fish exist which may be described as 'weak electric' animals, lacking the prey-killing power of the heavyweights, but sharing their unusual sensitivity to water-borne electric fields. Being somewhat smaller, these fish are more suited for the hobbyist.

In these animals, their discharges serve two purposes: firstly, like the larger 'electrics', location of prey and navigation; secondly, and most remarkably, communication. Some of their output broadcasts coded information regarding the species, sex, age, territorial claims, breeding readiness and general condition of the sender. In Mormyrids (African 'Nile Pike' or Elephant Noses) the location function has an effective range of only 10cm (4in), while the communicative aspect functions up to 100cm (c 39in) away.

In addition to these Mormyrids, other weak electric fish to be seen for sale include the Gymnotid Knifefish of South America and South Africa. Most of the weak electrics have modified axial and tail muscles with which to generate current, rather like the Electric Eel. However, the neotropical Aponotids use the somewhat uncommon vehicle of modified nerves for their discharges.

Many of these weak electric species poss-

ess some form of focussing system to enhance and maximise the effect of their electric currents. Knifefish bend their tails around the object they are investigating, while the Elephant Nose swims backwards

and forwards around the object, increasing its rate of discharge as it does so to increase the amount of information it receives.

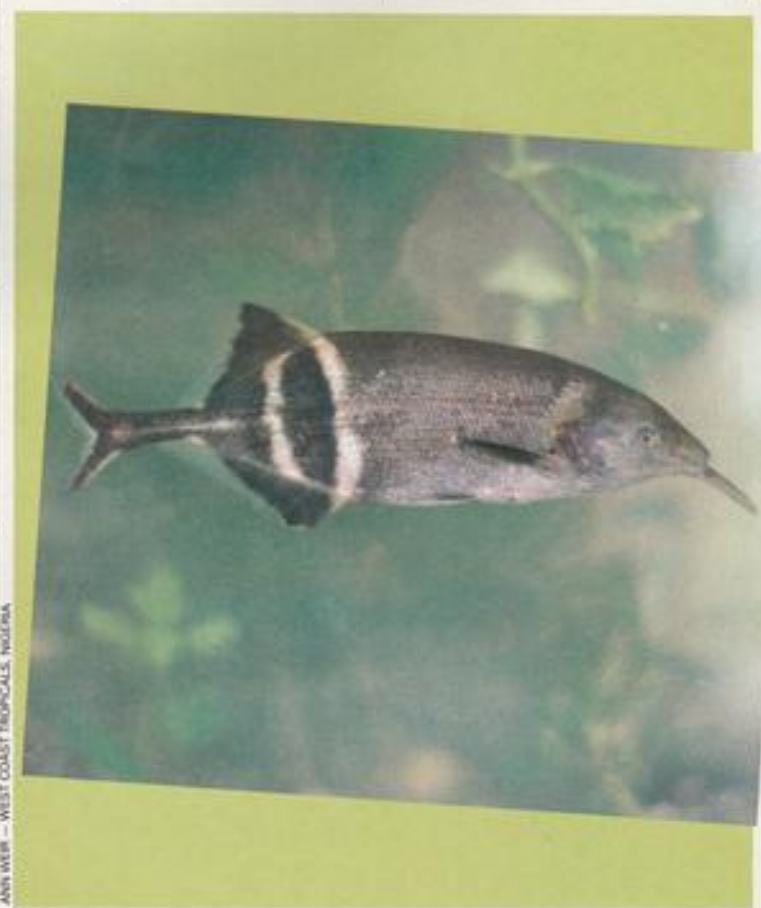
Elephant Noses

The African Mormyrids, a tube-snouted group related to the herrings, and which bear some resemblance to prehistoric genera, make suitable aquarium subjects. Their care is not too demanding, provided they are kept singly, or with larger species, as their discharges will upset smaller fish.

In captivity, the Elephant Nose, *Gnathopomus curvirostris* and the Tapir Fish *Mormyrus kneri* appreciate a soft substrate, which they will investigate with their trunk-like snouts. These shy animals will only accept live food with any degree of certainty. A shady position is desirable for their aquarium; placed in light and deprived of adequate hiding places, the fish tend to hide in the bottom sludge until dark.

Although none of the electric fish is the easiest of propositions, and despite their rather secretive natures, they can make fascinating subjects for the aquarium. Certainly, if your interests lie in the different, then Nature's answer to the national grid are well worth consideration.

AKF



Mormyrids are probably the best-known 'electric' fish.

FOCUS ON: CATFISH



Adult male Cascudo, identified as such by the thickened first ray of the pectoral ('chest') fin.

CASCUDO BONANZA

Some of the most spectacular successes come when we are least expecting them. Ray Hocking of West Cornwall Fishkeepers reports on one such occurrence which kept on going for a whole fortnight.

Photographs by the author



Close-up of the male 'at work'.

Our local aquatic shop always had a delivery every Thursday and I rarely missed the event. It felt like Christmas every week; there was always something different. One particular delivery contained four Cascudos or Hoplos, *Hoplosternum littorale*, one male and three females, each around 4in (100mm) in length.

These fish interested me as two of my club members were, at that time, trying to breed them without success. Some West Cornwall Fishkeepers' members had successfully bred *H. pectorale*, the Spotted Hoplo, several times, *H. thoracicum*, the Port Hoplo or *Atipa*, once or twice, but *H. littorale*, not at all.

SATURDAY MORNING SURPRISE

Most Saturdays I helped in the shop, so I decided to look at the fish again then. If only I had known! Saturday morning came and my first job was to check all the tanks.

I stopped at the two-foot tank holding the Cascudos. Three fish were stationary on the bottom, but the fourth was hovering in mid-water under a floating Amazon Sword leaf. The thickened first rays of the pectoral fin confirmed it was the male. The underside of the leaf was a mass of bubbles! We had all thought Hoplos of this size were too small to breed.

I kept an eye on the tank all morning before I was certain the nest contained eggs. Only 72 hours earlier, these fish had been in a wholesaler's tank. What had started them off? Was it just the change of water, or did the large change in pH from hard to soft water contribute towards this stroke of luck?

Colin and Ray, the shop owners, generously agreed that the eggs be removed and passed to a club member who was trying to breed the species. A show tank was therefore immersed, the bubble nest removed intact and the tank collected by a very excited



The male, swimming upside down to tend the nest and eggs.



Newly-born Cascudo.

aquarist. At that time we expected that any success we achieved would be small.

REPEAT PERFORMANCES

The next day, the male was busy building another nest, and the following morning that, too, contained eggs. This time, the male kept closer to the nest and we had to scoop both nest and protective parent into another tank. The male continued to look after the nest even in the show tank, and this enabled me to take quite a few photographs before he was netted and returned.

We were in the midst of removing the third nest of eggs a few days later, when a phone call told us that the first spawning had been a tremendous success — a high percentage had hatched.

It seemed that the male had mated with all

three females in less than a week. This we assumed would be the last nest of eggs. We were wrong. Two days later, it happened all over again. We were getting swamped! These eggs were passed to the second club member.

So it continued, a nest one day, eggs the next. Every two days for two weeks, seven spawnings in 14 days. Yet, we never saw the fish spawn. We believe this took place around dawn or just after. After 14 days, it abruptly stopped and nothing would induce the fish to start again.

The fry fed well on brine shrimp, micro-worm and a home-made recipe using beef heart. Colin and Ray decided to keep the

parents a while longer, despite many requests to sell.

FOLLOW-UP

Not more than a month later, Colin found a dead Cascudo; it was the male. As the fry were growing well, the three females were split up and sold. It wasn't too long before the fry reached a saleable size and many tanks contained 'locally bred' Hoplos for months afterwards.

Yet, some two years later, no one has, to my knowledge, had any breeding success with the offspring. I wonder why? **ALP**

Batch of yellowish eggs among the bubbles on the underside of the spawning leaf.



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DISCUS, DRAGONS AND

A & P editor
John Dawes
selects his
personal
highlights from
this year's
glittering event.

*Photographs —
unless otherwise
indicated —
by the author.*

Golden in
colour, as
well as in
price, these
brand-new
Discus gener-
ated a
great deal
of interest
on the
Aqua Fauna
Malaysia
stand.



An organiser's
dream: a packed
out corner of the
exhibition hall.

STUART BAIN



At times it felt
as if everyone
in the hall
wanted to
come and say
hello.



About a year ago, we received an invitation to act as the official English-language supporting magazine to Aquarama '93, an honour which we duly accepted. We are therefore particularly pleased to be able to report that the show proved to be a resounding success, far sur-

passing even our most optimistic expectations.

With their usual unerring sense of good timing, Expoconsult, the organisers, have just sent us a report containing their final breakdown of the various facts and figures regarding the show.

It makes fascinating reading. For instance,

it says that the last two days of the four-day event (these were the two days when the show was open to the general public) attracted no fewer than 30,549 visitors! This mouthwatering figure represents an increase of 7,000 over Aquarama '91, itself deemed a great success by those who travelled from all over the world to attend that particular show.

A & P SUCCESS

It's quite staggering when you consider that over 30,500 people, out of a population of a mere 3 million, will flock to a totally aquatic exhibition, given half a chance.

From our point of view, this was great, of course, since it felt as if all 30,500 stopped by the *A & P* stand at one time or other! To say that we were swept off our feet from opening time (10 am) to closing time (8 pm) on both public days would be putting it mildly ... very mildly.

We had a tremendous show in every sense of the word. What was particularly uplifting for me personally, as editor, was the fact that so many of our regular Far East readers came

FRIENDS AT AQUARAMA '93



The Singapore government's Primary Production Department — in association with Rainbow Aquarium — staged a display of captive-bred Red Dragon Fish which attracted large crowds throughout the show.



Horabagrus brachysoma — a sure-fire winner for the future — was exhibited by Aqua Marines of Sri Lanka.



Short bodies are, apparently, in. These Kissing Gouramis, photographed on the Keells Aquarium (Sri Lanka) stand were one of at least four types of short-bodied fish on show at Aquarama.

to see us, just to say Hello and tell us how highly they rate our magazine. Music to my ears!

There were, it must be said, some other aquatic exhibitors besides *A & P* at Aquarama '93... 75 to be exact, representing products from 139 companies from 22 countries.

Every single exhibitor I spoke to rated their presence there as a great success. If you take into account that over 70% of all the exhibitors came from countries other than Singapore, and that by the end of the show, some 73% of all the available exhibiting space for Aquarama '95 had already been pre-booked, this will give you a pretty good idea of just how highly Aquarama is now regarded within the international aquatic community.

Further confirmation of this comes from the attendance figures for trade visitors. At 3,170, from 44 countries, this year's total represents an increase of almost 40% on 1991. No wonder the organisers sound, quite rightly, and not surprisingly, so proud of their achievements in their final-analysis report.

SELECTED HIGHLIGHTS

So what was actually on offer at Aquarama '93 for it to be such an outstanding success?

For a start, this exhibition represents the largest gathering, under one roof, of fish, plants and every conceivable item of aquatic equipment and other dry goods you can dream of. Quite simply, there's nowhere else in the world that you could go to and find a comparable, exclusively aquatic, spectacle on this scale.

Whether you are a hobbyist or a member of the aquatic trade, at Aquarama you will find that there's always something round every metaphorical corner, just waiting to grab your attention.

New Fish

Aquarama always has a few surprises in this department. This year, three new fish — or new types of fish — are particularly worthy of note.

Short-bodied forms

Perhaps the best-known of the short-bodied fish within the hobby are Balloon Mollies and Blood-red Parrots. Both were present at Aquarama, the former in its Sailfin Green form, and the latter as the reddest Parrots yet seen at Aquarama or anywhere else.

In addition, I found several aquaria containing... wait for it... Short-bodied Kissing Gouramis!

There was even a short-bodied fish in the New Species/Varieties category of the fish competition. It was a Short-bodied Ram



This unusual, and as yet un-named, Discus with vertical — as opposed to horizontal — stripes, won the top award in the New Species/Varieties category. It has been developed by Gan Khian Leng.

which seems destined to do very well commercially. The judges agreed; they awarded it the second prize.

New Discus

Several new varieties made their first public appearance this year, lending weight to the belief we expressed in our January '93 issue that Discus breeding is experiencing a strong 'Far East Shift'.

Particularly noteworthy for me were some unbelievably beautiful Golden Discus which — appropriately — cost a mint! In fact, no less than US \$1,000... for juveniles... and worth every cent in the eyes of many adoring Discus keepers who visited the stand.

There was also a stunning pair of relatively young fish exhibited in the New Species/Varieties. This, as yet un-named variety, differed from all other Discus in having nearly vertical body stripes. It was therefore no big surprise to find that these impressive fish swam away with the top award in this category.

Wild-caught Cats

In some ways, the most exciting of all, were the large shoals of *Horabagrus brachyoma*, a South Indian species which has, reportedly, not been seen by anyone for countless years. As the accompanying photograph shows, these cats are very attractive indeed. They are also hardy (they were gulping down food pellets almost as fast as they hit the water), and not too large.

The specimens at Aquarama were between 10-15cm (4-6in), with something in the region of 12in (30cm) probably being the maximum size for the species. At least, this has been the largest specimen caught so far.

The exhibitors were very confident that they would soon be breeding this species



How about this for a display of unusual foods? They are Taiwanese in origin and include, among others, foods which bring out the coloration in Blood-red Parrots, and pellets for Dragon Fish.

commercially. Whether they do so or not, *Horabagrus* is certainly worth being on the lookout for.

Fish Competition

As in 1991, the fish competition was divided into a four-day section for Guppies, Angels, Fancy Goldfish, Discus and New Species/Varieties, and a two-day Koi competition organised by the Singapore Koi Club.

Among the Koi — which were judged by a

team from Zen Nippon Arinkai invited from Japan especially for the event — the best specimen out of a 260-strong, high-quality field, was a superb Sanke valued at S \$60,000 (approximately £25,000).

In the other categories, the top fish proved that the best that Singapore can produce (the entries from other countries notwithstanding) can more than hold their own alongside their foreign counterparts.

I've already referred to the quality of the Far East-bred Discus. Nowhere was this more evident than in the competition itself. This category just keeps getting better and better. The Grand Champion — an exceptionally regal Red Turquoise produced by Lim Yu Hoe — was probably the best Discus seen in public in these parts for many a year.

On the Fancy Goldfish front, not only were there some outstanding fish, but a few surprises as well. See Stephen Smith's special edition of *Coldwater Jottings* elsewhere in this issue for fuller details.

And so it went on wherever you looked. All in all, the fish competition acted as an important, colourful crowd-puller, and presented the international panel of judges (which included three UK representatives: our 'Coldwater Jester' Stephen Smith, Mick Seaby of Swallow Aquatics, and me) with a terrific, mind-stimulating challenge.

Conference

Backing up the other varied elements of the show was a five-session conference on *Global Perspectives of the Aquatic Industry: Present and Future*, which attracted speakers and delegates from every corner of the globe.

This central feature of Aquarama has already received very encouraging feedback from those who attended, so much so that an even larger conference room has already been booked for 1995.

As in the judging, the UK was well represented at the conference, with contributions from Mick Seaby (Swallow Aquatics), Dr Krishen Rana (Institute of Aquaculture — Stirling), Dr Keith Banister (ex-Natural History Museum — now aquatic consultant), Keith Davenport (OFI-UK), Dr Peter Burgess (University of Plymouth), Dr David Pool (Tetra) and myself.

SUMMING UP

Nearly 34,000 people flooded into the World Trade Centre in Singapore during its four days of non-stop aquatic activities. No one was heard offering anything other than compliments about the show, which could well mean that, at least, 34,000 satisfied customers will be back in 1995.

If you've already been to Aquarama, the chances are that you'll be back. If you haven't, why not make a note in your diary? The dates for '95 are 25-28 May. The basic format will be the same in that the first two days will be restricted to trade visitors, with the last two being open to the public. Plan a holiday to this tropical paradise around those two action-packed, exhausting, mind-blowing days, and you could be in for the time of your life!

Books

Nature And Aquarium

By: Berti Gesting.
Published/Distributed by: BioPlast (UK) Ltd.
Unit 1, Old Railway Goods Yard, Kildwick Crossing, Crosshills, Keighley, West Yorkshire BD20 7DA.
Tel: 0535 630230;
Fax: 0535 633690.
Price: £6.95.

Following up on the review of the Bioplast CO₂ Fertilisation Compact Kit (*Product Round-up, A & P*, August 1993), readers might like to know that they can explore this subject, along with other equally-advanced aquarium management themes, in the latest updated booklet by Berti Gesting.

The original edition brought a heavy response from readers, and the answers and further explanations to their queries are included in this new version. The first part of the book covers the environment of the tank: water, filtration, substrate and lighting; heating, as such, is not included, except for the use of substrate warming (by the innovative BioPlast heating hose system) for plant growth which is fully described.

Nature And Aquarium



Advanced Aquarium Management
Aquarium Plants

The maintenance and care section covers 'teething troubles' during the aquarium's early life, while the most common pests (algae, snails, insects, etc) lead into the final chapter on plant ailments, which neatly introduces the second half of the book devoted to the culture of aquarium plants.

This section has been expanded by about 50%, with 120 species being described. The artwork is much crisper and, although the printed details appear sparse, there is an actual wealth of information given.

NEW BOOK NEWS . . .

Reef Sharks and Rays of the World A Guide to their Identification, Behaviour and Ecology

By: Scott W Michael.
23 x 18cm, 113pp, 173 full colour photos (76 of rays), 59 b/w photos and text figures, including an illustrated key to families. Glossary. Bibliography. Indexed by scientific and common names. Slick wrappers.
Price: £22 post free (UK).

This colour photographic field guide describing 120 species of sharks and 112 species of rays likely to be encountered near rocky or coral reefs, is the first book of its kind to be worldwide in scope. Introductory chapters cover food habits, hunting strategies, interspecific relationships, reproductive behaviour, egg-cases, development of the young, social behaviour and diver/shark interaction.

Species accounts include information on identification, birth and adult size, geographical and depth ranges, reproduction, feeding, general biology and aquarium

Lighting particulars are given for each species and include subdued, moderate, bright and very bright, each expressed in lux (pass me my light meter somebody!) and aquarium usage details cover the range foreground, middle ground and background, plus planting suggestions as groups or solitary specimens.

Dick Mills

Review of Rivulus (Ecobiogeography – Relationships)

By: Dr Jean H Huber.
Published by and available from:
Cybium, Société Française
d'Ichthyologie,
Muséum National d'Histoire Naturelle,
43 rue Cuvier,
75231 Paris cedex 05, France.
Price (incl p&p): 450 FF.
ISBN: 2-950 7330-0-X.

Why would anyone wish to pay over £50 for a book that deals with just a single genus of Killifish containing some 70 species which are definitely known to be valid and 30 over which there exists some doubt?

Well, there are at least three good reasons. For a start, some of the money raised from sales of the book will go towards S.F.I., a non-profit-making organisation which funds fish research in Europe. Another part will go to P.A.H.O., the South American arm of U.N.I.C.E.F., for child health projects. The author has, in fact, agreed to receive no payment at all for his efforts.

Yet another very good reason – and the one which should determine whether the book deserves to do well in its own right or not – is its sheer quality. There can be no doubt that this 586-page volume must have already become the book on these often beautiful, and always fascinating Killies; if not, it soon will be.

care, collected from the literature, plus interviews with divers, aquarists and biologists, and the author's field observations over many years.

Profusely illustrated by the work of over 40 ichthyologists and photographers, this book is markedly different from the many mainstream publications currently available on sharks and fills a gaping void in the published knowledge on the rays of the world. It will be of use to anyone with an interest in sharks and rays, whether in the wild or held in aquaria.

Distributed exclusively in Europe by: Steven Simpson, Natural History Books, PO Box 853, Brighton BN1 5DY. Tel: 0273 727328; Fax: 0273 203754. (There is no VAT on books, but prices are subject to change. Catalogue of ichthyological and herpetological books is available on request. Please write stating interests.)

It seems to me that, if there's anything you wish to know about this South American genus, you're more than likely to find it here.

Admittedly, you won't find the contents packaged in the attractive manner which we have now grown to expect from aquarium books but, then, *Review of Rivulus* is not an aquarium book. It is, rather, a well documented record of the fish which constitute the genus *Rivulus*, with information on the status of each species; major data regarding morphology, etc; descriptions and locations of museum collections; biological, distribution and bibliographical details covering each species, plus some details of their aquarium care and breeding.

In other words, the information contained in the text is pretty comprehensive, particularly when it is backed up by some unbelievably detailed tables embracing lists of known species, their type localities, bone counts, their aquarium 'experience' and other bits of essential data.

Not all the information is easily accessible, however. The index, for instance, is more of a chore than an aid, while the small print size that was found to be necessary in order to squeeze in all the data into the limited space available for some of the tables, could present a few difficulties to some readers.

Having said this, there's so much valuable stuff packed into the 586 pages, that you'd be hard pushed to find a better, more economical way of fitting everything in. From treatment of the 'early' genus and poorly described species, to maps of collecting locations (by country), and from the definition of the genus *Rivulus* itself, to a comprehensive species analysis, it's all here, in *Review of Rivulus* – a book of unequalled quality for the specialist Killifish aquarist and researcher alike.

John Dawes



Helping Hand

By Kevin Fox



ADVANCE 'WARNING'

Hi everybody! Nice to be chatting with you all again.

First off, I've got some goodies to give away, so I'll be setting you a little quiz later on. The usual rules apply: the first correct answer out of the editor's Top Hat gets his or her hands on the goodies. And when I say goodies, I'm not just *Whinling Dixie!* The prize this time is one of the revolutionary Rolf C Hagen (UK) Ltd *BioLife* aquarium filters. To be exact, it's the Model 55 for tanks three feet and over. The prize was very generously donated by Tim Vincent on behalf of Rolf C Hagen (UK).

For those of you who've been vacationing on Venus for the past year or so, the *BioLife* filter has just about every possible method of cleaning your aquarium water. It has mechanical scrubbers, foam/sintered glass biological filtering, a charcoal-impregnated membrane for chemical filtration, and finally, the revolutionary part, both wet AND dry trickle filters!

Believe me: you miss out on this one, and you'll be kicking yourself all the way around your lounges! See Competition Corner, later.

HH FISH SELECTION

Sometime ago, our editor made a suggestion to me regarding a piece about certain species of fish. Pinching his

suggestion (I have no shame) and modifying it, I came up with an absolutely brilliant idea for the HH column.

Occasionally, I'd like to draw your attention to a specific species of fish which would be ideal for a disabled aquarist to keep. Fish which do not need the constant coddling of the more delicate species, and which don't mind all that much if you're just a few days late with the household chores, such as water changes, cleaning out filters, etc.

Of course, there's no such thing as a fish which requires no attention at all, but there are certain fishes which will tolerate a slightly dirtier tank than others.

The most obvious species which spring to mind are the Labyrinthfishes or Anabantoids; and specifically, gouramis. As capable aquarists yourselves, you already know that such fish can, and do, live in waters which make our own rivers and lakes seem positively sparkling-clean, hence the extra breathing apparatus which enables such fishes to live in waters with a very low dissolved oxygen content, e.g. mucky water.

Keeping a variety of such fishes in a community biosphere means that your regular maintenance routine need not be as rigid as it would be if you were keeping something like Rift Valley Cichlids.

Please, please don't get hold

of the wrong end of the stick. I am most definitely NOT advocating a biosphere which you can set up, and then just leave alone, with no further maintenance. My idea is, simply, to draw your attention to fishes which are hardy, and can survive well if their keeper (for whatever reason) cannot perform routine maintenance at definite times.

For example, in my own case, apart from various other disabilities, I also have an acute blood problem: I don't have nearly enough of the stuff! As my blood count drops lower and lower, my ability to perform certain tasks becomes increasingly more difficult.

Often I have no 'Go' at all, and at such times, work on my aquarium is simply impossible. Therefore, I created a biosphere, and stocked it with fishes which would be highly tolerant of such treatment. So far, and apart from an anarchistic Dwarf Gourami who seemed to have seen every James Cagney movie (*Top of the World, Ma!*), and had to be removed, I have suffered no losses.

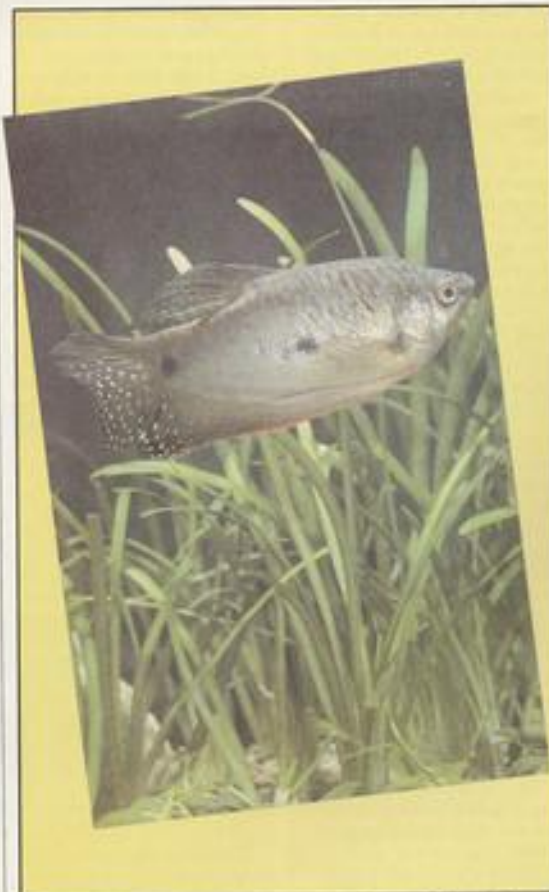
Of course I am, and always will be, a firm believer in the 'balanced biosphere' concept, and in my aquarium, plants outnumber fishes by twenty-to-one.

Obviously, gouramis aren't the only tropical fishes capable of withstanding 'bad' water conditions for extended periods of time. With so many of the more rarer species of fish, as well as the 'bread-and-butter' types now being bred in captivity, almost all tropical fishes are much, much harder than they were twenty years ago.

Back in the '70s, keeping Discus needed a lot of thought, time and money. Nowadays, they may be kept (almost) in water straight from the tap! When the next instalment of your favourite column is due, I propose to run over the essentials of keeping Lace Gouramis, one of the most beautiful of all tropical fishes.

MAILBAG

Thanks Doreen Underwood, for your letter — and by the way, if any of you want to know just how good the Hagen *BioLife* filter is — Doreen writes that she is highly delighted with hers.



Gouramis are great choices for aquarists who can't always keep on top of maintenance jobs.

LIBRARY OF THE FLORIDA TROPICAL FISH FARM ASSOCIATION



Steve Holmes (whatta name for an ex-policeman!): I haven't forgotten you. I will be in touch quite soon now. I've had quite a few problems to sort out recently, and if any one mentions the word CAR, the men in white coats will be calling for me. I've had car trouble like you wouldn't believe; such as having to drive around with the heater jammed full on in the summer!

Jane Lloyd: my sincere apologies, Jane. No car — no come. I hope that you had a really successful day at Sparsholt College despite my absence. I was all set to go, when unfortunately, my car's drive selector jammed in the 'P' (park) position. Even the AA gave up on it, although they did take the car to my garage. After that, I was kidnapped by some friends who took me to Nottingham for the day.

My thanks to Dave Thorley of Thorley International Koi who, having read my July column, faxed me details regarding his new premises at Aike Garage Farm, Aike, Driffield YO25 9BG. Dave's new facility was purpose-designed for disabled access right from the initial design stage. (Now, that's what I call clever).

There is full pram . . . err, sorry, wheelchair, access to ALL viewing areas and aisles in the shop, as well as extra-large disabled parking bays — so no more struggling to get your chairs out of the car. (Oh, no! not THAT WORD again!). Dave has many more plans for 1994 as well. Contact him on 0377 270627, or, if you're an apprentice Yuppie like wot I is, fax Dave on 0377 270313.

Finally for this column's Mailbag, a very heartwarming letter from Ms Clare

Edwards. This is the first real feedback I've had regarding NADA (National Association [of] Disabled Aquarists). By the way, Clare — absolutely loved the cartoon, I'm going to pass it on to the editor who may publish it. Glad to see that you stamped your copyright on it.

A lesson for any budding writer/illustrator. Copyright EVERYTHING you draw, scribble or note down. Not everyone is as scrupulously honest as A & P. Lovely handwriting as well.

Clare has offered her services for NADA, and has even offered to produce a regular newsletter on her PC if and when such an organisation comes into being. I'll be writing to you soon. Clare, from your cartoon we obviously share the same sense of humour!

THE NATIONAL ASSOCIATION (OF) DISABLED AQUARISTS — NADA

Just to clarify this NADA business, here are a few details. It is proposed that NADA will encompass all aspects of fishkeeping: freshwater tropicals, coldwater, sea fishes and invertebrates, and, of course, pond keeping.

It will be an organisation consisting of various experts in each area who will offer advice on their particular speciality.

Further, it is hoped that a database of able-bodied people be created, covering the whole of the UK, who would be willing to donate a couple of hours a month by assisting disabled aquarists or pondkeepers with their routine maintenance, etc. It is not necessary for each able-bodied NADA helper to know any-

thing at all about fishkeeping; the disabled aquarist he or she is helping has all of the necessary knowledge.

NADA would campaign on behalf of ALL disabled aquarists for better shop access, lobby manufacturers about modifications to, or even the creation of, aquatic equipment especially for fishkeepers with various disabilities.

NADA will cater for ALL disabilities, and not just for wheelchair users. So, no matter what your disability, NADA will have access to medical experts, as well as the aquatic specialists. You don't need me to inform you of the considerable benefits membership of NADA will bring you.

At the moment NADA is still my dream. I have said in the past that I couldn't do all that much to help due to other commitments. However, I feel so strongly about this idea that I have now dropped and postponed many offers of work, and intend to start a one-man campaign to ensure that the dream becomes a reality.

The National Association for Disabled Aquarists simply *must* be created. For far too long disabled aquarists have had the thin end of the wedge. Now is the time to unite under one organisation. If you believe, as I do, that such an association is a good idea, then help me. If you want it, you're going to have to work for it: no pain, no gain!

I need volunteers to form a committee and draft a constitution. I need input from other disabled aquarists as to what they perceive NADA should be doing. I need people in the trade to offer advice on equipment, plus species, filtration and plant experts to form an advisory resource facility. But more than anything else, I need your support!

Until next time. Keep the letters coming. Happy fishkeeping/pond plodding.

Competition Corner

The competition for this issue is pretty simple. All you need to do is send a postcard to the 'office' with your name and address on, and the answer to the question:
What is the Lace Gourami's proper scientific name?



You only need give a binominal Latin name; don't try and outsmart the system by adding a sub-species suffix; just give the binominal name, and then YOU could be the winner of our fabulous prize. Having run a BioLife filter for over a year, take my word for it; they are very, very good indeed.

JOBS FOR THE MONTH

Well it's almost over. Summer, that is! The evenings are drawing in now and even though we may well experience some hot days, we will find water temperature falling.

Swing Flattening

This is where some form of heating system becomes very useful because it can be arranged to flatten out those sometimes quite extreme swings in water temperature at this time of the year.

It is my practice to keep my Koi feeding as long as possible into the autumn, thus shortening the UK winter, reducing the stress on my fish and hence giving them the best of starts in facing the coming long period of low water temperature.

My 6KW electric swimming pool heater controlled by a time switch and thermostat starts 'cutting in' at this time of the year to prevent the dips in air temperature taking that of the water down too far.

Food Watch

If a heater is not available, then a watchful eye should be kept on the weather forecast and feeding adjusted accordingly. The general rule is: if the temperature is likely to fall too much, then don't feed; if the forecast is for rising temperature, then continue feeding as normal.

Consideration should be given to mixing a little of the wheatgerm variety of pellet into the daily diet. The gradual introduction of any change of food is far more acceptable to Koi than a sudden switch when a particular food is used up. Wheatgerm is generally accepted as being much more readily digestible by our Koi at the lower water temperatures.

Cover-up

Many people are purchasing or making themselves winter covers for their ponds. If one is not available, then it may pay to make a start on the design before it gets too cold. If you do have a cover, it will be well worth your while get-

Koi Calendar



By David Twigg

ting it out and pressing on with any repairs or modifications that might be required.

For the three winters before last, I used a polytunnel, which, apart from being quite cheap to buy, was excellent for giving me access to my Koi, even when the gales were blowing and the rain was falling.

Last year, however, while I was laid up for a few weeks following a small operation on that most necessary of human body parts to a Koi keeper, my back, Lyn arranged for a local carpenter to make up a 'Koi House' for me.

This comprised wooden framed panels of tri-wall polycarbonate sheeting which bolt together very easily and over which the original polytunnel polythene fits comfortably to make the roof. I should, of course, say that the polycarbonate sheeting was 'offcuts' obtained at knock-down prices from a local roofing specialist.

All my pond chores can now be carried out without difficulty and in reasonable comfort. Fish can be seen clearly and the biggest bonus is that I am minimising my heat loss to the atmosphere; water temperatures therefore stay higher longer and are far more stable, with the end result of lowering our electricity bill.

SHOW RESULTS

Shows are a very useful part of our hobby and this summer's results are starting to come in.

Peterborough & Cambridgeshire 4th Closed Show. Prizewinners: Nigel Harrison

— Best in Show, Best Jumbo and Best in Size 2; Bill Bailey — Best in Size 1, Best Tategoi.

Merseyside Section BKKS 2nd Open Show. Major Prize-winners: N Sanderson — Grand Champion, Supreme Champion Mature Koi, Best Jumbo, Best in Sizes 5 & 6, Best Tategoi (Mature & Baby); R Knox — Supreme Champion Adult Koi, Supreme Champion Baby Koi, Best Members Champion, Best Members Adult Koi, Best Members Baby Koi, Best in Sizes 1, 2 & 3; P Adamson — Best Members Mature Koi; R Mathews — Best in Size 4; S Kerfoot — Best Adult Tategoi, Best Doitsu Adult; A & P Findley — Best Doitsu Baby; PRO KOI — Best Dealer Koi (Mature & Adult).

South Hants Section BKKS 2nd Open Show. PRO George Rooney tells me that this show, attended by almost 1,700 people, exhibited 164 Koi and produced these results: Brin Phillips — Grand Champion; Graham Bowles — Mature Champion, Best in Size 5; Alan Purnell — Adult Champion, Best in Size 4; George & Kathy Rooney — Baby Champion, Best Tategoi, Best in Size 1 & 2; Keith Rose — Crystal Challenge Trophy; Sophie Collins — Challenge Shield (Juniors); J McCulloch — Best in Size 3; R Westcott — Best in Size 6.

SHOW CALENDAR **September**

4/5 — **Mid-Somerset Section BKKS, Closed Show.** Royal Bath & West Showground, Shepton Mallet. Contact

Alan Purnell on 0458 72132.

5 — **Hull Koi Section.** Closed Show. Springfield Water Gardens, Burstwick, Nr Hull. Contact Kevin Davis on 0482 838137.

11/12 — **Central Section BKKS.** "Midlands Open Show" at Avoncroft Museum of Buildings, Bromsgrove, West Midlands. Contact Sue Finney on 021 747 2733.

12 — **Avon Section BKKS.** Closed Show at Blagdon Water Gardens, Bath Road, Upper Langford, Avon. Contact Larry Lerway on 0454 898207.

Norwich Koi Section BKKS. Closed Show at the *Town & Country Event*, Royal Norfolk Showground, Norwich. Contact Doug Raby on 0603 32654.

26 — **East Riding Section BKKS.** Open Show. Beverley Westwood Racecourse. Lots of dealers and Craft Fayre. Contact Rod on 0482 866770 or Phil on 0482 799920.

October

2/3 — **Northern Koi Club.** Open Show. Tatton Park, Knutsford, Cheshire. Contact Tony McCann on 061 794 1958.

April/May 1994

30 April & 1 May — **International Koi Show** Telford Exhibition Centre.

WHAT'S ON IN **SEPTEMBER**

2 — **Middlesex & Surrey Borders Section BKKS.** CIU Norbiton Club, Kingston-upon-Thames. Contact Marie Martin on 0737 844338.

North Wales Koi Club. 7.45 pm, David Bryant Bowling Centre, Frith Beach, Prestatyn. Contact Eileen Price on 0745 591730.

The Potteries & District Koi Keepers Society. The Thistleberry Hotel, New-castle-under-Lyme. Contact Ivan Rwtaschew on 0782 45864.

3 — **Plymouth & District Section BKKS.** 7.30 pm, The Lynham Inn, Plympton, Plymouth. Contact Trevor Ridley on 0752 690087.

5 — **Suffolk & North Essex Section BKKS** *entertain Peterborough & Cambridgeshire Section BKKS at a selection of their ponds.* Contact Dennis Prou on 0371 856450.

- Worthing & District Section BKKS.** Preston Scout Hall, Bognor Regis, Sussex. Contact Steve Willard on 0243 267893.
- Lower Thames-side Section BKKS.** Members' Pond visit & Barbecue. Contact Val Radley on 0702 529675.
- Lea Valley & Harlow Section BKS.** Visit by members to *Wessex & Southern Section BKKS* ponds. Contact Bary Ford on 0279 419101.
- Leicestershire Koi Society.** Old Aylestone Constitutional Club, Leicester. Contact Ian Oliver on 0533 839707.
- 6 - **Kenet Valley Section BKKS.** 8 pm at Newbury Rugby Club, Pinchington Lane, Newbury, Berks. Contact Bob Thompson on 0734 713640.
- North Lines Koi Society.** Speaker is John Coe of UV Systems Ltd, UVAQ Division. 8 pm at Brackenhorough Arms Hotel, Fotherby, Nr Louth. Contact Anne Mawer on 0472 826605.
- 7 - **New Forest Section BKKS.** Monthly meeting at Tiptoe, Nr Sway. Contact Mrs Chris Middleton on 0425 272732.
- Yorkshire Section BKKS.** The Holme Leas Inn, Oussett, Nr Wakefield. Contact Fred Harston on 0226 722578.
- 8 - **Suffolk & North Essex Section BKKS.** 7.45 pm at the Prince of Wales PH, London Road, Marks Tey, Colchester, Essex. Contact Dennis Prou on 0371 856450.
- Merseyside Section BKKS.** Guest speaker from North West Water, Millbrook Manor Restaurant, Knowsley Village. Contact Robbie on 051 549 2001.
- South Hants Section BKKS.** Dr David Pool of Tetra talks on *Understanding Koi Behaviour* and a video on *A year in the life of a Japanese Koi breeder*. 8 pm, Denmead Church Hall, Hambledon Road, Denmead, Hants. Contact George Rooney on 0420 473169.
- 11 - **Heart of England Koi Society.** Koi Quiz Night. Warwick. Contact me on 0926 495213.
- 12 - **Yorkshire Koi Society visit East Riding Section BKKS ponds.** Contact M Back on 0947 810372.
- Northern Koi Club.** Speakers are Tony McCann and Graham Baines on *Koi Keeping in Hong Kong, Taiwan and Australia*. All Souls Church Hall, Salford. Contact Tony McCann on 061 794 1958.
- Lower Thames-side Section BKKS.** Monthly meeting. Contact Val Radley on 0702 529675.
- Scottish Section BKKS.** Contact Archie Dick on 0786 832073.
- 13 - **Northants Section BKKS.** Contact John Byles on 0604 718648.
- 14 - **Chiltern Section BKKS.** Contact Ann Howard on 0462 679315 or Mike Reed on 0525 375418.
- Nottingham Section BKKS.** The Rose & Crown, Derby Road, Nottingham. Contact Shirley Hind on 0602 810923.
- East Pennine Section BKKS.** Monthly meeting. 8 pm, The Phoenix, Plains Common, Barnsley. Contact John Timmis on 0226 289507.
- 15 - **Peterborough & Cambridgeshire Section BKKS.** Monthly meeting, Breaks Snooker Club, Peterborough. Contact Mrs Marion Parker on 0733 61016.
- Crouch Valley Section BKKS.** Laindon, Basildon. Speaker is Ron Paslour on *A Japanese experience*. Contact Alan Ward on 0268 543600.
- Mid-Staffs Section BKKS.** RNA Club, Elmore Green Road, Bloxwich. 8 pm. For details contact Don Dyché on 0543 425178.
- 16 - **Wirral & District Section BKKS.** Lever Sports & Social Club, 8 pm. Contact Gilla Hardisty on 051 645 7832.
- 18/19 - **Northern Koi Club host visit from Lower Thames-Side Section BKKS.** Contact Tony McCann on 061 794 1958.
- 19 - **Crouch Valley Section BKKS.** Members' pond open visit followed by barbecue. Contact Alan Ward on 0268 543600.
- Mid-Somerset Section BKKS.** New members' pond experience. Contact Alan Purnell on 0458 72132.
- South Hants Section BKKS ponds are visited by Chiltern Section.** Contact George Rooney on 0420 473169.
- 20 - **Border Koi Club.** Lanes Library, Carlisle. Contact Amy Fisher on 0228 513623.
- 22 - **Lower Thames-Side Section BKKS visit ponds of South Kent Section BKKS.** Contact Val Radley on 0702 529675.
- London Section BKKS.** Ruskin House, Coombe Road, Croydon, 8 pm. Contact Keith Nind on 081 673 3574.
- 25 - **Northern Koi Club visit PROKOM.** Contact Tony McCann on 061 794 1958.
- 26 - **Essex Section BKKS.** North Stifford Village Hall. Contact Bobbie Barton on 0702 611750 or Margaret Bishop on 0702 522388.
- South East of England Section BKKS.** Monthly meeting. 2.30 pm, Community Centre, Chelmsfield, Kent. Contact Mick Wright on 0634 718943.
- Lea Valley & Harlow Section BKKS.** Visit to members' ponds by Northants Section BKKS. Contact Bary Ford on 0279 419101.
- Northern Koi Club visit Nottingham & District Section ponds.** Contact Tony McCann on 061 794 1958.
- 28 - **East Riding Section BKKS.** 7.30 pm, Grovehill PH, Holme Church Lane, Beverley. Contact Tim Goodyear on 0964 542762.
- Mid-Lines Section BKKS.** West Ashby, Nr Horncastle. Contact Brenda Goodwin on 0522 688631.
- Hull Koi Section BKKS.** Monthly meeting, Telephone Club, Hull. Contact Kevin Davis on 0482 838137.

COMING IN OCTOBER

- 3 - **Worthing & District Section BKKS.** Preston Scout Hall, Bognor Regis, Sussex. Contact Steve Willard on 0243 267893.
- 4 - **North Lines Society.** Koi Competition. 8 pm, Brackenhorough Arms Hotel, Fotherby, Nr Louth. Contact Anne Mawer on 0472 826605.
- Kenet Valley Section BKKS.** 8 pm, Newbury Rugby Club, Pinchington Lane, Newbury, Berks. Contact Bob Thompson on 0734 713640.
- 5 - **New Forest Section BKKS.** Monthly meeting at Tiptoe, Nr Sway. Contact Mrs Chris Middleton on 0425 272732.
- Yorkshire Section BKKS.** The Holme Leas Inn, Oussett, Nr Wakefield. Contact Fred Harston on 0226 722578.
- 6 - **Suffolk & North Essex Section BKKS.** 7.45 pm, Prince of Wales PH, London Road, Marks Tey, Colchester, Essex. Contact Dennis Prou on 0371 856450.
- Leicestershire Koi Society.** Old Aylestone Constitutional Club, Leicester. Contact Ian Oliver on 0533 839707.
- Plymouth & District Section BKKS.** 7.30 pm, The Lynham Inn, Plympton, Plymouth. Contact Trevor Ridley on 0752 690087.

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FOCUS ON: CATFISH

Breeding: Corydoras

Derek Lambert shows you how to go about achieving spawning success with these highly popular and handy 'community cats'.

A female Peppered Catfish (*Corydoras paleatus*) cleans a potential egg-laying site as her mate watches.



REIDA ZUKAL

REIDA ZUKAL



The 'egg pocket' formed by the female's pelvic fins is clearly visible in this photograph.

REIDA ZUKAL



The female uses her 'pocket' to carry eggs to the spawning site.

REIDA ZUKAL



Egg-sticking in progress with the male in close attendance.

Catfish belonging to the genus *Corydoras* have been one of the most popular groups of fish for the aquarium ever since they were first imported. Many millions of them have been sold through the aquarium trade, and even dedicated specialists who work almost exclusively with other groups of fish, find space for a few of these endearing characters.

WIDESPREAD CATS

Corydoras species are distributed throughout South America, from Trinidad to the Argentine. However, it is in the Amazon that they are found in super-abundance. This huge aquatic ecosystem covers approximately 40% of South America and consists of every imaginable habitat, from rivers up to 50 metres in depth, to mountain brooks 5,000 metres above sea level in the Andes of Peru.

Corydoras can be found in much of this ecosystem. Dr Nijssen certainly proved this when he described *Corydoras trinitatis* in 1971 from specimens collected 3,350 metres above sea level in the Rio Vilcanota. These high tributaries often have clear soft water with temperatures which can fall as low as 17°C (c 67°F).

Most species, however, came from conditions similar to those reported by Dr Nijssen for Surinam. In this area, the water temperatures vary from about 22°C (c 72°F) in shaded forest creeks, up to 32°C (90°F) in the open water. The water quality where he found *Corydoras* ranged from a pH of 5.3 to 6.7, i.e. from acidic, to almost (but not quite) neutral. *Corydoras* were not found in lowland areas near the sea which are somewhat brackish in nature. This probably reflects their poor tolerance to salt.

The largest concentrations of species are found in small tributaries and streams varying in depth from 20cm (8in) upstream, to 2m (nearly 6½ft) near their outlet. They are overgrown with land vegetation and usually flowing. The substrate consists of sand partly covered by leaves and submerged trees. Near small rapids, the substrate becomes rocky with gravel, while in deeper pools and near the outlet, mud is often found.

In these conditions, schools of *Corydoras* can be found numbering from several dozen to over a thousand individuals. These schools are made up of several different species which, although they remain in one school, usually form sub-groups within the whole, where individual species will bunch together.



Corydoras adolfoi Burgess, 1982. The dark black markings of Adolfo's Corydoras sets off the lovely bright orangy pink on top of the head. This fish was bred by Dr Joanne Norton of America. The species originally comes from the upper Rio Negro in Brazil, but is now being bred in captivity.

Corydoras can be neatly subdivided into long-snouted species and short-snouted species (the latter make up about 85% of all *Corydoras*). Each school will usually consist of at least one species of the long-snouted type, and it is postulated that these feed on prey which is buried too deeply for the short-snouted species to reach.

AQUARIUM CARE

In the aquarium, Coeys tolerate a wide range of conditions and make the ideal 'clean-up crew' for a mixed community tank, spending most of their time searching through the gravel for food which has been missed by the other fish in the tank.

Despite serving such a useful function, *Corydoras* still need food placed in the aquarium specifically for them. There are several brands of pellet or tablet foods which are designed to sink when placed in the water. These serve well as a basic food but additional feeds of live or frozen foods will bring your fish into the peak of condition.

Barbel Problems

The gravel in a tank which contains *Corydoras* must be of the rounded 'Pea' type. This is because sharp gravel may damage the delicate barbels of these fish and allow them to become infected. Other causes of this common health problem are wide fluctuations in the pH, brought about by large water changes with water of a dissimilar nature.

This can be prevented by checking the pH of your tapwater before you do a water change and, if the pH is more than 0.5 of a degree different, then limit the water change to only 10%, but step up the frequency of your changes. The barbels regenerate of their own accord, given enough time, but regular doses of an antibacterial treatment may speed recovery.

BREEDING

If you are planning to breed your fish, it is wise to set up a tank specifically for the purpose. This should be bare-bottomed and contain plants such as wide-leaved *Cryptocorynes* or *Echinodorus* (Amazon Sword Plant) grown in pots, and a clump of Java

Moss. Wool mops placed on the bottom and hanging from the surface at the side of the aquarium, also make useful additions.

A corner sponge type filter should also be added. To start with, the water should have the same pH and hardness as that used in the main aquarium and be maintained at a temperature of between 72-79°F (22-26°C).

Once the aquarium has been set up and running for a week, the fish can be added. If you are buying fish from an aquarium shop, it is best to buy a group of about 6 to 8 young fish and grow them on yourself.

Sexing

This solves the problem of trying to sex newly imported fish which can be thin, with little discernible difference in body shape between males and females. Even if you can be sure of their sex, buy at least two pairs or, better still, two trios (two males to each female), since these fish like to spawn in a group.

Sexing *Corydoras* in good condition is usually not a problem. Females have a plumper, deeper body than males. The finnage of males is normally a little longer and more pointed; this is particularly noticeable on the pelvic fins.

Several species have more obvious sex differences, such as the cheek bristles of male *Corydoras barbatus*, or the reticulated colour pattern of male *Corydoras lanus*. However, both these differences only develop when the fish are fully mature and, in the case of *Corydoras lanus*, are only present when the fish is in good condition...

Conditioning

Once you have your fish installed in the breeding aquarium (newly purchased stock should have been quarantined for at least two weeks before they are placed in the breeding tank) the conditioning process can start.

Basically, this involves feeding the fish as much live food as possible. Grindal worms, white worms, bloodworms and *Tubifex* are suitable, as are finely chopped earthworms. Live *Daphnia* makes a useful addition. When no live food is available any of the frozen foods can be used. Ideally, try to ensure your fish have live food in front of them all the time during this period, and check regularly to see if they have spawned.

This can be a frustrating time, as some species will only breed at certain times of the year. Dr Nijssen reports that, in the Surinam, *Corydoras* probably spawn in April and May, which is the beginning of the long rainy season. During this period, the rivers will be running higher and more suitable breeding places will be available between the submerged plants found along the banks of creeks. Also, the additional rainwater will wash more food into the streams for the fry to eat.

Spawn-inducing Tricks

Some fish, particularly wild-caught specimens, will be on this yearly breeding cycle and, despite creating the perfect conditions, will not breed until the correct time of the year. Some can be fooled into thinking that time has arrived by topping the aquarium up with cooler water to create the illusion of heavy rainfall in the wild.



Corydoras habrosus Weitzman, 1960, the Dainty Corydoras, is one of the pygmy species which only attains 2.5cm (c 1in) for males and 3cm (1.4in) for females. The females of this species become very fat prior to spawning. This species is found in Venezuela and Colombia, where some variation is found between different populations.



DEREK LAMBOURNE

Others, particularly those species which have been bred for several generations in captivity, will breed at almost anytime, providing the conditions are right and the fish have been well fed.

If your fish refuse to spawn, it could be because the water is too hard and alkaline. Tapwater is often hard and alkaline and, while many species will breed quite happily in it, many will not. If, after a month of good feeding and a couple of cool water treatments your fish have not spawned, try lowering the pH and hardness.

This can be done with various chemicals available from your aquarium shop or, better still, by adding rainwater to the tank. This should be collected from the gutter down-pipe from a clean tile or slate roof and filtered through filter floss and activated carbon. Siphon off 10-15% of the aquarium water as though you are doing a normal water change and top up with the rainwater which is about 10°F (c 5.5°C) cooler than the tank water.

This will, hopefully, stimulate your fish to breed. If not, repeat it on a weekly basis for a few weeks. If, after all of this, your fish have not spawned, you may well have to wait until the correct time of the year.

Spawning Patterns

It is a common misconception within the hobby that all *Corydoras* breed in the same way. While the general method is the same, each species will choose different spawning sites and produce different numbers of eggs, laid, either in clumps, or singly. Some species will eat the eggs and others will not.

Corydoras sterbai Knaak, 1962. Sterba's *Corydoras* looks very similar to two other *Corydoras* species. *C. haraldschultzi* and *C. araguaiaensis*, but in both these species the head coloration is black spots on a white background, while in Sterba's *Corydoras*, it is white spots on a black background. The natural range of this species is in Brazil, but it is now being bred in the aquarium trade.

Some species will eat the newly hatched fry and others will not. Even different pairs within the same species may not do exactly the same thing.

The following is a rather generalised account of how *Corydoras* spawn.

Courtship usually starts with the males chasing the females around the tank. They often move in front of the females and display to them. The male will then rub his barbels over the female and occasionally nudge her. If the female is interested she will respond by nudging the male and sometimes cleaning various potential spawning sites around the aquarium.

During actual mating, the female will nudge the vent of the male (which will be sideways on to the female) and take sperm into her mouth while releasing several eggs into a pouch made by her pelvic fins. The sperm is then either blown towards the pouch by the action of the gills or else plastered over the spawning site before the

Corydoras latius Pearson, 1924. The Broad *Corydoras* comes from the Rio Beni Basin in Bolivia. This is a male in good condition, showing the reticulated breeding pattern.



DEREK LAMBOURNE

female pushes the eggs onto it.

Once the fish have finished spawning, they should be removed and the eggs left to develop. After three or four days, these should hatch. They do, however, sometimes fail. This may be due to a number of reasons, but the commonest is that the water may be too alkaline. This causes the shells to calcify and the fry become trapped in a shell which is too hard for them to break through. Dropping the pH will solve this problem.

Assuming the eggs do hatch, the fry will become free-swimming in about two days. At this stage, most species will be able to take newly hatched brine shrimp and micro-worms. This can be followed by Grindal worms and prepared foods. Fine powdered foods with a high protein content can be fed as a first food, but the best growth rates are achieved on a diet of live foods. On such a diet, most species grow very quickly in the initial stages and can reach 1cm (0.4in) long in under a month.

NEW BOOK

Later this year a new book on *Corydoras* Catfish is to be published by Blandford Press. This has been written by Derek Lambourne (President of the Catfish Association of Great Britain), and gives in-depth details of how to spawn many of the *Corydoras* in the hobby today. Having read the manuscript, I can heartily recommend this book to any potential catfish breeder. Watch out for it.

ADP

HANDY CORY TIPS

- 1 *Corydoras* catfish live in mixed species shoals in the wild and prefer to live in a group in the aquarium.
- 2 *Corydoras* are tolerant of a wide range of conditions but have a poor tolerance of salt.
- 3 The gravel in a tank which contains *Corydoras* must be of the rounded 'Pea' type. This is because sharp gravel may damage the barbels and allow them to become infected.
- 4 When attempting to breed *Corydoras* buy at least two pairs, or better still, two trios (two males to each female) since these fish like to spawn in a group.
- 5 Newly-imported *Corydoras* can be difficult to sex because they are often in poor condition and the plumper body of the female is not readily visible.
- 6 Condition your breeding stock properly with lots of live foods to encourage them to breed.

Reference

Nijssen, H (1970). Revision of the Surinam Catfishes of the Genus *Corydoras* Lacépède, 1803 (Pisces, Siluriformes, Callichthyidae). *Beaufortia*, 18.

The Pygmy Sunfishes were considered members of the Centrarchidae by most authors for many years. Today, the consensus is to place them in their own family, the Elasmomatidae. Characteristics of the family include a rounded tail fin, no lateral line, and a minute size seldom exceeding an inch and a quarter (some 3-2cm) in total length. The top of the head is usually unscaled. Otherwise, Pygmy Sunfishes are similar in structure to the Sunfishes of the family Centrarchidae.

Male Pygmy Sunfishes typically resemble *Basileichthys* (Chameleon Fish) or the Killifish *Cynolebias nigripinnis* in size, in their colour pattern of iridescent spots on a black background, and in having larger fins than the pale brownish females.

SPECIES

Most species of Pygmy Sunfish are limited to the southeastern United States, with one extending into the midwest. There is just one genus, *Elasmoma*, no subgenera, no species groups, and six species.



PYGMY SUNFISH SPECIES	
Scientific Name	Common Name
<i>Elasmoma boehlkei</i>	Carolina Pygmy Sunfish
<i>Elasmoma evergladesi</i>	Everglades Pygmy Sunfish
<i>Elasmoma okatie</i>	Bluebarred Pygmy Sunfish
<i>Elasmoma okfenokee</i>	Okfenokee Pygmy Sunfish
<i>Elasmoma sp.</i>	Spring Pygmy Sunfish
<i>Elasmoma zonatum</i>	Banded Pygmy Sunfish

THE PYGMY

Dr Robert Goldstein profiles all six species in this delightful family of tiny, colourful coldwater fish.

Photographs by Fred C. Rohde

Carolina Pygmy Sunfish

The male Carolina Pygmy Sunfish, *Elasmoma boehlkei*, has black fins and about 13 thin black bars alternating with an equal number of thin brilliant blue-green vertical lines on the sides. It is limited to a few counties of the Coastal Plain in the Waccamaw River drainage of southern Carolina and the Santee River drainage of northern South Carolina, in darkly stained, slow-moving, acidic (pH 4.0-6.1), moderately deep, blackwater creeks and old rice fields. The bottom sediments consist of mud over sand, with much plant debris.

The fish occurs along the edges of creeks with emergent and submerge aquatic vegetation, including *Myriophyllum*, *Egeria*, algae and bank roots. Its associates include Grass Shrimp, Everglades and Banded Pygmy Sunfishes, Redfin Pickerel, Pirate Perch, Blackbanded, Bluespotted, and Banded Sunfish (*Etheostichus*), Warmouth, Flier, Mud Sunfish, Spotted Sunfish, Pumpkinseed, Bowfin, Longnose Gar, American Eel, Golden Shiner, Yellow Bullhead, Chubsucker, Mosquitofish, Least Killifish, Eastern Mudminnow, Swampfish, Lined Killifish, and Swamp and Sawcheck Darters.

Following instructions from F.C. (Fritz) Rohde, who described this fish, a group of us from the Raleigh Aquarium Society seined and dip-netted a site on Juniper Creek in Brunswick County, North Carolina, collecting large numbers of Carolina Pygmy

Sunfish, two Blackbanded Sunfish, and two Bluespotted Sunfish from the vegetation.

During a second trip during a drought, we found the water two feet (60cm) below normal, with little submerged vegetation remaining. We failed to collect Pygmy or Blackbanded Sunfish, the yield consisting mostly of Redfin Pickerel, Pirate Perch, and darters.

Our fish were bagged with oxygen and Hypno (a tranquiliser), and a small amount of seawater mixed with the collecting water to prevent skin irritation. During a second trip, we substituted a commercial water conditioner/dechlorinator/stress reducer for the seawater, but it failed to prevent skin irritation, and we lost most of the catch.

Aquarium Care

One gallon (US) wide-mouth jars (3-8l) make ideal aquaria for a pair or a trio. Two-gallon containers (7-6l) can accommodate four to six fish. The aquarium is filled with dechlorinated tapwater at neutral pH, half or more filled with *Nitella* or Java moss, placed near a window for natural daylight, and provided with gentle aeration. I feed live foods only, including Brine Shrimp (*Artemia*) nauplii, mosquito larvae, and *Daphnia magna* or *D. pulex*.

Todd Wenzel, an excellent local aquarist, found that the number of females is proportional to the number of fry produced during the spring-early summer breeding season,

indicating little or no cannibalism. To be safe, when fry appear in the breeding jar, I remove the parents to another container for continued breeding, and raise the fry on *Artemia* nauplii and *Daphnia*. The young reach about a half inch (1.3cm) at two to three months of age, and will breed at one year.

The Carolina Pygmy Sunfish cannot tolerate degraded water quality (high ammonia and nitrites, low dissolved oxygen) from dead *Artemia* or daphniae, or associated with the growth of blue-green algae, and will quickly succumb to bacterial infection, indicated by massive swelling, pale color and failure to feed. Death rapidly follows the appearance of symptoms. Frequent, massive (at least 30%) water changes with chlorinated tapwater helps maintain good aquarium water quality, but overfeeding these light eaters poses a high risk.

Everglades Pygmy Sunfish

The male Everglades Pygmy Sunfish has black fins, with or without a few brown dots, a blotched body pattern, no black mark on the shoulder, and a black, brown, or dark green body sprinkled with brassy to blue-green iridescent scales, lightly to densely scattered and not forming lines. Two light blotches occur on the root of the caudal fin.

A very variably patterned fish, depending on locality, I found that specimens taken with *E. boehlkei* were very subdued in color-



SUNFISH REVIEW



Top left, a splendid Carolina Pygmy Sunfish male (*E. boehlkei*).

Top centre left, the dark colours of the Everglades Pygmy Sunfish (*E. evergladesi*) show up well on the white gravel of their aquarium.

Top centre right, the dark bars on the body of the Bluebarred Pygmy Sunfish (*E. okatiei*) are much wider than those of the Carolina species.

Top right, the blue bars of this Okefenokee Pygmy Sunfish male (*E. okefenokee*), while being resplendent, are quite narrow.

Above, in Spring Pygmy Sunfish (*E. sp.*), the dorsal fin carries a transparent 'window' near the top back edge and a dark blotch.

ation compared with specimens from northern Florida. This is the only Pygmy Sunfish with scales on the top of the head, readily seen with a microscope.

It occurs along the Coastal Plain from southern North Carolina in the Wilmington (Cape Fear) region southward to about Lake Okeechobee, Florida, and westward to the Mobile area of western Alabama, usually less than a hundred miles (160 km) inland from the Atlantic or Gulf coasts.

This species inhabits densely vegetated shallow margins of rivers, ponds, lakes, roadside ditches, springs and sinkholes over mud, sand or limestone bottoms, often among woody debris, algae and the pinkish roots of terrestrial vegetation. In lakes, it occurs among the roots of floating Water Hyacinth, Water Lettuce and other plants growing from or to the surface.

Associates include Grass Shrimp, Pirate Perch, Bluegill, Largemouth Bass, Warmouth, Flier, Mud Sunfish, Spotted Sunfish, Pumpkinseed, other Pygmy Sunfishes, Bowfin, Longnose Gar, American Eel, Golden Shiner, several kinds of Catfishes, Mosquitofish, Least Killifish, Eastern Mudminnow, Swampfish, Lined Killifish, Swamp Darter and Sawbeck Darter.

Any densely vegetated shallow habitat, from quiet forest streams, to river backwaters, to large lakes, may hold the Everglades Pygmy Sunfish. A dipnet is sufficient, but seines will collect more individuals much faster. I often collected this fish in northern Florida from pink tree rootlets at the edge of a sinkhole in a dense national forest, and in North Carolina from shallow streams near Interstate Highway 95.

Aquarium care

A gallon jar (3-8l) is sufficient for a pair or trio. Males establish territories close to a central food source; when food is evenly distributed, they don't establish territories.

For breeding, I set these fish up exactly as for the Carolina Pygmy Sunfish, using dechlorinated tapwater, *Nitella*, Java Moss, *Myriophyllum* or *Cobomba*, and set the container near a window for natural daylight, with gentle aeration, and feed *Artemia* nauplii, mosquito larvae and daphniae.

Pond or Ramshorn Snails are added primarily to consume dead *Artemia* nauplii, protecting water quality.

Additionally, the baby snails are important Pygmy Sunfish food. In nature, the fish eats copepods, cladocerans, snails, bloodworms, amphipods and insect larvae. In aquaria, it might eat some of its own fry if not supplied with abundant live invertebrates. Remove the parents to another container when fry are first noted in the breeding aquarium.

Don't mix Pygmy Sunfish species together, as the females, in particular, are difficult to identify. Water changes are the key to good health. Do not attempt to duplicate stagnant or blackwater conditions, which are unnecessary and risk rapid pH drops and ammonia build-up, in addition to excessive bacterial growth.

Bluebarred Pygmy Sunfish

The male Bluebarred Pygmy Sunfish has eleven dark bars, three times as wide as the intervening lines of bright blue-green iride-

scent scales. The blue bars extend from top to bottom in all specimens. Males usually have a bright spot on the low front edge of the eye.

This species differs from the Carolina Pygmy Sunfish which has narrower dark bars and often incomplete blue-green lines, and differs from the Banded Pygmy Sunfish which has a dark shoulder mark.

The Bluebarred Pygmy Sunfish is only known from Bamberg, Allendale and Jasper Counties in the New, Savannah and Edisto River drainages of southern South Carolina. It occurs here in densely vegetated roadside ditches, drainage ditches, ponds, and the backwaters of creeks and rivers, in darkly stained water, with a substratum of mud, sand and plant debris.

Stream vegetation includes *Myriophyllum* (Milfoil), *Ceratophyllum* (Hornwort), *Utricularia* (Bladderwort), *Lemna* (Duckweed), *Potamogeton*, *Nymphaea*, *Najas* (Water Lilies), *Brasenia*, and *Juncus* (rushes), *Carex* (sedges) and Poaceae (grasses). Streamside vegetation includes Red Maple, Wax Myrtle, Loblolly Pine, Yellow Tulip Trees, Gum Water Oak, Willow Oak, Rive Birch, Swamp Willow and other wetland trees.

Temperature and pH measurements from the literature range from pH 4.5 to 7.5 and 10°C to 32°C (50-89.5°F).

Associates include Banded and Everglades Pygmy Sunfishes, Banded, Bluespotted and Blackbanded Sunfishes, Bluegill, Dollar Sunfish, Redbreast, Largemouth Bass, Warmouth, Flier, Mud Sunfish, Black Crappie, Spotted Sunfish, Pumpkinseed, Longnose Gar, Swampfish, Chubsucker, Brook Silverside, Golden and Taillight Shiners, Brown Bullhead, Mosquitofish, Least Killifish, Eastern Mudminnow, Lined Killifish, Goldenear Topminnow and Swamp and Sawcheek Darters.

Aquarium Care

Aquarium care should be as for the other Pygmy Sunfishes. To date, no stomach analyses have been performed, but this fish probably feeds on small invertebrates, as do its relatives.

Both the Bluebarred and Carolina Pygmy Sunfishes are very locally distributed and susceptible to extinction from pollution or introductions. Aquarists maintaining broodstock in aquaria can provide a supply for reintroduction, should one of the few natural habitats be destroyed or damaged.

Okefenokee Pygmy Sunfish

The single distinctive character in both sexes is a depigmented central portion of the lower lip, not visible from the side. Otherwise, the male is black with scattered iridescent blue speckles tending to form weak lines.

The fish occurs throughout the Coastal Plain from the lower Altamaha River basin in Southern Georgia and the Florida panhandle to Fort Pierce (Hillsborough River drainage) and Tampa Bay on the Florida peninsula.

The first specimens were collected from



The largest (relatively speaking!) member of the genus is the Banded Pygmy Sunfish (*E. zonatum*). The specimen shown is an impressive fully grown dark-bodied male.

Kettle Creek, a tributary of the Satilla River near Waycross Georgia, near the northern edge of the Okefenokee Swamp in 1956. The site was an open ditch at a culvert where the natural streamside vegetation had been removed and the grass grew to the edge. The bottom was sand and silt, leaves, roots, and woody debris. The black water had a pH of 5 to 6. In other locations, it was found with the tiny killifish, *Lepidogobius ommata*, in soft, acid water among rootlets and plants overhanging deep clean water, rather than at the edges.

The adults select algal masses for breeding in densely vegetated pond and lake edges, ditches, sinkholes and backwaters. They occur in clear or stained water, over a substratum of mud and silt, among a great variety of submerse, emerse and floating vegetation, and among the bank roots of riparian (streamside) vegetation extending into the water.

Aquarium Care

Feed live foods and maintain snails for cleanliness and a food source. Breeding is easy, using a gallon jar and removing the parents after fry are seen.

Spring Pygmy Sunfish

Both sexes of the Spring Pygmy Sunfish have five or six block-shaped, very wide brown to black bars, interrupted by very thin brassy lines. The rear of the male's dorsal fin has a clear area (a window) and a dark blotch.

This fish was previously known from three densely vegetated springs and spring-fed pools from Lauderdale and Limestone Counties in the Tennessee River drainage of northern Alabama. Today, two of those populations have been eliminated. The Spring Pygmy Sunfish was therefore recommended for protection under the Endangered Species Act.

Do not attempt to collect this species before determining its federal protection status from the US Fish & Wildlife Service, and its state protected status from the Alabama Department of Fish and Game.

Aquarium Care

If it becomes available, the Spring Pygmy Sunfish should be kept and bred as described for other species of Pygmy Sunfishes. Its natural habitat, however, is spring-fed pools, indicating an exceptional intolerance of

even minute levels of pollution.

It will be important to feed only live foods and maintain abundant snails in the water. Springs tend to have hard (calcareous) water and neutral to alkaline pH.

Banded Pygmy Sunfish

One or more prominent, dark shoulder marks on the side behind the gill cover and under or just in front of the dorsal fin, identify this fish. Nine wide, dark bars are interrupted by green or brassy lines of iridescent scales, and there is another brassy mark under the eye. Generally an olive green, dark banded fish with many black speckles around and under the head, it has pretty green iridescent scales on a blacker body in the breeding male. It is our largest Pygmy Sunfish at one and a half inches (c. 3-8cm).

It is also the most widely distributed, ranging from the Piedmont and Coastal Plain of northern North Carolina to eastern Texas, and northward along the Mississippi River valley to southeast Missouri, southern Illinois, western West Virginia, western Tennessee, eastern Arkansas, southern Georgia, southern Alabama and all of Mississippi and Louisiana.

This fish inhabits vegetated edges of lowland river backwaters, creeks, pools, ponds, lakes and ditches, over muddy, mud-sand, sand (in springs), or detritus-covered bottoms. Even in springs, the Banded Pygmy Sunfish occupies dense vegetation, including *Ludwigia*, *Najas* and *Najas*. On the Atlantic seaboard, it often occurs with other species of *Elassoma*.

Stomach analyses have yielded rotifers, amphipods, daphniae and other crustaceans, and midge larvae (bloodworms).

Aquarium Care

A gallon jar is sufficient for a pair, but slightly larger quarters will accommodate additional females. Maintain dense vegetation, daylight or artificial light, and aeration with a sponge filter. Water quality is critical, and the bottom should be siphoned during frequent, massive water changes.

Daphnia is the preferred natural food of the Banded Pygmy Sunfish, but should be supplemented with mosquito larvae, bloodworms or other live insects or crustaceans. Easily bred, the adults should be moved when fry are observed in the breeding container.

TOMORROW'S AQUARIST...

By Gina Sandford



MIKE SANDFORD

Mating Damselflies. Note the folded wings (see text for details).

DRAGONS AND DAMSELS

In the summer, parents have an annoying habit of taking you out on picnics and walks to the most mundane places and expecting you to amuse yourself — quietly! Well, this is not such a problem, as long as there is a pond or stream in the vicinity.

Watch out for Dragonflies. These beautiful insects patrol the margins of the pond or stream within which there are certain vantage points where they rest, their wings held out at right angles to the body. If you are lucky, you will witness a female depositing her eggs below the water line.

Often confused with Dragonflies are the smaller, more delicate, Damselflies. It is easy to tell the difference between the two as Damselflies rest with their wings folded along their bodies.

With both these insects, the larvae are aquatic and climb up stems of reeds or other tall water plants when they are about to emerge as adults. To watch the nymphs (young) split and the adult fly emerge, rest, expand and dry its wings and finally fly off is riveting.

There are plenty of books from your local library to help with identification, so have fun watching the bugs. Oh yes, and when your parents complain about the number of midges and gnats that are annoying them, you can confound them with science and explain all about the aquatic stages of their development!

PROLIFIC KILLIES

I recently required some photos of Killifish, *Aphyosemion* species to be precise, and, searching through Mike's pics, discovered that they were few and far between. What makes me think that Killies are not his favourite fish?

Desperate measures were needed. I scoured the local, and not so local, aquatic establishments to no avail. It just happened that we were going to Syon Park for the FBAS/A & P Show, Fishworld '93, the following weekend and, lo and behold, while chatting to friends on the stand of the West London branch of the British Killifish Association, I noticed a lone male Lyretail Killie (*A. australe*), chocolate form.

It also transpired that they had a beautiful pair of *A. australe*, the gold form, for sale. I paid the money.

It is now several weeks later and Mike has taken the pics. The fish are installed in their own tank with some plants and a spawning mop. They are quite prolific. Two days after the Syon Park show, there were eggs on the mop and the adults have been spawning ever since.

'POOLING' BREEDERS

Think about it. How often can you buy a pair of fish that are in such good condition that they spawn for you within days of the purchase?

Rarely. Yet, there are hobbyists up and down the country who are breeding

quality characins, cichlids, catfish, killies, livebearers and even marines, sometimes in large numbers and, at other times, in very low numbers, but sufficient to form the basis of a captive population.

In order to breed some of the rarer species, it is not unknown for individuals to pool their resources. For example, if one person has two specimens of a fish and a colleague has the same, then the four fish are brought together for possible breeding. There are times when I get a call from someone trying to find a male fish to go with their females, or vice versa.

Money doesn't enter into

the equation; it's just one hobbyist helping out the other, with the result that each of them is playing their own small part in conservation of what may become an extinct species in the wild.

So what part can you play in this? You can report any breeding successes, or failures, that you have. Drop me a line with the details and, maybe, the exchange of information with other aquarists will result in more species being bred.

It can be any fish whatsoever, from Guppies, where the challenge is not usually breeding them but to raise the fry to a reasonable size — to Chocolate Gouramis.

Our latest acquisition: a brilliant and highly prolific Lyretail Killie.



MIKE SANDFORD

T.A. TIPS

1 Try propagating some of your plants. The various species of *Bacopa* and *Hygrophila* can be layered. This is the same technique that gardeners use, and consists of bending the stem down until it is lying on the substrate. Anchor it there with hair pins or similar, and leave it alone.

Roots will grow from the leaf joints and shoots will appear. Once the shoots are long enough, they can be removed and planted as cuttings.

2 Look for floating rafts of mosquito eggs. These look like small pieces of dead leaf but, if viewed under a magnifying lens, you can see the eggs. They float on the water surface and are easy

to collect. Place them in your fish tanks and, as the larvae hatch, they make excellent food, particularly for young, growing fish.

3 Water finds its own level, so if you use external power filters, make sure the intake pipes do not reach the base of the aquarium but stop about 5-8cm short of the gravel.

Then, should the worst happen — as it did in my fish house last week when the wood supporting my large bucket Eheim finally rotted through and sent the filter toppling sideways — and the water siphons out of the tank, there will be a few inches left in the aquarium to keep the fish alive.

What's your opinion?

By Billy Whiteside,
BA, ACP

Following the IRA bombing of the City of London in April, I was fascinated to read a story about a junior partner in a law firm risking his life soon after the bombing to attempt to save his secretary's two goldfish. Of one there was no sign, but the other was found alive in a pool of water on the floor and was rescued.

Years ago a friend found his large goldfish on the kitchen floor, in a state of desiccation, after it had jumped out of its aquarium. He administered two drops of brandy into its open mouth in an attempt to revive it. It didn't work — but perhaps the fish died happy!

My latest purchase is a lovely, young Pearlscale Oranda which has joined my other coldwater fish in their aquarium. It cost me £3.50 and it's a cute, fat article with a lot of apparent character — although not as outrageous as my late Bubble-Eye.

OPEN SHOW PRIZES

Steve Jones is a member of Scarborough & District Aquarist Society and he responded to my recent comments about Open Shows and the lack of trophies. Steve wrote: "We at Scarborough & District Aquarist Society have, for the past few years, given pottery as first, second and third prizes at our Open Show. We found that winners wanted something different from the normal run-of-the-mill trophy, so we decided that we would give plates depicting scenes of Scarborough.

"A lot of the exhibitors are men, and when given trophies that gather dust, it's the wives who usually have to do the cleaning. So, why not give something that they can also enjoy? I have personally been to a lot of Open Shows in the past few years and have found that many perpetual trophies were left behind by the winners. We also give any donations that we receive from manufacturers away with the prizes where possible.

"It is becoming increasingly difficult for societies to give something different that is within the price range of the

said societies, but at Scarborough, we will continue to do our best."

COMMUNITY DISCUS

When I was younger, and on holiday in London, I used to seek out Discus breeders and, on my last morning in town, buy a pair of not-too-expensive young Discus and bring them home on the plane to Northern Ireland with me later that day. The last baby Discus I saw were bred by a friend — professional aquarist Desi Bryans, who lives in County Down.

Andy Muir's home is at 253 Claymore Path, Glenrothes, Fife, Scotland, and his topic is Discus.

He writes: "The breeding of Discus in a community tank is, in all probability, rare. The rearing of the said same fry in the same tank is virtually nil. Well, I've knocked that myth right out of the window. To cut a long story short, I've kept tropicals for over 20 years, with the usual variety of species; but in the past five

years I have been keeping and breeding two particular types: Dwarf Cichlids and Anabantoids.

"I have a small fish house which contains 36 tanks, in which I have 16 species of Dwarf Cichlids, and ten species of Anabantoids. I also have a 6ft x 18in x 18in Amazon display tank at home, containing two dozen Cardinals, a dozen Emperors, a pair of *Apistogramma agassizi* with fry, a pair of *Apistogramma nyanza*, a pair of *A. trifasciata*, a single *Peckoltia pulcher* cat and, finally, a *Peckoltia vittata*.

"The only decoration is made up of extensive bogwood and very heavy floating Indian Fern. Lighting is from two 4ft Triton fluorescent tubes, and the temperature is 87°F (30.5°C). Filtration is provided by two Marathon 700 external filters which pass through two trickle filters; 25% of the water is changed twice per week.

"At the beginning of the year, I purchased two Cobalt Discus, purely to add to the display; but the following month, a good friend offered

me three large Turquoise Discus. Incidentally, Billy, I use only live food and supply my fish with six varieties of 'bugs'.

"On 22 March 1993, to my surprise, a Cobalt and a Turquoise Discus had decided to pair up and spawn. When I finally noticed the spawning, the fry had already hatched; there were 62. The parents had decided to move them to the uplift pipe of the external filter.

"During this time the pair were acting in true cichlid fashion by completely herding the rest of the tank inmates into approximately 2ft of tank space — with the exception of a pair of *A. agassizi*, with their fry, which the Discus did not seem to consider a source of possible bother.

"The main problem for me was the fry being placed on the uplift pipe of the external filter. To my dismay, about 40 were lost by being sucked up. Thankfully, the parents moved them again; and, to my joy, 19 fry are thriving with the parents to date.

"At the time of writing, the pair have decided to spawn again, and being a believer in letting nature take its course, I will not try to separate them after what happened with the first spawning.

"Well, nature has certainly worked positively for me. Those who maintain that Discus are shy and reclusive have certainly been proved wrong on this occasion. To see the parents holding 4ft of tank space solely for themselves is truly a sight to behold.

"Have I just been lucky? To be honest, Billy, I don't think so. You don't get luck coming in threes, especially with Discus. It's amazing to get such a good, matched pair as this, that care for their young in such extremes and defend them in such a way. What do other readers think?"

[Well done, Andy! B.W.]

I hope you like this month's photographs. I've just concluded that my new camera is sporting several faults and have returned it to the British headquarters in England. Perhaps there's more to go wrong with very complex technology!



Young Discus which I bought in London about 20 years ago... long since dead and gone, of course.

Discus kept in a mixed aquarium by Michael Dingwell, major prize winner at this year's Bangor show (See WYO? — July '93).



FOCUS ON: CATFISH

AIRSAC WITH A STING



The Airsac Catfish takes food mainly (but not exclusively) from the substrate, frequently burying its head completely.



The slender body and short dorsal fin are diagnostic features of *H. fossilis* c.f. *Clarias* sp.



Note the forward-facing barbels and terminal mouth indicative of a predatory nature.

Call it what you will, the Airsac, Liver, Fossil or Stinging Catfish, should always be handled with care, as Dr David Tipping explains.

Photographs by the author

I was recently surprised to find three *Heteropneustes fossilis* for sale in an aquarium shop under the name of Liver Catfish! Were this just a *Clarias*-type catfish with no other special attributes, this would have been unnoteworthy. However, this particular catfish is renowned for another characteristic, reflected in another common name: Stinging Catfish. This is because the pectoral ('chest') spines carry a venom. Descriptions of the strength of the venom vary, but there are recorded cases of human fatalities.

DISTINGUISHING FEATURES

Since the Airsac Catfish (yet another common name) is rarely seen, there is a good chance of an unsuspecting person buying it as a case of "mistaken identity". This species appears very similar to *Clarias* species (the so-called Walking Catfish), with the main visible difference being a much shorter dorsal fin and more slender body. The coloration varies, but is typically a dark brown with longitudinal yellow stripes of varying intensity, but which are particularly prominent in males.

Adults attain a size of about 12in (30cm), although specimens twice as large as this have been recorded.

The Airsac Catfish derives its name from its ability to breathe air and to store it in airsacs inside its body. This allows it to

survive in oxygen-depleted water in its native Asia. This fish is an accomplished jumper, so a tight-fitting aquarium lid is essential.

AQUARIUM NEEDS

The species seems unfussy with respect to water quality or temperature and accepts with relish most dried and frozen foods. Airsac Catfish eat until they become well and truly bloated, another feature reminiscent of *Clarias* catfishes. Note that the four pairs of forward-facing barbels belie the predatory nature of this species to fishes small enough to consume. Airsac Catfish often venture from their hideaways to forage during the day, and swim with a pleasing eel-like motion.

They are very social, at least when small, and are best kept in an aquarium with a sandy bottom, since this is the closest condition to the muddy waterways which it inhabits in the wild. Sand also allows the fish to engage in its passion for burying its head in the substrate while feeding.

Breeding

'Airsacs' spawn in captivity, and much scientific work has been performed on them, especially in India. Fishes mature at about 7-8in (c 18-20cm). However, females will only produce eggs at temperatures between 25-29°C (78-84°F). This species does not

initiate breeding if exposed to temperatures below 25°C and ceases to breed if exposed to temperatures greater than 29°C.

Therefore, the breeding season does not occur all the year round, but for about four months in the spring/summer. The temperatures at which these fishes are reproductively active coincide with the occurrence of the monsoon season.

The parents spawn in depressions in the substrate and guard the eggs until they hatch. At this time, they are outwardly aggressive. This pugnacity may explain the reported attacks on humans without apparent provocation.

DANGEROUS STING

A sting from one of these catfishes injects a painful venom, which must be treated promptly. The best immediate course of action is to attempt to destroy the venom by immersion of the affected part of the body in water as hot as can be withstood without scalding. Thereafter, professional medical attention should be sought. It has been reported that even small specimens carry the venom.

Unfortunately, the relative obscurity of the Airsac Catfish means that these fishes may be sold without a health warning.

There are, mercifully, few venomous species for sale in the high street, but aquarists should be aware of those fishes which are potentially harmful and be able to recognise them, especially those like the Airsac Catfish, with many common names. This particular species is best avoided by inexperienced fishkeepers, or anyone who does not have a specific interest in it. The closely related *Clarias* species makes a very similar (and safer) alternative. DAF

Trade Talk . . .

Accolade for Dillon at Swallow

Top student Dillon Priest could be the envy of most graduates passing out this summer. Not only has he graduated as "Student of the Year" at Sparsholt College, but he has also landed the job of his dreams — keeping fish at Swallow Aquatics at East Harling, Norfolk.

Dillon describes himself as a "fish fanatic", and first went to Swallow Aquatics on placement from Sparsholt College, Hampshire.



Sparsholt College "Student of the Year" Dillon Priest, the latest recruit in a succession of highly-qualified staff at Swallow Aquatics.

"I was planning to go to art college but, with my interest in fish, I joined Sparsholt in 1991 instead," explained Dillon. "I have kept fish all my life and, through my hobby, I got in touch with Keith Davenport, who was then a lecturer at Sparsholt. He arranged an interview and I was offered a place."

He continued: "The two-year course is tremendously interesting and varied, and the subsequent placement with Swallow Aquatics is a great opportunity; they have an excellent team and could not have been more friendly."

"At East Harling I am running and controlling the tropical fish department, which is quite a responsibility. I am particularly interested in cichlids which I am breeding here, including my particular favourites, the African Rift Valley species."

Dillon is in good company at Swallow Aquatics; there are also two other former "Students of the Year" from Sparsholt, as well as several National Diploma and National Certificate holders among the staff.

Barraclough Goes Space-Age

Space-age technology has enabled the keeping time of

'live' fish food to be extended from around two days to up to six weeks, according to Barraclough Fish and Aquarium Supplies.

Mike Cole, sales manager of the Bradford-based company, sole importers of food processed using this technology, explained, "Space-age technology is being applied to the simple world of live foods for ornamental fish feeding and should bring benefits to millions of fishkeepers, as well as fishermen who use the foods for live bait."

"Live food has always been much in demand for keeping fish in the home aquarium, but the main drawback has been in keeping it alive for any length of time. The newly-applied technology has extended this keeping time, and thus provides advantages for the trade and the distribution chain, in that stocks can be held over a much longer period. All that is required to keep the food alive is simply to keep it cool and away from strong light."

The live food is available in single-feed sachets containing generous portions, with *Tubifex*, glassworm, and two sizes of bloodworm, available at around 50p per sachet.

For information, contact Mike Cole, Sales Manager, Barraclough Fish and Aquarium Supplies, Hayfield Mills, Haycliffe Lane, Bradford BD5 9ET. Tel: 0274 576241.

Move for Fishes Galore

St Ives-based Fishes Galore has put fifteen years' experience in the aquatic industry into constructing a purpose-

designed unit at a new premises within a garden centre.

Filtration systems have been installed by Aquarium Life Support Systems using the latest trickle filtration units, and the systems are used for all types of fish: Koi, cold-water, tropical and marine.

From early September, the company's new location is at Tacchis Garden Scene, A1123 between St Ives and Huntingdon, Cambridgeshire. Tel: 0480 468809; Fax: 0480 431004.

International Pet Expo

Aquarist Joseph Gargas is one of two main speakers at the International Pet Expo '93 (26/27 October 1993, Sands Expo and Convention Center, Las Vegas).

His seminar, entitled *Basic Freshwater Fish Care and Husbandry*, will provide an overview of fish sources, basic aquarology, possible start-up problems and recognising, treating and preventing disease.

Admission to the seminar is \$25 and takes place between 8.30 am and noon on the second day of the trade show for buyers and sellers of pet care products, pet foods, equipment and services.

For further information, contact the organisers: Western World Pet Supply Association Inc, 406 South First Avenue, Arcadia, California 91006-3829 USA. Tel: 818 447 2222; Fax: 818 447 8350.

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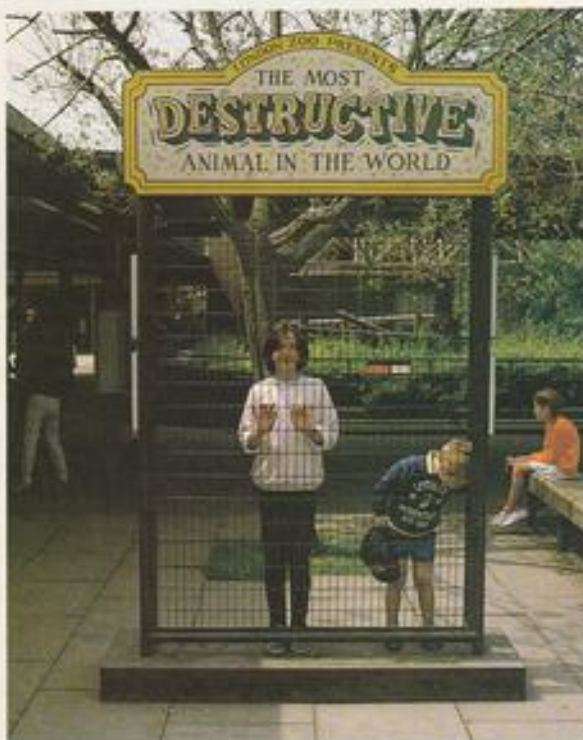


BREEDING PROGRAMMES AND FISH CONSERVATION

PART I Stating the Problem

Dr Chris Andrews, Senior Director of Husbandry and Operations at the National Aquarium in Baltimore, makes a welcome return to *A & P* with a major report on endangered and threatened species of fish and what should be done to protect them.

Photographs by the author



A source of many of the problems.

The biology of the vast majority of the 22,000 or so known fish species (which comprise 50% of all living vertebrates) is virtually unknown. Since available information suggests that, in some parts of the world, about one-third of the local fish species may be threatened, their conservation therefore presents a massive challenge.

The greatest number and variety of fishes

occur in the oldest freshwater lakes, wetlands and river systems of the tropics and subtropics, and in the waters surrounding coral reefs. Therefore, single species conservation is of less relevance than the conservation of fish communities and their habitats, and the conservation of whole ecosystems must be the long-term goal of fish conservationists.

This article briefly summarises informa-

tion on the importance and status of fish populations on a global basis, and also outlines the threats they face and their current conservation needs, particularly in relation to captive propagation efforts by zoos and aquariums.

IMPORTANCE

Since many fishes live in a largely unknown and unseen environment, their importance to humans is often overlooked. There are two overlapping justifications for the long-term conservation of fishes:

1. Economic factors;
2. Intrinsic factors.

Economic Factors

About 85% of the 90 million metric tons of fish which make up the annual global fisheries catch comes from the harvest of wild populations (the remainder is supplied by aquaculture), and fish are our only major food supply which is captured principally from wild sources. In some areas, particularly certain tropical countries, fish are a vitally important source of available and/or inexpensive protein for the local populace.

Angling and ornamental fishkeeping are two popular pastimes enjoyed by many millions of people across the world. These hobbies promote a better understanding of the importance of aquatic ecosystems and have significant economic implications for the countries so involved. Scuba diving, snorkelling and similar water sports are also popular recreational activities which are important in attracting tourists to various parts of the world, where many of the countries have come to depend on income from this industry.

Fish are used for ecological monitoring, as experimental animals and for pest control, and have contributed in a major way to the understanding of ecological principles and population genetics. Potential anti-cancer drugs have been identified from sharks, stingrays and various aquatic invertebrates. Therefore, as science advances (and as cultural values change), the potential value of all aquatic species must be emphasised.

Intrinsic Factors

For centuries, fish have played a significant part in art, in several religions and in our general appreciation of the natural world.

There is, therefore, a need to move away from the dominant ethic in the developed world, which requires that species are commercially valuable before attracting significant conservation attention, and develop the more acceptable approach of long-term sustainable utilisation of all natural resources (whatever their commercial value).

THREATS

A number of human-related activities (either individually or acting in concert) are causing changes in natural fish populations at an alarming rate. These activities can be discussed under two broad headings:

1. **Habitat alteration**, including destruction, pollution and the introduction of alien species.
2. **Over-exploitation**, including over-fishing for food and over-collection for other purposes.

Habitat Alteration

Habitat alteration is a major cause of changes in fish populations in both freshwater and marine environments. For example, dams may act as barriers to migrating fish, and man-made lakes and reservoirs may replace small streams or ponds, with subsequent disruption to the endemic fauna.

The widespread filling-in and/or draining of ponds, marshes and other small water bodies can have a significant effect on communities of smaller fish species, and some such environments may also act as an important nursery ground for larger and perhaps commercially valuable species.

The effect of pollution on aquatic ecosystems can be sudden and obvious (e.g. acute fish mortalities following the release of a toxic effluent), or more gradual and perhaps discreet (e.g. the effects of acid rain on upland fisheries in North America and Europe, or the sub-lethal effects of other pollutants on fish longevity, fecundity and resistance to disease). Heated, nutrient-rich or sediment-laden effluents may change the chemical and/or physical characteristics of the receiving water body.

While toxic effluents are often assumed to exert their main effect on fish populations in downstream water courses, such effluents may also form a barrier to the migration of fish through the river system, and hence affect the viability of upstream populations.

The introduction of alien fish species can also adversely affect local fish populations in a number of ways, including via competition, predation and hybridisation.

Over-exploitation

Subsistence fisheries have existed for a long time, and probably have had very little impact on wild populations. However, it was the development and use of large-scale mechanised fishing techniques in the 1950s and 1960s that highlighted the effects of the over-exploitation of stocks. Several of the commercially important North Atlantic and Pacific fish stocks declined dramatically as a result of overfishing.



Overfishing (this is Lake Tanganyika) poses very serious threats to fish populations.



Deforestation has multiple consequences, including excessive erosion with subsequent siltation of rivers and, eventually, coral reefs.



Tourist developments around coral reefs and coastal areas (this one is in Singapore) can have a significant influence on the local aquatic fauna and flora.



The gigantic Arapaima. Some of its former habitats have been seriously altered. This species is currently listed in CITES Appendix 1.

The sudden and drastic decline of a once-numerous species, can also have a pronounced effect on other animals in the same ecosystem (e.g. the collapse of Chilean and Peruvian Anchoveta fishery in 1970s and the decline in local sea birds).

However, it is generally assumed that this type of over-exploitation will not lead to the total extinction of a species, as there will

come a point when the fishing is no longer commercially viable and exploitation (fishing) will cease. This may not be the case for particularly high-value fish, such as some of the species for the ornamental fish trade.

There is a thriving worldwide ornamental fish trade. Although the majority of freshwater fish involved in the trade are from captive-bred sources, significant numbers

are still removed from the wild, and the majority of the marine fish in the trade are still wild-caught. There is now mounting concern that over-exploitation may be causing the decline and even commercial extinction of a number of species which are popular in the trade and that there is a need for greater monitoring and legislative controls.

STATUS

According to the 1990 *Red List of Threatened Animals*, some 762 taxa of freshwater and marine fish are considered to be threatened or extinct. Since the vast majority of the listed species are freshwater fish, this represents about 9% of the 8,500 or so species which occur in freshwater habitats.

However, available data from certain areas suggest that the actual situation may be far worse (see accompanying Table). For example, in the African lakes of Barombi Mbo and Lake Victoria, large proportions of the fauna are endangered. In North America, 292 (28%) of 1,033 species of freshwater fish are known to be threatened or extinct, and in California, 57% of the 113 species of native freshwater fish were thought to be threatened or in need of conservation action. Around 160 (32%) of the 500 or so species of Mexican freshwater fish may be threatened, with one third of the threatened taxa in the desert regions of Sonora and Chihuahua.

Further examples are listed in the Table, and there is increasing (sometimes anecdotal

or unpublished) information to suggest that the situation may be, at least, as critical in many other areas, including Madagascar, the Aral Sea, Philippines, Thailand and Hawaii.

Although the 1990 *Red List* contains relatively few completely marine taxa, considerable concern is being expressed over a range of marine fish species, including cer-

tain sharks and rays, Blue Fin Tuna and some coral reef fish, and it has been suggested that limited distribution, slow attainment of maturity, intrinsic rareness and excessive exploitation may all be important factors in placing some marine fish species in jeopardy.

(TO BE CONTINUED)

▲▲

SOME THREATENED FRESHWATER FISH FAUNAS

Location	*Estimated Number Threatened Species	% of Total
British Isles	10/55	18.2
Belgium	29/39	74.7
Europe	98/200	49.0
Mexico	160/500	32.0
California	64/113	57.0
North America	292/1003	28.3
Australia	65/192	34.0
Waikako River, New Zealand	7/18	38.9
Sri Lanka	11/64	17.2
Peninsular Malaysia	145/382	38.0
Singapore	19/53	35.8
Himalayan waters, Nepal	25/130	19.2
Lake Victoria	315/350+	90.0
Barombi Mbo	12/17	70.0
Southern Africa	24/214	11.2

Note: *The first figure represents the estimated number of threatened species. The second figure represents the estimated total number of existing species. For example: 10/55 indicates that 10 out of 55 species, i.e. 18.2% fall within the threatened category.

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filters can be flow regulated, have their volume expanded by add on modules or have oxygen enrichment with a screw on diffuser. The filters are suitable for marine or freshwater environments and can be used particularly well as additional quick run filters.

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Your questions

Answered

Having problems? Send your queries to our panel of experts who will be pleased to be of service. Each 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 experts to whom your query should be directed. All letters must be accompanied by an S.A.E. and addressed to: **Your Questions Answered, The Aquarist & Pondkeeper, 9 Tufton Street, Ashford, Kent TN23 1QN.**

Herpetology, Julian Sims. **Koi,** John Cuveller. **Tropical,** Dr David Ford. **Coldwater,** Pauline Hodgkinson. **Plants,** Barry James. **Marine,** Gordon Kay.

TROPICAL

MISSING GUPPIES

I have a tropical freshwater aquarium housing Mollies, Platies, Neons, Zebras, Black Widos, Scissorails and Guppies.

Recently, two of my Guppies have gone missing. I've searched the tank thoroughly for them but there's no trace. Have you got any idea as to what might have happened?

When a fish dies in the community aquarium it becomes food for the other fish, especially the scavengers.

Overnight, the carcass can be pecked until the fleshy parts are removed. The bones then dislocate quickly in water and are swept apart by filter or aeration flow. Therefore, within just a few hours, there is often no sign of the fish or its remains.

If there is even a small gap in the lid, some fish can leap through it in search of a less crowded environment. These

'disappearing fish' may be found at the back of the tank or furniture at some future time.

The other cause of a fish's disappearance is when it is so small it can fit into the mouths of larger fish, especially predators, such as some large cichlids. Some of the larger catfish feed nocturnally and can also swallow unsuspecting sleeping fish. It is truly an underwater jungle...

AGGRESSIVE MALE MOLLY

I introduced a male Molly into my community tank about a month ago. I soon noticed that he was rather aggressive towards the other fish, but I thought he might need time to settle down.

Alas, he's still the same; at feeding times it's even worse. This fish is disrupting the tranquility of my tank and I am worried just in case he damages one of the other fish.

Is there anything I can do, or do I have to find him a new home?

Male Mollies are often quite aggressive fish and so become 'boss of the tank'.

This is all right, as long as no actual damage to the other fishes occurs. Everything usually settles down when all the fish learn their respective

place in the pecking order.

You could try adding more Mollies so that they become so concerned with each other that they pay less attention to the other species.

If fighting continues taking place and actual damage occurs, all you can then do is remove the Molly. You won't be able to change its nature.



Male Mollies which become 'boss' can develop an aggressive streak.

NANCY GREY/FLORIDA TROPICAL FISH FARMERS ASSOCIATION

KOI

DEPTH AND STOCKS

I am setting up a Koi pool measuring 17 x 6ft. What depth of water should I go for?

Once the pool is completed, how many fish... and of what size, should I buy?

To keep Koi properly, you should aim for an optimum depth of 4ft or, better still, 5ft. At such a depth, the fish will be able to derive full exercise benefit and rapid growth.

Should you not already have a copy of *The Interpet Encyclopedia of Koi*, then get one, as

If you want your Koi to grow to their maximum size, make sure you provide them with deep water.



LAWRENCE E. PIERSON

this book is absolutely essential reading for serious Koi keeping!

It is not really possible to quote the number of Koi which a particular pond will safely hold, as there are too many variables involved, such as the quality and effectiveness of any filtration, etc... but assuming everything else is correct (a big assumption), then it should be possible to have about a dozen large (circa 20-plus inches) fish quite happily in a pool of the dimensions you are proposing.

HERPETOLOGY



The Kenyan Clawed Toad (*Xenopus borealis*) is not seen as often as its larger relative *X. laevis*.

'CLAWED' DIFFERENCES

Would you please tell me how I can distinguish between the three species of *Xenopus* Clawed Toads?

Although you refer to only three species of *Xenopus*, there are, in fact, fifteen species and subspecies belonging to this genus!

The largest species of African Clawed Toad is *Xenopus laevis* — usually referred to as the Clawed Toad, although it is

called the Common Platanna in South Africa. Females of this species can grow to a maximum body size (snout to vent) from between 8 to about 10cm (3¼ to 4 in). Males are much smaller, only growing to a body length of between 6 to 8cm (2¼ to 3¼ in).

The Kenyan Clawed Toad (*X. borealis*) is a smaller species of toad, adults growing to little more than 7cm (2¾ in) in length. Another difference between this species and the African Clawed Toad is that

the Kenyan Clawed Toad has golden yellow coloration to the underside of the rear legs.

As its name suggests, the Dwarf *Xenopus* or Nigerian Clawed Toad (*X. tropicalis*) is an even smaller species, males only growing to about 4cm (1½ in) and females to about 6cm (2½ in).

Dwarf *Xenopus* is an unfortunate and misleading common name because there is also a Dwarf Clawed Toad (*Hymenochirus boettgeri*). This very small African toad, which grows to a maximum size of 3½cm (1¼ in), looks like a miniature Surinam Toad (*Pipa pipa*) found in South America. However, unlike *Pipa*, female *Hymenochirus* do not carry their eggs on their backs during development.

HERPETOLOGICAL SOCIETIES

Are there any herpetological societies which specialise in providing help and information about keeping and breeding tortoises and freshwater turtles (*terrapins*) in captivity?

The British Chelonia Group (BCG) was formed in Bristol in June 1976. Since that first meeting seventeen years ago, a regional network has been established which organises local meetings. This network now extends from Bury, Lancashire, in the

north, to Devon and Cornwall in the south-west, and Essex and Kent in the east.

The BCG publishes an informative Newsletter every two months and an annual journal, called *Testudo*. The BCG also publishes ten different Care Sheets on a variety of important subjects.

Further details about the categories of membership (individual, family, junior and overseas) can be obtained by sending a stamped addressed envelope to the following address:

BCG Membership
Secretary,
PO Box 235,
LINCOLN,
LN6 8AX.

The Tortoise Trust is dedicated to the conservation, welfare, captive husbandry and breeding of Chelonia. It also conducts surveys, for example, into the welfare of North American Box Turtles (refer to the April '92 edition of *Herpetology Matters*).

The Tortoise Trust Newsletter is published six times a year. The Trust also produces information leaflets; for example, on *Disease Prevention*.

Further details about the work of, and membership to, the Tortoise Trust can be obtained by sending a stamped addressed envelope to:

The Tortoise Trust,
BM Tortoise,
London WC1N 3XX.

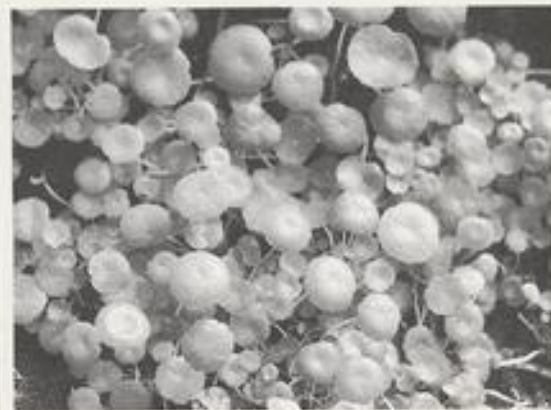
PLANTS

'VULGAR' PENNYWORT

I have just purchased a potted plant with small round leaves on short stems. The label said it is *Hydrocotyle verticillatum*. However in my book this plant is called *Hydrocotyle vulgaris*. Which is correct?

There is some confusion in the trade with regards to the various *Hydrocotyles*. The plant you have is undoubtedly *H. vulgaris*, the European Pennywort.

Emerse (bog-grown) leaves of the European Pennywort.



DEFICIENT CRYPTOS

I have a beautiful *Cryptocoryne* which has done very well for over two years. Normally a nice olive-green, it has recently changed. The veins are dark green, but the tissue in between is pale yellow. What is the cause of this, and will it kill the plants?

Your tank is lacking manganese. *Cryptocorynes* and *Hygrophilas* are particularly affected by this condition.

The remedy is simply to add regular daily doses of manganese which is contained in any good trace element fertilising solution.

MARINE

CLOUDY WATER

All of sudden my aquarium has become cloudy. No matter what I do, I cannot get rid of the milky appearance.

What is it, and what can I do?

What you have is a free-swimming bacterial infestation, commonly called a 'bacterial bloom'. It is the result of overfeeding, overstocking, dead fish or uneaten food lying about and — well — a lack of good aquarium husbandry.

Do a couple of large water changes and practise restraint at feeding time. The problem should soon disappear.

KEEPING BUTTERFLIES

I adore Butterflyfishes, but everyone tells me that they're

impossible to keep for more than a month or two. Is this advice correct? I have been keeping marines for around 18 months.

The advice you received is rot. I have kept all manner of Butterflies for 3 to 4 years and one particular Wimplefish (*Heniochus acuminatus*) was 13 when he died!

Butterflies are not for beginners, or their new aquariums, but, provided you have been successful in managing the Nitrogen Cycle and your water quality is perfect, go ahead. Buy only omnivorous species, though. You will fail if you try to keep species which eat only coral in the wild — and don't keep them with bullies or ebullient tankmates.

Species you should go for are the Vagabond (*Chaetodon vagabundus*), Threadfin (*C. auriga*), Yellowtail (*C. xanthurus*) and *Heniochus acuminatus*.



Among the many Butterflies that can be easily kept in aquaria, Wimplefish are some of the longest-lived.

and *Heniochus acuminatus*.

There are of course, many other species to avoid, including Meyer's (*C. meyeri*), *C. aus-*

triacus, *C. triangulum* and the Rainbow (*C. trifasciatus*).

The moral is — do your homework. Good luck!

COLDWATER

BASIC TIPS

As a newcomer to fishkeeping, and the owner of one small aquarium, I have gradually become rather disillusioned as my fish gradually fall sick with Fin Rot or Fungus and then die. Those that I replace the dead ones with, die off in much the same way.

Why is everything always going wrong? Could it, perhaps, be my fault?

Goldfish need space and should never be kept in crowded conditions. You do not say what size the tank is, but I am afraid that small volumes of water pollute very quickly, and all the problems you have had are caused through poor water quality.

Therefore you must pay special attention to tank maintenance. This would mean keeping the tank and gravel as clean as possible; a gravel cleaner obtainable from your aquatic dealer is a great help with this task. Two or three partial water changes are necessary each week, changing about 1/4 of the volume each time, and some form of filtration will be very beneficial in maintaining the best possible water quality.

Take care that you are not putting too much food into the tank; use no more than the fish are able to consume within a few minutes. You cannot overfeed fish but you can offer too much at any one feed, so that some is left to turn bad and pollute the water.

TACKLING ULCERS

I have a pond which was functioning perfectly well until I added a Comet which I later realised was carrying a disease. I now know it to have been a form

of ulcer-type infection which started as a small white patch, then broke open into a bloody sore.

All my goldfish have died, though none of the Orfe appear to have been affected.

The disease which you describe was rather more common, I think, a few years ago in imported fish. As you have experienced, it is highly contagious.

The ulcers are caused principally by *Aeromonas* and *Pseudomonas* bacteria. As a result, secondary infections often occur, one of which is

Saprolegnia (Fungus), which makes a recovery unlikely. In goldfish, chronic septicaemia often occurs; this then leads to dropsy and inevitable death.

I personally would treat sick fish out of the pond either in tanks, or holding ponds, where they are not able to come into contact with other fish and where it is easier to keep a close watch over them. Attempting to administer treatment to a pond often means that a proper control over the correct dosage of medication is difficult; the amount needed to treat the whole pond also makes the procedure very expensive.

I am not surprised to learn that the Orfe are not affected, for (I am told) these fish appear to have an immunity against some infections. I have also had it suggested to me that they may even be carriers. In larger members of the carp family, such as Koi, the disease seems to affect mainly the surface of the body and so there is a much better chance of recovery.

Treatment would, in all cases, be with antibiotics or medicated flake/pellets available through your vet.

Ulcers can only be treated effectively (and, even then, without a firm guarantee) with antibiotics.



PRODUCT ROUND-UP

BY DICK MILLS

Water, Water everywhere — and good enough to drink!

Diluting spirits at the best of times may seem a heresy to some purists, but now, at least, any water you use will not detract from, or impair, the taste. Similarly, your fish can also benefit by having purer water in their tanks, thanks to a new range of WATER FILTERS from AQUAPURA, a new company marketing BRITISH-made products.

The mid-range model provides aquarium quality water with 99 + % of metals and chlorine removed. Typical cost is around 0.3p per litre, compared to 30p per litre for bottled water.

The water flow rate through the filter modules is from a

minimum of 3 litres/minute, so even with a large tank, it shouldn't take you too long to make your fish feel really at home.

Filter life is obviously dependent on the amount of use and on how much needs to be extracted from the water. However, the range encompasses models from a few litres capacity right up to 4 million litres capability — enough for a Koi pool.

Details from: AQUAPURA (SW) LTD, Lytherva, St Tudy, Cornwall PL30 3NN. Tel/Fax: 0208 851489.

'Soaking' rocks

AMMO-ROCKS, a new addition to the Pond Care range from AQUARIUM PHARMACEUTICALS, consist of a natural mineral ore which 'soaks up' harmful



ammonia. Their natural ion exchange resins first attract toxic (and stress-provoking) ammonia, then neutralise it with nitrifying bacteria.

A layer of Ammo-Rocks on the bottom of the pond promotes a healthy pond environment and, at the same time, provides a decorative base over which fish and plants become more visible.

In a newly set up pond, Ammo-Rocks form a valuable safeguard against high ammonia levels while the biological filter is maturing. In established ponds, their surface area provides additional growing space for nitrifying bacteria; Ammo-Rocks can be used within actual filter compartments, too.

Ammo-rocks (distributed by INDEPENDANCE (UK) LTD) are supplied in extra-strength polythene bags with carry-home handle; each 40lb (18.2kg) bag will treat 100 gallons (380 litres) of pond water. Sold loose, Ammo-Rocks retail for 99p per lb.

Details from: INDEPEN-

DANCE (UK) LTD, Blackburn Industrial Estate, Enterprise Way, Sherburn-in-Elmet, Leeds LS25 6ES. Tel: 0977 681962; Fax: 0977 681963.

Unclog your Brain of the Filtration Facts Fog

Any quality filtration system would perform three main functions: mechanically trapping visible, suspended matter; chemically adsorbing invisible, dissolved contaminants; biologically removing (by bacteria) nitrogenous waste products.

External canister filters manage the first two functions more than adequately but, because nitrifying aerobic bacteria colonies depend heavily on dissolved oxygen in the water flow to thrive, such colonies may not develop in sufficient numbers in the filter body to do their job properly, due to the oxygen already being taken up by the fish or other life forms in the aquarium.

The answer is to utilise atmospheric air if possible. New trickle filters house beneficial nitrifying bacterial colonies in almost open air, in a 'dry' environment. Aquarium water trickling through a filter bed which is open to the atmosphere is subjected to biological filtration probably 20 times more efficient than that found in submerged systems.

Add to these factors the bonus that all the dissolved oxygen in the tank is available for the animals, and you can see that this form of biological filtration has to be a real boon.

Now, if we could only com-



AQUAPURA (SW) LTD



bine everything in one compact container (even within the aquarium itself) . . . Enter HAGEN's BIOLIFE wet/dry filtration system, although, to be fair, it does even more than filter.

The primary chamber contains the aquarium heater (no more fish burns or heater abuse from rough fishes). Mechanical filtration follows (comb brushes and sponge medium), succeeded by a floss-protected carbon chemical stage.

Now for the clever bit. The central container remains dry (even when immersed) thanks to the pump returning water faster than the centre can fill up. Here lives the heart of the biological stage of the filter, a ceramic core on whose multi-myriad surfaces bacteria perform their task. It is claimed that efficiency area is equivalent to at least 8 to 10 gallons of the plastic ball type of trickle filter medium used in necessarily much physically-larger systems.

Being in a dry environment, it is unaffected by routine cleaning of the mechanical and chemical filter media.

By incorporating all filtration's desirable qualities (and latest technological developments) in one compact, well-designed unit, the Biolife Filter creates, and sustains an aquarium environment that is closest yet to nature's own — whether it be freshwater or marine.

Details from: ROLF C HAGEN (UK) LTD, California Drive, Whitwood Industrial Estate, Castleford, West Yorkshire WF10 5QH. Tel: 0977 556622.

Nitrates? They went Thataway!

Water pollution is usually in the news but there seems no

end to the gradually-rising levels of nitrates in the tap-water supplies (especially in the east and south). Ideally, an 'in-line' nitrate remover would seem to be the answer to many pond- and aquarium-keepers' prayers, so it came as no surprise when those clever people at PURITY ON TAP produced just that.



The NITRAWAY is a self-contained unit that takes care of everything — from removing nitrates to self-regeneration (an automatic 'timed' process if plugged into the electricity supply).

The combination of a strongly anion and nitrate-selective, highest quality resin, with a well-tryed and reliable backwash and service valve, makes for efficient removal of nitrate and highly accurate dosing of granular salt, and flow control, for resin regeneration for the integral reservoir. Simply setting the valve to 'regeneration' sets the automatic process underway; no need for any calculations or measuring.

The unit needs a firm, level base to stand on (it's 27in high by 12in by 15in), together with a nearby drain to take the

backwashings and any overflow. It comes complete with a 1.5in hoses and an 'in-line' tap to control the flow.

Performance figures depend entirely on what it's asked to do but, as general guide, the Nitraway will remove 25ppm of nitrates from well over 10,000 litres of water at flows of up to 5 litres/minute, before regeneration (with ordinary granular salt) is needed.

Details from: PURITY ON TAP LIMITED, Wickfield Farmhouse, Shefford Woodlands, Newbury, Berkshire RG16 7AL. Tel: 0488 648319; Fax: 0488 648997.

Breedin' 'n' Feedin'

When developing a food for fish, it seems commonsense to design the food around the fishes' needs. Probably the greatest need is found by studying young, growing fish which are at their most demanding and critical stage of their life.

If you combine the two, then you will inevitably arrive at the position of PROKOL, both a breeder and developer/producer of fish food, whose double manufacturing role is going along quite nicely, thank you.

On the fish production front, things are expanding so fast that partner Geff Lambert finds it hard to keep up with the various projects now in progress: four, second-stage production units are under construction which will have an expected capacity of four tons per annum of high-intensity Koi farming, a 70,000-gallon third-stage rear-

ing unit; modifications to the existing 600,000-gallon clay ponds; plus the start of the next field construction of another similarly-sized clay pond system.

The location of the extensive premises is advantageously situated; being on an advanced waste technology project site, there is almost limitless heating energy (from methane gas resources) which is used to provide the necessary warm water conditions so important for successful Koi rearing.

After much research, development and field trials over the past ten years, the time has now come for the launch of PROKOL PREMIUM FISH FOOD, a product which, in addition to meeting ALL conventional nutrition requirements, has also passed the ultimate Koi (and fishkeeper) test — it produces great results!

You can now give your own Koi exactly the same food as used by the professionals, at a more than reasonable price. Recommended retail price is £14.99 for a 2.5Kg bag of either 3mm or 5mm pellets.

Details from: PROKOL ENTERPRISES, West Quarry, Appley Lane North, Appley Bridge, Lancashire WN6 9AE. Tel: 02575 4104; Fax: 02575 3194.

Be Like Troy Tempest — Go for Marina!

Viewers of TV's Stingray know that Troy Tempest is fascinated with Marina, the non-speaking mermaid, and you'll be thrilled with the





quite different MARINA too. That's the brand name of a very efficient range of submersible pumps from DATA PUMPS LTD, distributed in the south of England by AQUAVITA CENTRE.

The pumps come in a range of four sizes, with or without float switches, denoted by the suffix 'G' to the model numbers: the ST 200 (G) has a maximum flow rate of 90 litres/minute, consumes 200 watts, has 5 metres of cable, a 1in diameter delivery tube and will drain down to 3mm.

Details of other models, where different to the previous, are: the ST250 (G) — 110 l/min, 250 watts, 10 metres of cable; the ST350 — 180 l/min, 350 watts, 1.25in diameter delivery tube, draining down to 15mm; the SF750 (G) 350 — 260 l/min, 800 watts; the SF1,000 — 285 l/min, 1,000 watts and drains down to 30mm.

Details of these products and other aquatic services from: THE AQUAVITA CENTRE, 1 Lane End, Old Uxbridge Road,

Rickmansworth, Hertfordshire WD3 2XU. Tel: 089 582 4556; Fax: 089 582 3663.

Hair Today, Gone Tomorrow, Don't Come Black Another Day!

OK, let's get it over with — we're talking about Hair and Black Algae and their successful removal. Like all algae, these two are ravenous eaters of any surplus nutrients in the water, often getting to them faster than your aquarium plants!

Among their basic diet is phosphate, so if you can elimi-

nate this, then they could be on a terminally-ill diet in no time at all.

One efficient commodity in this respect is PHOSPHATE REMOVER from DEEP-ENDEALE PRODUCTS. In addition to the regular 1 litre size, it is now available in two extra sizes: a budget-sized 350ml and an economy sized 2.5 litre. Potential users range from a single-tank freshwater hobbyist, to the owner of a large marine reef tank.

All of the products in the company's increasing range are applicable to both freshwater and marine uses.

Full details of all products from: DEEPENDEALE PRODUCTS, 1 Bracken Road, Ingrow, Keighley BD22 2DF. Tel/Fax: 0535 608030.



DIARY DATES

1993

SEPTEMBER Friday 10

Yorkshire Cichlid Group — Anton Cass speaks on *My Favorite Cichlids* at St Annes Church Hall, Wrenthorpe Road, Wrenthorpe, Wakefield. Contact Phil Gardner on 0532 600482. YCG is an area group of the British Cichlid Association. Meetings are held on the 2nd Friday of each month.

Saturday 11

Hounslow & D.A.S. — 30th Open Show, St John's and Spring

Grove Community Centre, St John's Road, Isleworth, Middlesex. Details: Show Secretary, Trevor Butler, on 0628 25581.

Sunday 12

Northern Area Catfish Group (CAGB) — Annual Open Show. Aspell Civic Centre, Woods Road, Aspell, Wigan. Grand Auction (aquatic items only), raffle, canteen, etc. Benching: 11.30 am-1 pm. Booking in for Auction: 11.30 am-1.30 pm. Further details: Brian Walsh on 0254 776567 or Dick Thompson on 0942 224059.

Sunday 19

Basingstoke A.S. — Open Show, John Hunt of Everest Secondary School, Popley Way, Basingstoke. A of A rules. Contact Paul Dean on 0734 701461 (24-hour answerphone).

Mid-Sussex A.S. — Open Show, Southgate Community Centre, Crawley. FBAS Championship Class 'De' — Rift Valley Cichlids. A & P Gold Pin. Meetings on 2nd and 4th Wednesday each month at Jack and Jill Public House, Clayton. Information: Ken Best (Secretary) on 0903 820879.

Otley A.S. — Annual Open Show, Prince Henry's Grammar School, Farnley Lane, Otley, North Yorkshire. Raffle and auction. Judging of 37 classes to start

at 2 pm. Benching: noon-1.45 pm. Exhibitors: 20p per entry. Non-exhibitors: 30p. OAP's and children: 10p. Full details from the Show Secretary, Simon Midcalf, 23 Riverside Drive, Otley, North Yorkshire LS21 2RU. Tel: 0943 464632.

Saturday 25

Bristol Tropical Fish Club — 32nd Open Show, All Saints Church Hall, Grove Road, Fishponds, Bristol. Benching: 9 am-noon. Open to public (for trade stands, refreshments, etc): 9.30 am; Fish Auction: 1.30 pm; Fish Exhibition: 3 pm. FBAS Trophy Class D. Free entry to main hall for auction and trade stands. Show entrance fee: 70p adults; 40p children and senior citizens. Details from: Tony Hatcher. Tel: 0272 324583.

Sunday 26

Darwen A.S. — Open Show, Darwen Library Theatre. Benching: 11.30 am-1 pm. Specialist fish auction and members' stand. A & P Gold Pin. Details from John Gibson on 0254 776960 or Brian Walsh on 0254 776567.

Yorkshire Cichlid Group — Auction, starting at 1.30 pm. St Annes Church Hall, Wrenthorpe Road, Wrenthorpe, Wakefield. Contact Graham Ash on 0924 371488.

OCTOBER Saturday 2

Goldfish Society of Great Britain — Open Show, St Paul's Church Hall, Chigwell Road, Woodford Bridge, Essex. Fish Auction: 1 pm. Refreshments available all day. Full details from Bert McMurray (Show Secretary). Tel: 0202 523173.

Sunday 3

British Cichlid Association — AGM and Convention. The Deepings School, Deeping St James, Lincs (on A16 between Stamford and Spalding). Doors open: 10.30 am. Guest speaker: Ad Konings on *African and Neotropical Cichlids*. Auction of fishes and equipment. Tickets (on the day): £2.50 members; £3.50 non-members. Contact Mrs Lynn Fern, 5 Winding Shot, Hemel Hempstead, Herts HP1 3QQ (see please).

Solway A.S. — Dr David Ford of the 'Aquarian' Advisory Service will lecture on *Fish Nutrition: What, Why and How of Feeding Ornamental Fish and Aquaria International: Fishkeeping in 16 Different Countries*. Start: 1 pm at Mount Sydney Inn, Dumfries. Details: John Cowan on 0387 75606.

PLEASE SEND US
YOUR DIARY DATES
WELL IN ADVANCE



DISTRIBUTION OF THE BANDED NEWT
(*Triturus vittatus*)

Keeping and Breeding Banded Newts

Marc Staniszewski provides the definitive guide to these beautiful, hardy amphibians

Illustrations by the author

For anyone who has a specific interest in the class Amphibia, there is a tendency to be drawn into keeping those species which show unusual habits, are highly coloured, have a bizarre appearance or are rare. It is therefore by no strange coincidence that newts of the genus *Triturus* represent one of the most popularly kept amphibians due to their ability to transform from relatively dull, secretive dwellers of a subterranean world, into aquatic creatures which freely exhibit

their resplendent breeding colours and beautiful body adornments.

But even in a world which offers the hobbyist such delights as the stunning Marbled Newt (*Triturus marmoratus*), the robust, vigorous Crested Newt (*Triturus cristatus*) or the enchanting Alpine Newt (*Triturus alpestris*), one species surpasses all others owing to its peculiar behaviour and, more especially, the extraordinary guise of the breeding male. Such elements, coupled with the fact that this species is rarely seen in the

hobby, has led to the Banded Newt becoming one of the most sought-after amphibian species.

CLASSIFICATION AND DISTRIBUTION

The Banded Newt is a predominantly western Asia Minor, mountain-dwelling species which has been categorically divided into three geographical races. The nominate form, known as the Turkish Banded Newt (*Triturus vittatus vittatus*), has the widest distribution, ranging from the Kocakatan Daglari Mountains in north-west Turkey, to Upper Galilee in central Israel.

The subspecies most frequently encountered in captivity is the Caucasian Banded Newt (*Triturus vittatus ophryticus*), which occurs from Istanbul in extreme north-east Turkey, to the Caucasus Mountains in the state of Gruzinskaya, C.I.S. (formerly USSR).

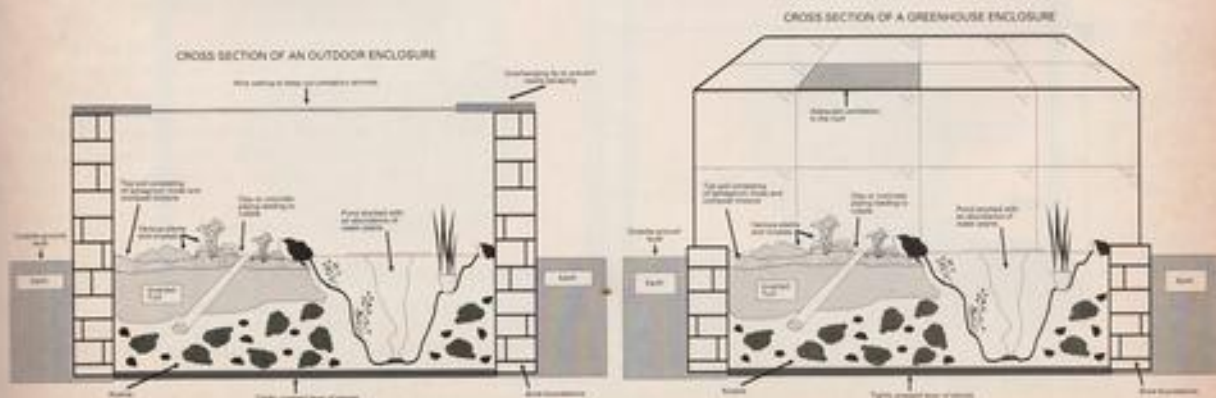
The third subspecies — the Syrian Banded Newt (*Triturus vittatus syriacus*) — is little-known and rarely seen in captive collections, although it is apparently fairly common in its natural habitat, where it ranges from north-west Syria and western Iran, to central Jordan and north-west Iraq.

DESCRIPTION

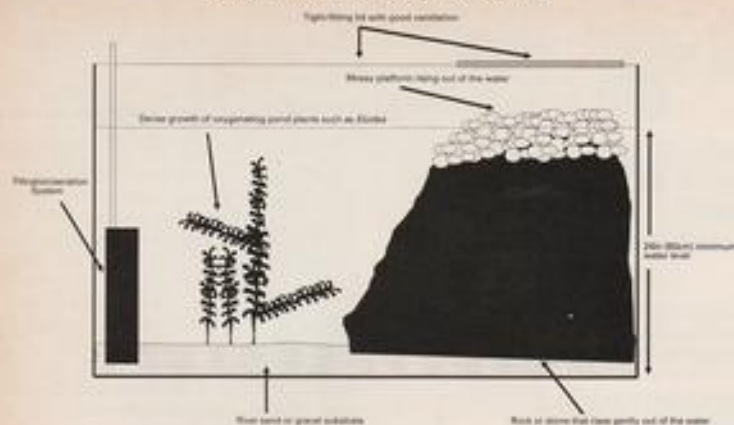
Of the three subspecies, the most robust is *Triturus vittatus ophryticus*, the Caucasian Banded Newt, with adult females and, more rarely, males attaining 5½-6in (13.97-15.24cm). *T. v. vittatus* is a much more slender creature but can reach 6½in (15.88cm), while the plump *T. v. syriacus* is the shortest form, averaging around 4¼-4½in (10.80-12.07cm).

In its terrestrial form, the dorsal ground colour of all types varies from sandy brown or olive, to light grey. Faint dark brown or black flecking may be present, particularly in females. The head is quite broad and somewhat depressed, with the Turkish subspecies possessing more prominent eyes (rather like those of Plethodontid salamanders) than the other subspecies.

The feature of this newt, from which the common name is derived, is the attractive broad pearl or cream band which extends along the flanks. During courtship this band



AQUARIUM SET-UP FOR BREEDING ADULT BANDED NEWTS (ALSO SUITABLE FOR REARING LARVAE)



becomes even more conspicuous, as do the throat and venter (see Glossary), which transforms from a red-brown to a bright orange in *T. v. ophryticus* and *T. v. tyriacus*, and from a greyish-white to a silvery white or pale yellow in *T. v. simans*. In the last subspecies, heavy spotting is also present on the throat and, to a lesser extent, on the belly, while in the other two subspecies, this is completely absent.

It is during courtship that the male Banded Newt comes into a class of its own, where beauty and curiosity are concerned. The denticulate ('toothed') dorsal and tail crests that develop are the most flamboyant of all semi-aquatic newts. In the Caucasian Banded Newt it extends from a point just behind the snout, where it soon rises to as high as 1.2-2in (3.05-5.08cm) and appears like a jagged piece of silvery olive and white corrugated metal. This crest discontinues at a point just above the cloaca, before recommencing along the tail. In addition, the head and upper flanks develop a networked pattern of white spots, interlaced with olive veins, while the eyes become conspicuously surrounded by a white ring, making them appear twice as large.

Elsewhere, the feet and lower regions of the hind limbs are adorned in thick webbing, the venter takes on a more vivid colour

and the cloacal region swells considerably. An iridescent dark blue stripe which may encroach upon the cloaca can also be discerned along the centre of the tail.

Male Turkish Banded Newts have a lower (0.8-1in - 2-2.5cm) and less denticulate crest than their Caucasian counterparts, and the wiry limbs appear almost too fragile and end in extremely long digits (0.3-0.6in - 8-15mm), with the rear limbs lacking the heavy webbing. Also, the network of spotting on the upper flanks is more highly concentrated, sometimes attractively engendering an almost shimmering white appearance.

Courting Syrian Banded Newt males are similar to the Caucasian Banded, although webbing is usually absent from the hind limbs and the tail is less pointed and lacks the iridescent dark blue. In contrast, females of all three subspecies remain comparatively dull, but are overall much more robust and develop strong but low crests which aid swimming, on the tail.

CAPTIVE CARE

Banded Newts present few difficulties in captivity because, in the wild, they are generally dwellers of fairly high altitudes (above 4,900ft - 1,500m) and are therefore

tolerant of both very low and relatively high temperatures.

Normally, there are two well-defined periods of activity - from early spring to summer (February to July), which forms the courtship period, and early autumn to early winter, when they actively hunt for food. At other times, they will enter a phase of torpidity, hibernating when temperatures fall below c 4°C (39°F) during mid-winter, or aestivating in hot, dry weather during summer.

Housing

Whatever container is used in maintaining Banded Newts, it must be, above all else, completely escape-proof, for these newts have a wonderful affinity for seeking and finding the slightest gap through which they can squeeze, by using a combination of body flattening and slime secretions.

Indoor Vivarium

A 36in (90cm) glass aquarium with a rigid, well-ventilated, custom-built lid (available from most herpetile outlets) will adequately house up to eight adult newts. If placed near a well-lit but sunless window, there is no requirement for supplementary lighting, but where this is necessary (for example, in a dark location, or where live plants are present), it should be in the form of a low wattage, natural daylight tube.

The basal substrate should be around 4-8in (10-20cm) deep and split roughly into two parts: live sphagnum moss which is kept moist, but not sodden, can form one part, while a mixture of dry tree bark, twigs and leaves can form the drier part. Several robust pieces of cork bark and limestone rocks should be settled firmly onto the basal substrate to provide seclusion for these shy amphibians.

Various plants, such as small ferns, Creeping Jenny (*Lysimachia*) and Marjoram (*Origanum*) can be grown and provide higher humidity, but need good light. In the centre of the vivarium a 10in (25cm) wide, 2-4in (5-10cm) deep water pan can be provided which should have easy access/egression points, such as a suitable slanting log or stone. The sphagnum moss part of the vivarium must be lightly misted each evening to create dew and entice the newts out to hunt for food at night.

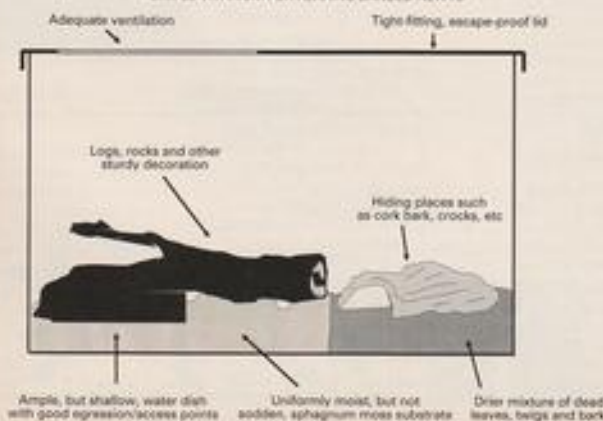
Normal room temperatures must not stray above 21°C (70°F) and, should it be impossible to prevent such conditions arising, then the newts should be allowed to aestivate by filling the vivarium with a further 10-15in (25-38cm) of a damp, chopped live sphagnum moss, moss peat and straw mixture.

Outdoor Vivarium

Banded Newts make excellent subjects for outdoor vivaria, mainly because of their temperature-tolerant nature.

After years of keeping this species, I have come to the conclusion that a converted greenhouse is more successful than an 'open' brick-walled enclosure on several counts.

SIMPLE VIVARIUM FOR REARING BANDED NEWTS



First, it is almost impossible to prevent newts escaping from the latter, and they are less tolerant of pesticides/fungicides and pollutants than most newts and temperate amphibians. This does not mean to say that they won't survive, but they are more at risk than if they were in a carefully sealed greenhouse.

Installation of both the greenhouse and walled enclosures are based on the same principle, except that, with the greenhouse, the framed glass structure completely covers the whole arrangement. Foundations should be around 3-4ft (90-120cm) high and consist of either cemented bricks/concrete breeze blocks or metal sheets, 2-3ft (60-90cm) of which should lie below the ground level.

The whole base should then be layered with 6in (15cm) of round pebbles which are compacted with a garden roller or sledge hammer to provide a barrier against burrowing newts, but still allowing good drainage. On the top of this can be settled a 6-10in (15-25cm) layer of sand and then, excepting one corner where a pond is to be located, 1-1½ft (30-45cm) of rubble (broken corks, wood, logs and bricks) should be spread to form hibernation/aestivation quarters.

On top of these are placed a few layers of inverted turf which not only prevent the soil which is to be situated on top from filling in the spaces in the rubble, but also gives added protection for newts resting in the rubble against harsh weather. Gaps should be left in between turf into which clay or concrete piping should be inserted at an angle to provide easy access to the rubble. A good layer of insecticide-free compost should then be spread over the turf.

At this point, the pond can be put in place, ensuring that where a liner is used, there are no sharp edges to cause a puncture. A pond should always have gently sloping sides and, in the case of Banded Newts, a fairly deep (2-3½ft — 60-105cm) central region which will remain relatively cool even in hot weather. The rest of the greenhouse can then be furnished with moss, plants, logs and rocks to give a Mediterranean feel and, as with an indoor vivarium, it should incorporate both damp and dry areas.

The actual greenhouse itself must be inspected with a fine tooth comb, and any small gaps on the vertical and lower diagonal planes must be sealed with a weather-proof silicone sealant.

Good ventilation is essential in hot weather and, therefore, roof vents and fully opening the door during the day are necessary. In the case of the latter, a 3ft (90cm) high, semi-rigid, smooth perspex sheet which fits the width of the door opening can be inserted to hinder escape, and wire netting can be fixed over the entire door and roof vents to prevent potentially harmful rats, birds and cats entering. Some form of shading may also be necessary.

Many other temperate amphibians, and some reptiles, can be kept amicably together in the same set-up, but be warned that Banded Newts are a vigorous species and, when in an aquatic state, they will attack and devour tadpoles, other newt larvae and even smaller newts.



A dark and slim Turkish Banded Newt male



A high-crowned Caucasian male in courtship display.



A walled enclosure can be used and is constructed in a similar manner, except the foundation should rise a further 2-3ft (60-90cm) above the ground level. On the top-most layer of bricks should be fixed a 10in (25cm) overhanging 'lip' consisting of roofing tiles or perspex. Wire netting should cover the entire enclosure.

Feeding

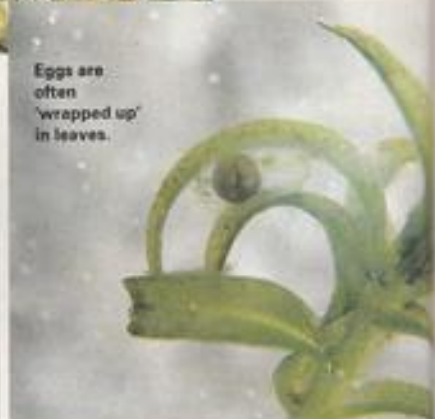
These newts will take most small, soft-bodied invertebrates, such as earthworms, white slugs, waxworms, freshly-sloughed mealworms and caterpillars. Unlike other newts, they also display quite agile movements and may stalk crickets and flies which they seize with a long and sticky extendable tongue.

All food should be dusted liberally with a multi-vitamin powder in captivity.

BREEDING

The main breeding period for *Triturus cristatus* is from March to early July, although adults may enter water during February if weather permits. There are two factors which determine whether or not a newt will enter the water. First, it must have built sufficient body weight from the autumn/early winter feeding period and, secondly, it must have had a short, but definite, hibernation period.

The latter can be accomplished by placing newts in an escape-proof container filled with a mixture of damp chopped sphagnum, moss peat and straw. This is then located in a cool, but frost-free, location, such as an unheated garage, attic or fridge part of a refrigerator, for a period of 8-14 weeks.



Eggs are often 'wrapped up' in leaves.



A one-month-old Turkish Banded Newt larva.

On returning the newts to their vivarium, males will regularly be seen in and around the water bowl, and it is at this point that they should be transferred to a large, escape-proof aquarium filled with 18-36in (45-90cm) of cool (45-65°F — 7-18°C) freshwater which is freely oxygenated and filtered. Plants such as *Elodea densa*, *Hygrophila*, *Ludwigia malincolta* and *Sagittaria* are to be



A good outdoor vivarium for Banded Newts.



Suitable temperate greenhouse accommodation.



This Syrian male has a beautiful creamy-coloured band running the length of the body.



Females of all three subspecies (this is a Caucasian one) do not have the impressive crests of the males.

preferred to plants with small foliage, and need only be grown in small quantities.

In the wild, these newts breed in limestone rock pools devoid of vegetation. The aquarium should also be moderately lit and the decor can consist of a gravel, river sand or smooth pebble base. Several large limestone and granite rocks (one of which should protrude out of the water) will give more surface area.

Here, over a period of several weeks, males will take on their breeding adornments and mark out small, but distinct, territories which they will defend vigorously from other males and newt species. This is a trait seen in very few *Triturus* species and places a limitation on the number of Banded males which can be maintained in a single body of water (a 36in — 90cm aquarium should have a maximum of three male Banded Newts).

Females remain terrestrial, where they will consume large quantities of food, but by mid-March they will also be frequenting the water pan. On introduction to the aquarium, females are initially quite reluctant to show an interest in the males' frenetic courtship display which involves tail oscillation, head bobbing, back arching and an intense nudging or even biting of the female.

Fertilisation is non-copulatory, but internal, and eventually, possibly as long as 8-10 weeks later, the female will finally accept one or more male spermatophores (often from several different males, depending into whose territory she has entered) which she will either store in special ducts called the receptaculum seminis, for later use, or immediately utilise to fertilise her eggs.

Egg-laying

Banded Newts' eggs have a 1.3-1.6mm (2.3mm, including gelatinous capsule) diameter and are half cream, half olive-brown coloured. Females prefer to wrap each one

carefully in the leaf of a suitable plant, but *Elodea canadensis* is rarely used because it seems to be too compact and narrow-leaved. However, 1cm width strips of thin plastic can be provided and these are also used, and represent a more hygienic egg-laying site.

In total, Caucasian Banded Newts (*T. v. ophryticus*) and the Syrian subspecies (*T. v. syriacus*) may deposit in the region of 120-200 eggs over a period of three months, whereas the Turkish subspecies (*T. v. vittatus*) may produce as few as 60, with 100-130 being more usual. The nominate form is also unusual in that it may simply adhere its eggs to rocks.

Care of Eggs and Larvae

Banded Newt adults will avidly consume their own eggs, unless suitable large quantities of food are provided. In any case, eggs are best removed to an aquarium, which needs to be similar in terms of water quality, temperature and decoration.

Hatching commences after 5-12 days depending on temperature and the 10-12mm (0.4-0.5in) larvae are relatively slow-growing. They need large quantities of infusoria, live *Paramecium*, *Daphnia*, *Cyclops* and *Tubifex* and, after three months, should be approximately 30-38mm (1.2-1.5in) in length. By this time they should be feeding (in addition to the initial diet) on blood-worm, chopped earthworm and gnat nymphs.

Metamorphosis after 3½-4 months is a critical time, when plenty of mossy, terrestrial areas should be provided. The 2.8-3.2cm (1.1-1.3in) newtlets should be removed to ice-cream tubs filled with moss, where they must be provided with suitably small, soft-bodied invertebrates. They are best overwintered in a cool room for the first winter, where they will feed sparingly.

If food is generously given, maturity will be attained in the third year when the newts are 2-3in (5.08-7.62cm) in length, although *T. v. syriacus* may breed just one year after metamorphosis at a length of only 1.75in (4.45cm).

Aestivation:

Denticulate:

Venter:

Subterranean:

Oscillation:

Internal Fertilisation:

GLOSSARY

A state which amphibians are able to undergo during extremely warm and/or dry weather, when they reduce their metabolism to almost zero and maintain a near-constant, and very cool, body temperature, usually deep underground.

Jagged-edged, rather like the 'teeth' on a saw.

The underside or belly of an amphibian.

Leading a life below the surface of the ground, inhabiting burrows, loose soils or crevices underground.

Ripple or wave-like movement seen in the tail of courting male newts.

Eggs are fertilised by the males' sperm while they reside in the females' body. External fertilisation takes place after eggs have been deposited, and these are much more prone to being infertile, hence the mass spawning seen in many amphibians.

Herpetology matters

By Julian Sims

My two daughters, Hologn (Hollie) — holding a captive-bred Blue-tongued Skink — and Fearn, had a great time among the reptiles at Fishworld '93.



REPTILES AT FISHWORLD

The Federation of British Aquatic Societies Fishworld '93 exhibition was held over Saturday 12 and Sunday 13 June, at Syon Park, Brentford, Middlesex. Additional reports about the two days were included in another article in last month's edition of *A & P*.

Due to the nature and organisation of the exhibition, the majority of the stands were devoted to ichthyological (fishy) topics. However, the Mobile Petz exhibit did have a distinctly herpetological theme. Petz is run by Sue Okey and specialises in providing animals — including reptiles — for demonstration purposes in educational establishments. The provision and use of animals is also an important part of certain types of therapy in hospitals, including psychiatric work.

Sue undertakes a range of educational work which involves animals. This includes contributing to courses leading to certificates and diplomas in animal care and management at Sparsholt College, Hampshire. If you are interested in using animals as a resource in schools, colleges or hospitals, then Mobile Petz can be contacted on Ferndown (0202) 578582.

Currently, Petz are looking



A & P editor John Dawes, complete with albino Pine Snake (*Pituophis melanoleucus*), and herpetile breeder Geoff Clarke, with a few of the numerous fascinated visitors to the PETZ exhibit.



for sponsorship for their van used for transporting livestock to the varied establishments where they work. If your business can help in any way, Sue would be pleased to hear from you.

The reptiles Petz display, including the Blue-tongued Skink (*Tilapia* sp.) in the photograph, are captive-bred and have been supplied by Geoff Clarke. Captive-bred animals offer many advantages over 'wild-caught' livestock, including:

- (i) They are the offspring of reptiles which have adapted to captivity and are known to do well when the correct conditions are provided.
- (ii) They are less likely to carry diseases and parasites — sometimes a problem with wild-caught animals.

(iii) Animals that have been bred in captivity do not promote the destruction of natural habitat or cause a species to become endangered in the wild due to over-collection.

If you are about to purchase any reptiles or amphibians, then the acquisition of captive-bred animals should be strongly considered for these reasons. Full details of the species and colour variants of captive-bred reptiles and amphibians which Geoff Clarke can supply are available from:

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Fax: 0929 472150
Mobile: 0850 235982

ROUND ISLAND'S REPTILES

The British Herpetological Society (BHS) will be holding an extended meeting at Birkbeck College, Malet Street, London WC1 during the afternoon of Saturday 16 October from 2.30 to 5.30 pm. There will be three illustrated talks:

- ① Leigh Gillett will be speaking about the role of the amateur in herpetology in *Long-term studies*.
- ② Roger Meek will be talking on the *Thermal ecology of lacertid lizards*.
- ③ David Bullock will be providing the latest information on a very important practical project to conserve some of the world's rarest

reptiles: *Round Island's reptiles under new management.*

Round Island is formed from half a volcanic crater, the other half being submerged. The island has an area of nearly 400 acres and is situated approximately 14 miles (22 kilometres) to the north and east of Mauritius in the Indian Ocean.

As with many other oceanic islands, during the 18th and 19th centuries, rabbits and goats were deliberately released as a potential source of fresh meat for mariners. Sailing ship voyages could vary in duration, as they were dependent on the vagaries of the weather. Adequate storage and provision of fresh food was a problem because the ships of the time lacked the refrigerated facilities of modern vessels.

However, instead of being an asset, the introduced animals have dramatically reduced the vegetation cover on this once-forested island, to the detriment of the native animals.

Round Island is inhabited by eight different types of reptile: two species of snake, three species of skink and three species of gecko.

Of these, four of the species are unique to the island — the two snakes: the Keel-scaled Boa (*Casarea dumamieri*) and *Bolyeria multicarinata*, the Round Island Skink (*Leiolopisma telfairi*) and the Round Island Gecko (*Phelsuma gauthieri*). The two species of snake are of particular importance because they are the only living representatives of the subfamily Bolyerinae — a primitive group of Boas.

Another species of gecko, *Cyrtodactylus serpinusula*, has a slightly wider distribution, being found on Round Island and nearby Serpent Island. The other three species, the skinks *Ablepharus bosonii* and *Gongylomorphus bojerii* and the gecko *P. ornata* are not so restricted in their distribution.

In 1980, the Jersey Wildlife Preservation started a captive breeding project to increase the numbers and, ultimately, re-populate the island with Round Island Skinks, Round Island Geckos and one of the species of snake, the Keel-scaled Boa. At that time, the Association for the Study of Reptilia and Amphibia (ASRA) was one of the spon-

sors for this imaginative captive breeding venture.

Further information about the progress with the conservation of these three species will be made available at the extended BHS meeting on 16 October.

TURTLE WATCH

During the summer months, female Loggerhead Turtles (*Caretta caretta*) nest on some of the beaches of various Greek islands, particularly Kefalonia, Zakynthos and Crete.

Several conservation activities involving the International Herpetological Society (IHS), the Mediterranean Association to Save Sea Turtles (MEDASSET) and Care for the Wild have been reported in past editions of *A & P*, including the December '88, July '89, April '92 and November '92 editions of *Herpetology Matters* and a feature article, *Turtle Saviours of Kefalonia* by Gordon Kay, in the May 1992 edition of the magazine.

Currently, the Sea Turtle Protection Society of Greece is recruiting volunteers to protect nesting sites from the time females visit the beaches and lay their eggs to when the hatchling turtles emerge through the sand and make their way to the sea. The conservation project also intends to increase public awareness to the plight of marine turtles.

Dangers which threaten the long-term survival of these reptiles include mopeds and 4-wheel drive vehicles being driven along beaches and over nesting sites, the disorientating effect of noise and lights from tourist facilities, trawler nets, baited long-lines at sea, and marine pollution.

The Turtle Protection Society began this year's conservation scheme on 25 May and it will continue until 10 October. If you intend to visit the eastern Mediterranean within the next six weeks and wish to become involved in the latter part of this project, contact the Society at the following address:

Sea Turtle Protection Society of Greece, Volunteer Section, Solomou 35, 106 82 Athens, Greece.

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Coldwater jottings

By Stephen J. Smith



How exciting it is to be able to write: "Whenever I visit Singapore..." OK, so I have only been there twice so far but, already, I feel comfortable enough with the place and its people that it has become almost a second home (if only...!).

However, having returned from my recent visit to Singapore to participate in *Aquarama '93*, I make no apologies for dedicating this month's *Jottings* to providing you with an insight into the coldwater highlights of the trip.

WHERE WAS THE FOUR-BUBBLE?

It was with eager anticipation that I approached the show, in the knowledge that I was going to be one of the first Westerners to see first-hand the Four-Bubble Goldfish, recently-developed in China and to be introduced to the outside world at *Aquarama*.

Sadly, this was the first of only two disappointments of the entire trip — no Four-Bubble!

Apparently, there had been some difficulty in transporting the fish to Singapore so, for the time being, it's hold on to your hats. If the fish won't go to the *Jotter*, then this *Jotter* had better make tracks for the fish...!

GIGANTIC FANCIES

What there was, however, were some mighty attractive (and mighty-sized) Fancy Goldfish, which I had the honour, not to mention pleas-

Singapore Special



ure, of judging; along with Swallow Aquatics' proprietor Mick Seaby, and Kazuki Kawakami of Kyorin Co, Japan (the manufacturer of 'Hikari' Koi food).

Imagine Orandas and Rancho with bodies almost the size of an English tea-plate? Or Ryukin bigger than the palm of your hand? I was delighted that we were all able to agree that the Grand Champion of the Goldfish classes was a pair of magnificent Hamanishiki (though it was extremely difficult to decide from 'the best of the best' of each of the five classes), exhibited by Woo Chong Kang.

It is worth noting here that the methods of showing fish were quite different to those at Goldfish shows in the UK. In this country, the fish are exhibited individually, while at *Aquarama*, the fish were shown in pairs, and in large glass tanks. Each of the tanks has air-operated mechanical filtration (an aspect which, if adopted, could, no doubt, help to reduce stress among fish on



If you are looking for top-quality Hamanishiki, you'd be hard-pushed to find a better specimen than this Grand Champion produced by Woo Chong Kang.



The winner of the Grand Champion Goldfish at *Aquarama '93* was Woo Chong Kang, whose pair of Hamanishiki were the best I have ever seen.

the UK show benches).

And, apart from the sheer size and quality of the fish, a further aspect which left a lasting impression upon me was the enthusiasm which the Singapore public had for seeing the fish! Throughout the two public days, thousands of people, in rows three or four deep, slowly filed past the tanks to appreciate the specimens on display. If only the public would show similar interest at Bristol, London, and Altrincham...

NEW GOLDFISH VARIETIES

Among the new varieties of fish displayed, one of particular note was a **Black Globe-eye Pearlscale**. I had the good fortune to meet the breeder of this fine specimen (though I am sworn to secrecy to reveal how he has, eventually, achieved such a fine result).



NEWS SERVICE

This is the first specimen of a Black Pearlscale Globe-eye to have been shown in public. This 'Aquarama '93 fish' is a superb example, with the rich sooty colouring extending throughout the body and finnage, including the undersides, which are known to turn brassy in varieties of black Goldfish.

However, what I found particularly impressive was that the blackness of the fish extended throughout the body

and finnage, including the undersides (where black Goldfish tend to show some brassy colouring) and that, according to the breeder, he is able to achieve a significant number of 'true' offspring from subsequent spawnings.

WOT, NO CRYPT?

During a trip to the aquatic plant and fish farms of Lim Kim Kiat (South Island Aquarium) in Malaysia, I was more than a little disappointed (as was John Dawes, who was with me on this particular excursion) to find that (probably) the last known remaining examples of *Cryptocoryne schulzei* in the wild would seem to have disappeared.

John covered this rare *Cryptocoryne*, and the tissue culture work that was being carried out on the species, in a feature article in *A & P* last year (July 1992) so, hopefully, as a result of the work John reported, the species may not, strictly, be lost.

However, I was grateful to have seen, and photographed, the plants during my previous



NEWS SERVICE

The last surviving natural specimens of *Cryptocoryne schulzei*, photographed in Malaysia in 1989.

visit, in 1989, but sad that this most attractive plant may have become, technically, extinct.

IN CONFERENCE

There really wasn't one talk which anyone interested in aquatics would have wished to have missed — I would dearly have loved to have attended them all. However, of those which I did select, the highlight of the conference sessions, for me, was to see Shigezo Kamihata, president of Kyorin Co, Japan, present a talk on the selection of good parental Koi.

This man has my utmost

admiration, not only for his intimate knowledge of, and enthusiasm for Koi, but not least for the fact that he delivered his talk in English. There would be little danger of me ever attempting to give a talk in Japanese...!

This was only the second time he has done so (the first was at Aquarama '89, where I also attended that talk). The insight which he provided, illustrated with some of the best Koi I have, or will ever, see (they were so well-defined they were almost unreal), significantly enlarged my own appreciation of the 'big fish of the coldwater scene'.

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The Grand Victorian Aquarium at Brighton, 1872.



The aquarium pillars are topped with elaborately carved sea creatures.

Victorian 'Bellamy'

The most prominent of these Victorian naturalists was Philip Henry Gosse, the son of a miniatures painter, born in 1810.

At the age of seventeen, he sailed to Newfoundland, where he worked on his book, *The Canadian Naturalist*, published in 1840. He also travelled to Jamaica, but eventually settled in Devon, owing to ill-health.

It was in Devon that he devoted himself to the study of seashore life. He wrote a series of books about the seashore, splendidly illustrated, thanks to the artistic talent he inherited from his father. These books were very popular and made Gosse a household name, a Victorian David Bellamy.

It was this skill of writing and painting that allowed him to transmit his fascination and enthusiasm of seashore life to a much wider public. This, in turn, led to many requests for him to lead trips along the Cornish coast. Dressed in a longcoat, fisher-

Early Days in Brighton

Stephen Savage traces some of the major stages of aquarium keeping from their Victorian origins.

Photographs by the author (With the exception of the reproduction of the Brighton Aquarium, 1872, all other pictures are reproduced with thanks to Brighton Sea Life Centre).

Fishkeeping is very high up the list of popular hobbies. Whether we are content with a community of tropical freshwater fish, or aspire to a tropical reef aquarium, as aquarists we are equally enthusiastic about all our aquarium inhabitants. Many of us, at

one time or another, have kept local marine fish and invertebrates and, for me, it was my first introduction to keeping aquatic animals.

Of all the aquatic habitats, the seashore is, by far, the most accessible to the enthusiastic nature lover.

ORIGINS

An interest in the seashore is certainly nothing new. In fact, during the reign of Queen Victoria, there was a great deal of interest in the no-man's land between the tides. Today, armed with our modern technology and expertise, we are able to peer ever closer in the private lives of even the most elusive marine creature. In this day and age, it is very easy to forget, and take for granted, the vast store of knowledge handed down by past generations.

As far as our coastline is concerned, it was the Victorian naturalists who scrutinised, studied and brought the wonders of the seashore closer to the public eye.



A Victorian mannequin gazes into a table top tank (reproduction).

men's boots and a wide-brimmed hat, he led an assortment of Victorian ladies and gentlemen across the rocky shore.

Ravaged Coasts

The then unspoiled coastline was full of living treasures waiting to be discovered by the seashore rambblers. The rocks were covered in lush seaweed growths and the walls of tidal pools were covered in sea anemones, while hermit crabs and other creatures scurried across the bottom.

Sadly, in true keeping with the Victorians' love of collecting, the Victorian parties were armed with collecting baskets, glass jars and, sometimes, even a hammer and chisel. This constant collecting eventually ravaged some stretches of coast.

EARLY AQUARIA

It was the discovery that fish were able to utilise the oxygen generated by aquatic plants that inspired the early marine aquarium. A surgeon named Ellis was thought to be the first to observe this. However, it was explored deeper by the chemist Robert Warrington and Gosse. The discovery of the balance between fish and plants was used by Gosse to establish the marine aquarium.

In 1854, Gosse wrote *The Aquarium*, which was full of information on building, stocking and running a marine aquarium. The book paid particular detail to the way the aquarium was stocked, so that the correct balance was established.

First Synthetic Seawater

Seawater was transported and carried in wooden casks and stone jars. To overcome the expense and difficulty of transporting large quantities of seawater inland, Gosse developed a formula for artificial seawater. This contained carefully measured amounts of Sodium Chloride, Epsom Salts, Magnesium Chloride and Potassium Chloride. Although crude by today's standards, many hardy marine plants and animals were said to survive and even thrive in this artificial seawater.

Gosse also went on to publish other important works including: *The Manual of Marine Zoology*, *Actinologia Britannica* (British sea anemones), *Evening at the Microscope* and *A Year at the Shore*.

First Public Aquarium

Gosse's marine aquaria were the inspiration behind the public aquaria we have today. It was due to the popularity of the home aquarium that the first public aquarium appeared.

In 1853, the doors opened on London Zoo's first salt and freshwater vivarium, or aquarium. The aquarium was stocked by Gosse, in tanks primitive by today's standards. The aquarium housed a variety of inhabitants, including periwinkles, prawns, hermit crabs and anemones.

Lacking aerators, thermostats, filtration and the other aquarium equipment today's

aquarists take for granted, maintaining a public aquarium was far more time consuming. To control conditions, blinds were pulled up and down to alter light levels, and a syringe was operated by hand to control the oxygen level.

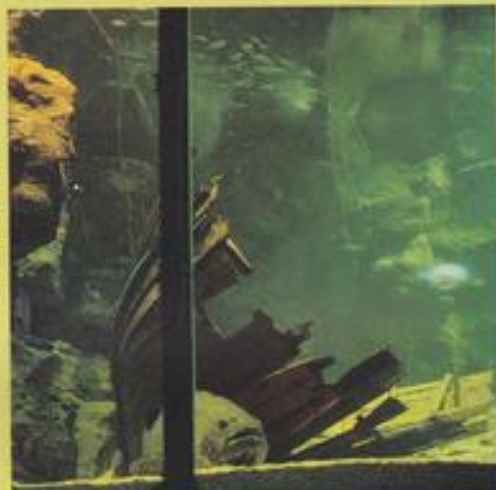
The London Zoo Aquarium stimulated even more interest in the home aquarium, which was to be short-lived. The difficulties in maintaining the correct balance of the home aquarium led to the death of thousands of sea creatures as the novelty wore off. This may not have been entirely a bad thing, as the constant collecting of specimens was beginning to have a drastic effect on the marine habitat.

ing techniques and the advancement of knowledge that took place there and in other early public aquaria.

In 1866, a London architect called Eugenius Birch, travelled to Boulogne to visit a public aquarium. He loved the seaside and was fascinated by the creatures that lived there. Birch returned home fired with enthusiasm to build a similar aquarium in England. His aquarium was to be built in Brighton, not far from the West Pier, which he also designed. Birch had hoped to incorporate his aquarium into the shore end of the West Pier, but objections were raised by the Town Council.

Brighton was also chosen because of its

The Victorian aquariums' inhabitants ranged from tiny shrimps to enormous groupers.



These same difficulties led to the closure of London Zoo Aquarium a few years later because of the manpower and expense that maintaining it involved. Even so, important lessons had been learned that would be utilised by other public aquariums and London Zoo's second aquarium.

Major Breakthrough

A major leap forward in British aquaria occurred with the opening of the Crystal Palace Aquarium in 1871. The aquarium was 400 feet by 70 feet wide and contained 60 large tanks, the largest being 20 feet in length and holding 4,000 gallons.

There were also 20 smaller tanks, varying from 40 to 270 gallons in capacity. In these the various sea creatures could be viewed from above, as well as from the front.

The Crystal Palace Aquarium created a great deal of interest in such living exhibitions and paved the way for the success of the Brighton Aquarium.

BRIGHTON: A CASE STUDY

The Brighton Aquarium must surely be one of the most famous of British aquaria and, although many changes have occurred, it still survives today. For this reason, it is at the Brighton Aquarium that I am going to take a closer look at the Victorian's fishkeep-

ing techniques and the advancement of knowledge that took place there and in other early public aquaria. Most of the aquarium was underground, due to height limitations imposed upon Birch. This was to prevent the aquarium from obscuring the sea view from the houses opposite, which were originally on the seafront until land was reclaimed for the purpose of building the aquarium.

The Brighton Aquarium officially opened to the public on 10 August 1873, to coincide with the annual meeting of the British Association for the Advancement of Science. (Unofficially, though, it had been opened in Easter 1872.)

Major Feat

The Brighton Aquarium was a great feat of design and construction. An elaborate superstructure containing a large clock, dominated the entrance at the top of the steps which led down to the aquarium itself. The aquarium consisted of several corridors, resembling a cathedral with large columns, and, on the top of each, sat an elaborately carved sea creature.

The aquarium was built to an overall length of 715 feet, which included three corridors and a conservatory. It also boasted the largest display tank in the world: 100 feet in length and 40 feet wide, which held 110,000 gallons of seawater.

This tank was designed to hold large specimens of sea creatures, such as porpoises and turtles. In fact, the aquarium received its first specimen of porpoise in 1874.

Seawater was (and still is today) pumped in from the sea and stored in a huge underground reservoir capable of holding up to 500,000 gallons. After a period of settling, the water could be pumped up to the aquarium displays.

Vital Factors

The successful keeping of aquatic creatures was made easier by the method of aeration used. Each tank had its own independent water supply, and air was pumped into each by steam power.

The tanks still did not have a filtration system, so the cloudiness of the water was partly overcome by using live oysters. Great numbers of large oysters were added to each aquarium tank, and apparently took about 10 days to render the water reasonably clear. Each tank also contained hermit crabs which scavenged on uneaten food, thus contributing to the water quality.

The large aquarium tanks were glazed with plate glass, 74in x 40in, and approximately 1in thick. It was thought that this glass would be able to withstand the water pressure that they were subjected to.

However, on several occasions, a pane of glass would suddenly split, spilling water and tank inhabitants into the aquarium corridor. It was considered that the difference in water temperature and the air temperature may have been a contributory factor. All new panes of glass were subsequently bedded in a rubber substance, and this seemed to cure the problem.

It is difficult to imagine and appreciate what it must have been like for Victorian visitors to the aquarium, who were truly seeing these wonders of the sea for the first time. Today, even the most rare creatures and the intimate moments in their private lives have been captured on film and are transmitted to our homes. No wonder such creatures were given names like "Sea Devil", "Water Horse" and "Sea Flowers".

Wide-ranging Collection

The Brighton Aquarium housed many examples of aquatic life, from the beautiful to the grotesque. The aquatic charges were under the care of two famous naturalists, Henry Lee and Frank Buckland. Henry Lee was the author of two books: *White Whale* and *Octopus*.

Under his supervision, the aquarium bred numerous octopus. The newly-hatched young and other rarities were shown to the visitors under a microscope.

Frank Buckland eventually became the first Commissioner of HM Fisheries. Under such dedicated and enthusiastic people as Lee and Buckland, the Brighton Aquarium provided major contributions towards the advancement of knowledge of marine life, as well as educating the public.

The aquarium exhibited many indigenous aquatic creatures. Freshwater fish were

represented by pike, perch, trout, bream and chub, to name a few. Marine fish included gurnards, flatfish, Conger Eels, rays, dogfish and bass. Noteworthy foreign fish included King Crabs (Horseshoe Crabs) from America, ornate varieties of goldfish from China, sterlet from Russia and mud-fish from Gambia. There was also a diving bird display, and the marine mammals exhibited ranged from porpoise to sealion.

Feeding all these creatures was no mean feat and several people were constantly employed to collect various types of live food. Common shrimps were one of the major foods used. At least 16 quarts (containing over 35,000 shrimp) were required each week to feed to aquarium inhabitants, such as Dragonets, Surlmullet (Red Mullet), cuttlefish and wrasse.

Sand hoppers were the chief diet of the smaller inhabitants, including anemones, sea horses and pipefish. Feeding time was always popular with visitors and was an ideal time to pass on interesting facts about the many inhabitants.

Diversification

It was realised as early as 1851, that the Brighton Aquarium could not survive solely as a scientific institute. Entertainment was therefore used to bring in extra revenue, which helped to support the aquarium institute for the continuation of research and education.

visitors who went to the aquarium for its entertainment value.

Over the years, many changes have occurred as the aquarium has had its ups and downs. It has, for example, seen the addition of a ballroom, later to become a motor museum, and a dolphinarium. Due to changes in attitudes towards performing animals, the dolphinarium closed at the end of 1990 and the dolphins were rehabilitated and returned to the wild.

Latest Developments

The Brighton Aquarium has now become part of the Sea Life Centre chain of aquariums. As you enter you step in to an area that has been refurbished in its former Victorian glory. The fish exhibited here represent species that would have been seen by Victorian visitors. Today's visitors are therefore able to experience the Victorian atmosphere before moving on to the more modern aquarium displays.

Many other public aquaria have been built since the Brighton Aquarium opened, far too many to mention here, but suffice to say that each has been able to use the experiences of past aquaria and make their own contribution to the history of fishkeeping.

The keeping of the home aquaria is again widespread. With the technological advances we have today, even a marine reef can be re-created in our own living room and, as our knowledge of fish increases and our tech-



Chinese carp, or goldfish, as they are known today, seen here in a reconstructed table top tank.

The aquarium therefore became more than just a place to marvel at the wonders of the sea. It became a place where ladies and gentlemen could meet, a place where you could read the day's papers and magazines, sample fine food and listen to good music. Many entertainment acts were provided at the aquarium, including an animal mesmerist and a performing bear.

Although many people now feel uneasy about the idea of mixing entertainment and animals, it has meant that the aquarium has survived through many hard times. This is more than can be said for Eugenius Birch's West Pier. Many millions of people have had the opportunity to learn and discover the mysterious creatures that inhabit the watery realm — supported by the many other

nology advances even further, there are plenty of challenges for the aquarist, particularly in the field of captive breeding.

THE FUTURE

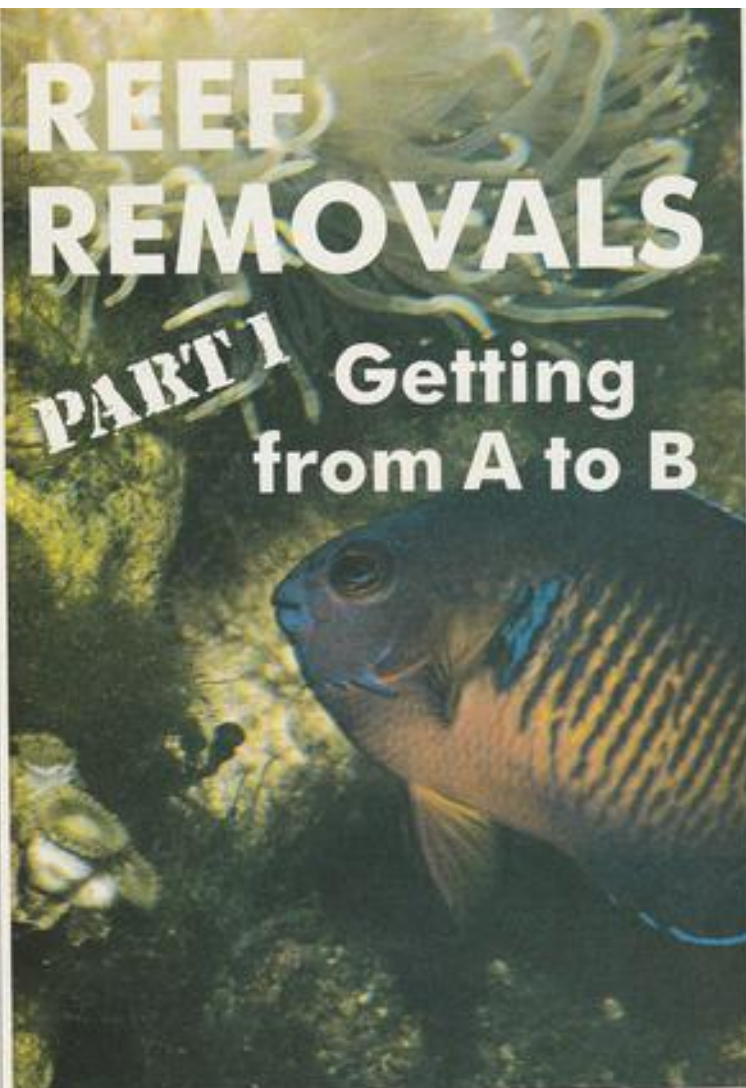
Fishkeeping has a very promising future as many more species of fish are now being bred commercially for the aquarium trade. Let us hope that we have learned a very good lesson from the mistakes made by our over-collecting Victorian ancestors.

Very few of us will ever have the chance to dive on a coral reef or join an expedition up the Amazon river, but home and public aquaria allow us to experience and learn about the aquatic life from far-flung, but sadly ever-decreasing, regions.

REEF REMOVALS

PART I

Getting from A to B



Beautiful though my Coral Beauty was, it had to go . . . but it didn't!

Moving house, as Philip Hunt can vouch for, is a lot more than *just* moving, especially when you've got a tankful of marines to think about.

Photographs by the author.

Moving house can be trying at the best of times, and these days, when many of us have to move with our jobs or to change jobs, it is something that we can expect to do several times in a lifetime. For aquarists, removals are further complicated if they wish to take their tanks and inhabitants with them. In practical terms, it may well be better to sell everything and start again, but it's difficult to dispose of a prized collection of invertebrates, or fish which have come to be pets.



The Curlicue Anemone (*Batholomea annulata*) — an unfortunate casualty of the move.



Leather Corals (*Sinularia* and *Lobophytum*) bagged up.

I found myself moving from York to Sussex when I took a job as a scientific writer, and decided to take my aquarium with me. It was a marine fish and invertebrate system which had been running for about two and a half years. It contained a selection of hard and soft corals, a *Tridacna* clam, a Curlicue Anemone, and various colonies of Mushroom Anemones and zoanthids. Fish were represented by a Coral Beauty, a Midas Blenny, a Common Clown and a Seven-lined Wrasse.

ORIGINAL SYSTEM

When I set up the aquarium, I didn't really intend it to become a 'reef' tank, so the filtration doesn't sound very impressive: a canister filter containing ceramic pieces for

the gravel. I came to this conclusion after seeing the huge numbers of bacterial colonies covering the Siporax when I cleaned the filter. It struck me that, as nitrifying bacteria require high concentrations of oxygen, by the time water hit the gravel, it had been deoxygenated by the bacteria on the Siporax, and so the gravel was serving no useful purpose other than providing a home for fireworms and a trap for mulm, which is difficult to remove from coral sand.

In theory, reverse-flow undergravels do not trap detritus, due to the upward flow of water; in practice, the flow is spread over such a wide area that it becomes very slow and weak, and particulate matter can settle easily.

I'm a great believer in protein skimmers as an essential part of the marine filtration

hopefully, cover any short-term loss of bacterial activity during transportation, and getting the skimmer running would minimise the amount of waste reaching the filter.

One good thing about the move was that it gave me a chance to take stock, as it were, of my livestock. I decided to trade in the Coral Beauty, which, as it matured, had developed bad habits, becoming rather aggressive (it had recently killed my prized Purple Firefish) and pecking at invertebrates. It didn't damage corals, but had dispatched my fireworms by biting off their crowns of tentacles repeatedly as they regrew from each previous assault. So, despite its good looks, it had to go.

I also wanted to get rid of most of my Mushroom Anemones, as these, though attractive and hardy, never seem to look their best in the turbulent conditions that most corals enjoy.

ALL CHANGE

Meanwhile, an offer had come in on the house and we duly accepted it. This, I thought, was fine, as four weeks or so would be ample time to mature a filter. Then things started to go wrong; our buyer announced that she wanted to move earlier than we would have liked, and, given the state of the market, we couldn't argue.

Also, I paid a visit to my local 'trop shop', with the intention of trading in my unwanted livestock for some of the hardware I needed, or, at least, getting rid of them. Unfortunately, they weren't interested, despite the fact that I'd been a regular customer and some of the things I wanted to get rid of had been bought there. So it looked as though I'd be moving more stock, rather more quickly, than I would have preferred.

Down in Sussex, I ordered a 36 x 15 x 15in (90 x 38 x 38cm) tank from a local dealer, and everything else I needed, including a stand for the tank. When I went to pick the tank up, however, it turned out that he couldn't get one of the required size for another fortnight; after the livestock was due to arrive! I wasn't exactly pleased about this, but, in desperation, bought a 36 x 12 x 15in (90 x 30 x 38cm) tank.

I now had a tank and stand which didn't match, but fortunately I had a spare 48 x 12in (120 x 30cm) stand which I used for plants, so the new one would be used to house my cactus collection and the four-foot used for the tank, with space to spare. The snag was that this stand would arrive only three days before the fish!

We'd arranged with our buyer to collect the livestock a couple of days after she'd moved in, and found a colleague to take the old tank, meaning that we now had to empty it as soon as the occupants were out, before we could leave for Sussex.

PREPARATIONS

It was a Wednesday evening when a pantechnicon appeared outside the flat, bearing the contents of our old house, including the stand for the new tank.

The following day, I set up the tank and set



Our car boot full of livestock and the big canister filter.

mechanical filtration, a polyfilter and X-phosphate as chemical filtration, with three litres of Siporax and a foam block as part of the biological filter, the rest theoretically being provided by the gravel bed of the tank, through which the outflow was pumped in a reverse-flow system.

It seems basic for inverts, but it worked. I never detected any nitrate in the tank water, even though, for the first 18 months, all the water going into it was made up using York tapwater ranging from 25 to 50 ppm nitrate.

The system wasn't without problems; the tank was prone to growing filamentous algae, especially when I stopped cultivating the seaweed, *Caulerpa*, and this led to maintenance being rather time-consuming, as did cleaning the prefilter.

I'd increased the amount of Siporax from one to three litres, as I became convinced that most of the biological filtration was happening in the filter canister and not in

system and, while I started with an air-driven countercurrent type, I adapted it to run on a powerhead and eventually, when funds permitted, bought a venturi type, which made a big difference to water quality, as judged by the quantity of unwanted algae.

INITIAL PLAN

I reasoned that in a stagnant housing market, I'd have plenty of time after starting the new job to set things up in Sussex, though this would mean paying both rent and mortgage for a while. The house was put on the market and I rented a small flat in Lewes.

The plan was to set up a smaller tank, mature a hang-on external filter, using a litre of Siporax as medium, and transport the existing canister filter, plus fish and inverts, to the new tank one weekend. The old tank was to be drained the following weekend. The matured filter on the new tank would,

about filling it, and hit the next snag. My new deioniser was short of a bung, which meant that I had to improvise one, but, eventually, I managed to produce enough water to fill the tank. The deioniser worked; the Lewes tapwater entered at 25 ppm nitrate and emerged at zero.

I added salt, put in the heater-thermostat, and a small hang-on external filter filled with coconut carbon, to circulate the water to dissolve the salt, and to pick up any amines, which some deionising resins leak into water, especially when first used. For marine fishkeepers, coconut carbon is ideal for this, as it does not leach phosphates into the water, unlike most other types.

After twenty-four hours, the tank was at the correct temperature and specific gravity, and it was time to make the six-hundred-mile round trip to collect the livestock. Unfortunately, this particular Friday happened to be the start of the spring bank holiday weekend.

I could only hope that the traffic wouldn't be too bad the following day, and my partner Emma and I set off late in order to miss the jams. We reached my parent's house near Doncaster, to stay the night, in about four hours.

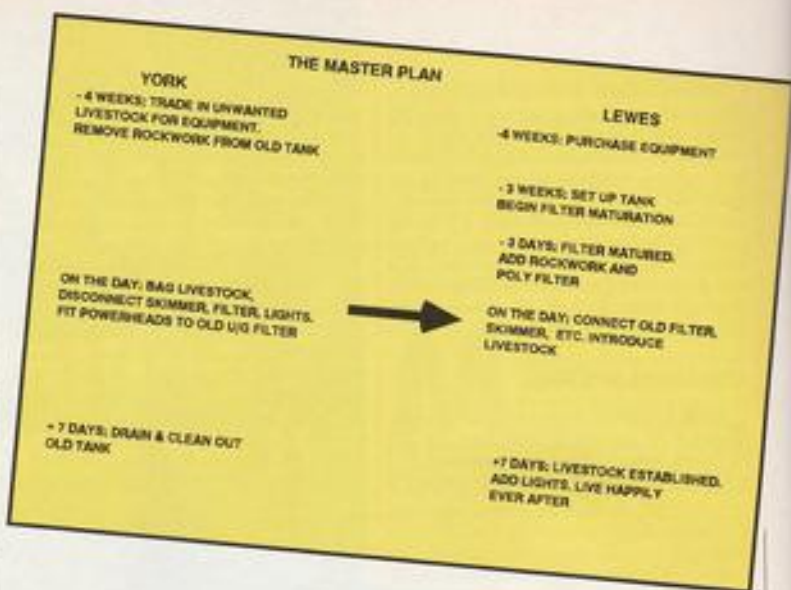
THE MOVE

The next day we arrived at our former home equipped with a supply of plastic freezer bags, and polystyrene shipping boxes. To carry everything we had a Volkswagen Golf, which we hoped would be big enough.

Once inside, we dismantled the hood, took out the bank of fluorescent tubes, took apart the spaghetti of wiring serving the lights, and disconnected the heater and thermostat. The hood was a home-made wooden one, which would be remodelled to fit the new tank. Then out came the circulation pump and skimmer.

Inverts First

The next task was to take out the livestock. The strategy was to take the hardest inverts out first, then the more delicate ones, followed by the fish, which we decided should be in the bags for as short a time as possible, as their oxygen requirements and rate of



waste production were much higher than those of the inverts.

Mushroom Anemones were first; these were bagged 'dry', simply placed into bags which were then sealed. Next came zoanthids and soft corals, in a small volume of water, then the hard corals, the clam, and a gorgonian. All the latter were bagged with plenty of water to keep them covered. The bags were stacked into polystyrene boxes.

The only invert remaining was the anemone, which was firmly attached to a large piece of rock. Unfortunately, the rock was chalk, rather than tufa, so it was impossible to break off a small section with the anemone attached. I tried to pry the creature loose with my thumb but without success, so we reluctantly decided to sacrifice it.

Fish Next

The next task was to catch the fish. The Midas Blenny was hiding in its usual home, a hole in the same rock that held the anemone, and was shaken into a bag. It had adopted a 'stressed' colour pattern; Midas Blennies are quite sensitive to stress, and so it was the fish that I was most concerned about moving.

The other fish were netted, bagged and

put into a shipping box, and the lid closed; the darkness would, hopefully, stop them becoming stressed.

Filter Last

With the livestock out, it was time to remove the filter and empty the tank. I turned off the filter, sealed the canister and disconnected the pipes. I tipped off some of the water to leave a reasonable surface area above the media for gas exchange.

It was then time for the messy part; the water was drained off and the gravel removed, along with a lot of mulm; so much for the gravel-cleaning abilities of reverse-flow filtration!

The fish had now been in bags for an hour and the inverts for somewhat longer. We loaded the car, and set off. The survival of the filter bacteria was the main concern; the only filtration available at the other end was of the chemical variety, and I tried not to think about those textbooks which suggested that turning off a biological filter for more than an hour or so was likely to end in catastrophe. In a few hours we would find out whether or not our plan would work.

TO BE CONTINUED

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FRIENDS AT AQUARAMA '93



The Singapore government's Primary Production Department — in association with Rainbow Aquarium — staged a display of captive-bred Red Dragon Fish which attracted large crowds throughout the show.



Horabagrus brachysoma — a sure-fire winner for the future — was exhibited by Aqua Marines of Sri Lanka.



Short bodies are, apparently, in. These Kissing Gouramis, photographed on the Keells Aquarium (Sri Lanka) stand were one of at least four types of short-bodied fish on show at Aquarama.

to see us, just to say Hello and tell us how highly they rate our magazine. Music to my ears!

There were, it must be said, some other aquatic exhibitors besides *A & P* at Aquarama '93 ... 75 to be exact, representing products from 139 companies from 22 countries.

Every single exhibitor I spoke to rated their presence there as a great success. If you take into account that over 70% of all the exhibitors came from countries other than Singapore, and that by the end of the show, some 73% of all the available exhibiting space for Aquarama '95 had already been pre-booked, this will give you a pretty good idea of just how highly Aquarama is now regarded within the international aquatic community.

Further confirmation of this comes from the attendance figures for trade visitors. At 3,170, from 44 countries, this year's total represents an increase of almost 40% on 1991. No wonder the organisers sound, quite rightly, and not surprisingly, so proud of their achievements in their final-analysis report.

SELECTED HIGHLIGHTS

So what was actually on offer at Aquarama '93 for it to be such an outstanding success?

For a start, this exhibition represents the largest gathering, under one roof, of fish, plants and every conceivable item of aquatic equipment and other dry goods you can dream of. Quite simply, there's nowhere else in the world that you could go to and find a comparable, exclusively aquatic, spectacle on this scale.

Whether you are a hobbyist or a member of the aquatic trade, at Aquarama you will find that there's always something round every metaphorical corner, just waiting to grab your attention.

New Fish

Aquarama always has a few surprises in this department. This year, three new fish — or new types of fish — are particularly worthy of note.

Short-bodied forms

Perhaps the best-known of the short-bodied fish within the hobby are Balloon Mollies and Blood-red Parrots. Both were present at Aquarama, the former in its Sailfin Green form, and the latter as the reddest Parrots yet seen at Aquarama or anywhere else.

In addition, I found several aquaria containing ... wait for it ... Short-bodied Kissing Gouramis!

There was even a short-bodied fish in the New Species/Varieties category of the fish competition. It was a Short-bodied Ram