

BULLETIN

MARCH 2015



**FEDERATION OF BRITISH
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COVER PHOTO:
Tropical Lily (*Nymphaea* sp.) by Malcolm Goss

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QUARTERLY BULLETIN

SPRING 2015

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Edited, published and produced for the FBAS website by Les Pearce

EDITORIAL

Welcome to the first Bulletin that I have been involved with since March 2008 and indeed, my first ever as Editor. Is it really seven years since I last had any involvement with the Bulletin?

I would like to begin by extending my sincere thanks to both the previous editor, Malcolm Goss and the FBAS Webmaster, Dick Mills who have both been very helpful in getting this, my first issue, into publication. I am sure that you would also like me to thank them both, on your behalf, for all of their past efforts in producing your Bulletin.

This issue contains a total of 36 pages, filled with information, and there is a stronger than usual accent on marines for a change. I would very much like to increase the number of pages but this can only be done with your help and input. Please consider putting 'pen to paper' and jotting down something for inclusion in the next issue. It need not be very long and if you are worried about spelling or grammar I will be happy to check it over for you before it is published. Why not write a bit about that new species you have just got or, perhaps, fish that you have just managed to breed. Perhaps you are building a new fish house or pond and would like to share the trials and tribulations of this with other hobbyists. A few accompanying photographs would be really useful. I am quite sure that others will want to read about it just as I hope you enjoy reading about the experiences of fellow fishkeepers.

Just send your article and photographs to me using the contact details below. Items are best sent as an email attachment but, if you prefer, you are most welcome to send them by post, either as a hard copy or on a memory card or stick which will, of course, be returned to you. Also if you have any constructive comments or ideas for future issues, I will be glad to hear them.

I hope you enjoy this issue and I look forward to an influx of new material in time for publication in the June issue.

LES PEARCE (FBAS Bulletin Editor).

Email: Les_the_Fish@sky.com

Post to: 44 Weeks Road, RYDE, Isle of Wight, PO33 2TL

FISH BREEDING

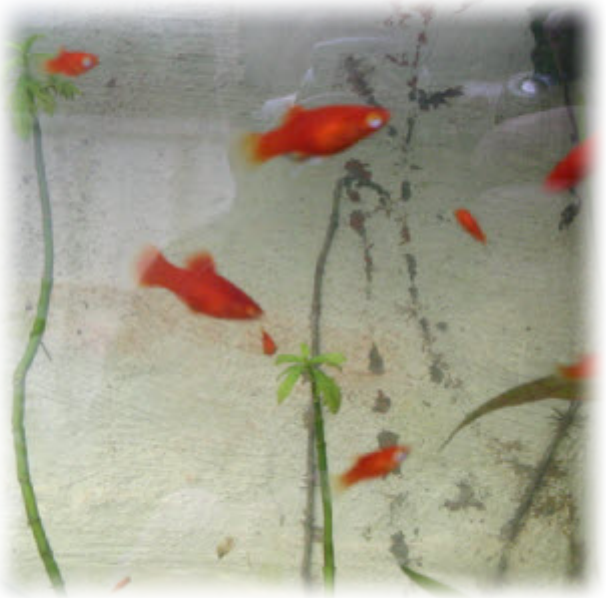
MALCOLM GOSS

Most aquarists keep livebearers and I was given some very nice Red Platies (*Xiphophorus maculatus*), often marked up in the shops as Coral Platy. Well, as far as I know there are no secrets about breeding cultivated livebearers other than giving them plenty of hiding places for the young so they do not get eaten.

Normally this means making sure the aquarium has plenty of floating plant such as Water Lettuce (*Pistia stratiotes*) or many of the common floating plants like Duckweed and Fairy Moss. But be warned, once you have introduced them into your tanks they not only grow like mad but are difficult to remove from any aquarium set up.

The most important feature of breeding these fish is to have good stock and rotate with new parents from time to time to stop your young fish from being deformed though to much in-breeding.

If you want a challenge why not try the humble little fish, the Bumblebee Goby (*Brachygobius xanthozonus*), with a yellow coloured body and three vertical bands of black, the last being across the caudal peduncle. As I said, a small fish that needs very little



space, the FBAS size guide is just 40mm. These fish need to be purchased at least five at a time and really up to eight or nine. Ask the seller what water they are in. Do not be surprised if you are told “tap water”. Less scrupulous dealers can often say things like this



when hoping to make a quick sale. If you feel at all concerned, do not buy them straight away. Keep checking their condition every day and after a week or so, if you are happy with the look of them, then go ahead and buy them. Ask for them to be placed in the largest bag possible so you also have plenty of water to go with them. They do not like soft acidic water so add teaspoonful of sea salt and set a temperature of 70/72° Fahrenheit (21/22° Centigrade).

Feed them on Daphnia and Tubifex as well as frozen brine shrimp and frozen blood worm to bring them into breeding condition. They like spawning in small caves made from slate or smooth boulders and rocks on a sandy bottom. They like to select a cave, so make up to five or six. Once a pair have selected their cave, turn up the thermostat one or two degrees each day until the temperature reaches 80/83° Fahrenheit (27/28° Centigrade). These fish do not like stale water so change about 10 percent each day. The female will get larger each day while the male protects the cave. The females are a bit selective about the males but, given time, the female will enter the cave and deposit her eggs while the male joins her to fertilise the

eggs, this may well take an hour or so. The male takes on the role of guarding and fanning the water over and around the eggs which will go on for a week. After a second week the fry will leave the cave and swim about looking for food, they have no colour and just look like a pair of eyes with a tiny tail. Feed on liquid foods, infusoria and, later, newly hatched brine shrimp. With a mature sponge filter operating and daily water changes of 10% at a high temperature of 85° Fahrenheit (29° Centigrade) when added, but no more, and they will grow quickly.

It is a good idea to remove the female after spawning and then the male after the fry move out from their cave. The parents should not be placed together again until some months have passed.

I have also had success with Emperor Tetras (*Nematobrycon palmeri*) from three pairs that were given to me by Bernie Mould of the late Hendon Fish club. They are in a long thin aquarium of 90 x 25 x 25mm given to be some years ago by Tom Glass, also of Hendon Fish club. The tank has a sandy bottom and is crammed full of plants. The water is half tap and half rain water. I feed the fish on flake and frozen blood worm. The tank has a temperature of 76°



Fahrenheit (24° Centigrade). Without me doing anything, the newly born fish just appear out of the plants.

DOWN BY THE SEA

DEREK SANDS

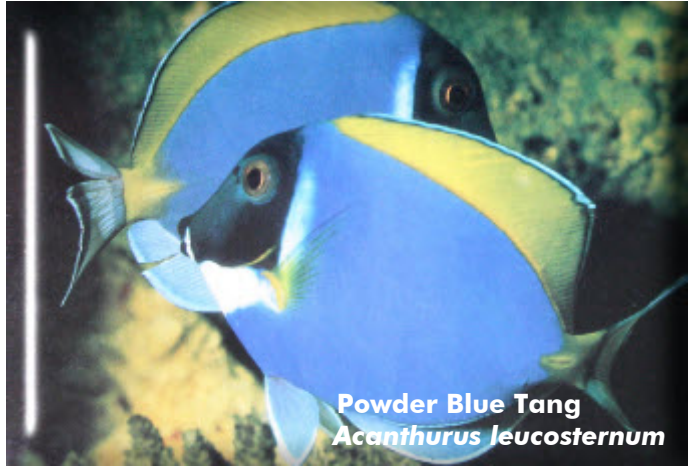
The tropical marine aquarist often gets left out of the Bulletin so we are going to try and change that with this article in the hope that we will hear from those who keep these magnificent fish that live in the world's tropical oceans.

The Clown Trigger (*Balistoides niger*) is truly a fish to behold, not only for its colour but also in its character. Coming from the Indo-Pacific area around the Maldives, it reaches a size of 300mm. Juveniles can be found nearer to land in reefs but the adults swim in open waters within a temperature range of 24-27° Centigrade. It is an ideal fish for the marine aquarist as it has a tough, boisterous character and will respond to hand feeding. Sadly it has not been bred in captivity.



Clown Trigger
Balistoides niger

The Powder Blue Tang (*Acanthurus leucosternum*) comes from the Indo-Pacific and lives within large reefs. It is full of colour. However it can be extremely territorial and that is shown in the picture with two fishes squabbling over territory. They thrive on a varied diet including vegetable flake, shrimp and blanched lettuce.



The Flame Angel (*Centropyge loriculus*) is found in Hawaii and the Western Pacific Ocean living among coral reef outcrops. It reaches a

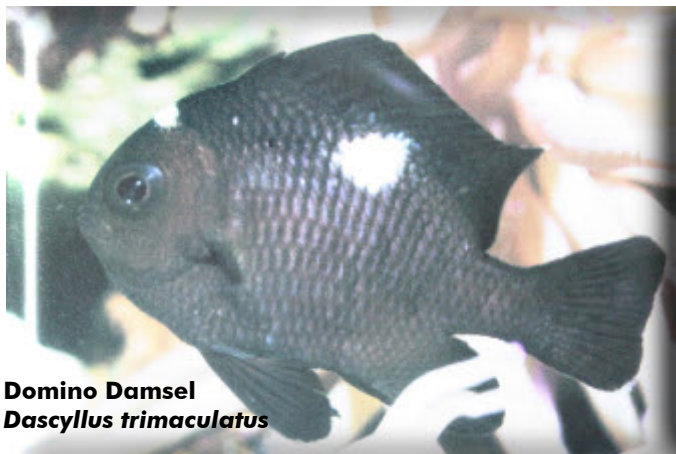


size of 90mm. With its bright red body and being small in size makes it ideal for any marine community.

Although expensive to purchase, the Flame Angel is a much better buy than many of the

larger angels because of its small size. They enjoy finely shredded shrimp, good flake food and live brine shrimp. Spawnings have occurred in the aquarium, but the fry require micro plankton which is difficult to provide.

A very common species with the marine aquarist is the Domino Damsel (*Dascyllus trimaculatus*). It is widely found in the Indo-Pacific. Juveniles form large schools whereas adults, as with clown fishes, pair off and become extremely territorial. Individuals can be aggressive towards other fish. They have a tough character and outlook which makes them ideally suited to new set ups.



Domino Damsel
Dascyllus trimaculatus

The Red and Black Anemone Fish (*Amphiprion melanopus*) are very widespread, ranging from Indonesia, New Guinea, Queensland, the Solomon Islands, New Caledonia, the Fijian Islands and the Marshall Islands. It reaches a size of 100mm and it is easily recognised with its golden orange body marked by white/bluish vertical band that is formed just behind the eye and a large black patch over the later part of the body. An aggressive clown species which can be kept in smaller marine communities providing the companion fishes are robust. The breeding of this fish has been recorded in the aquarium.



Anemone Fish
Amphiprion melanopus

THE FLUVAL SEA RANGE

A REMARKABLY HIGH QUALITY LINE OF EXCEPTIONAL PRODUCTS FOR SALT WATER AQUARIUMS

LES HOLLIDAY

It is a little over two years ago that Fluval first launched its premier Fluval Sea range aimed at novice and serious marine aquarists alike. This impressive, high quality and well thought out line of merchandise for salt water aquariums was introduced by Rolf C. Hagen as an extension of their well established core Fluval aquatic brand which already has earned a successful reputation over 35years experience.

Fluval Sea is a really welcome addition to the Fluval range, offering an entirely, newly developed array of aquatic solutions for all marines enthusiasts, whilst reflecting the same attention to quality and good design expected from the

Fluval brand. What's more this remarkably high quality line also provides a very comprehensive array of all that's needed to set up a simple or advanced form of marine system including lighting, a high quality series of pumps dedicated especially for marine aquarium use or highly effective protein skimmer and a complete supporting range of necessary dry goods including a premium mix of pro-formula marine and reef salt and an extensive line of marine liquid supplements. Complete Fluval Marine Aquarium Sets are also available incorporating full material Fluval Sea specs in 54, 90 and 135L sizes.



A closer look at the Fluval Sea collection soon confirms that it's the Reef Performance LED lighting that invites the most attention. This range of Marine Reef Performance LED strip lighting incorporates an LED spectral combination which equals a complete multi-spectrum solution for marine and reef aquarists both optimal for life in the aquarium and of a spectral valve that is best for human observation. To achieve this the Fluval LED lamps feature a balanced

combination of six unique LED band widths including actinic blue wave lengths for full spectrum coverage. This provides key spectral reinforcement to allow a balanced combination for optional coral photosynthetic activity for growth and for viewing. In scientific terms, incorporated in each LED lamp are wave bands in the visible spectrum for normal human sight ranging from violet at 400nm (measured on a nanometer scale) to red at 600nm, the green-yellow range of 500-600nm where the eye sees the best and brightest colours. Colours appear 'most normal' to us when light is rich with wavelengths within this range. The best wave bands to promote strong coral growth and colour, on the other hand, are linked to the light waves which encourage photosynthesis, the key being the absorption of light by chlorophyll which has strong peaks in the ranges 400-450nm and 600-650nm. These bands are both strongly represented, as also are blue-green light band waves in the 400-550nm range which are dominant at depths where corals occur in nature. The spectral combination available from the Fluval LED lights is therefore ideal and these lamps rank amongst the best in spectral quality lighting terms for a marine aquarium, available at the present time.



LED lighting has many other advantages for marine aquarium illumination. The LEDs are tiny light emitting diodes that, unlike other more conventional forms of aquarium lighting which emit light from vacuum or gas, are solid in form. This means the LED diodes are highly resistant to shock and wear and have a lamp life of up to 50,000 hours, equating to around ten years normal use combined with little significant deterioration in light output and spectral value. It's also, not surprising that resulting from savings in energy costs, as compared to more conventional lighting, systems, can be quite considerable due to LEDs

delivering much higher useable and visible light sources. In looking for further savings by comparison with conventional light sources it should also not be overlooked that being cool running in operation, with minimal heat transfer to the aquarium, can often overcome the need for fan cooling in summer or the use of other forms of cooler.

Moving on to other gems in the Fluval Sea collection brings us to the Fluval Sea Internal Protein Skimmer which, for its relatively small size and ultra-silent performance, delivers an outstandingly large organic removal capacity. The easy to maintain design features an innovative rim connector which slides on and suctions to the glass for extra secure stability and easy to adjust foam collection cup. This skimmer provides pure reef-like water conditions thanks specifically to the Turbine Air Injection system featuring a 24 blade turbine.



An equally vital requirement in any marine tank, especially for sump-equipped marine systems, is an efficient, quiet running, high performance pump. The Fluval Sea SP2 55watts model and SP4 95watts model cover most needs with



powerful flow rates and head delivery. Special features are: submersible/dry use, impeller and bearing made from superior wear resistant Alumina Ceramic and as an extra with the SP4 model, Smart Pump Technology which is a digital control system that controls directional start up and monitors RPM. This innovative design is also

equipped with a thermal switch which will temporarily shut the unit off during abnormal conditions such as a blocked impeller.

An additional range of Fluval Sea pumps is designed to simulate natural reef currents identical to those found on flourishing coral reefs. The CP1 model is designed for aquariums with 30-60L capacity, a CP2 model for 60-100L capacity systems, CP3 for 100-200L systems and CP4 for 200-350L capacity systems. Aquarium mounting is easy using the unique suction system (CP³/₄) which allows versatile installation positions. These efficient circulation pumps are outstanding also for creating the kind of indirect water currents which corals prefer.

In the vast expanses of our oceans there is a virtually unlimited supply of trace elements. However, over time because they are involved in and affected by various biological and chemical processes. It's important therefore to supplement marine aquariums regularly with a range of trace elements so that there are always sufficient amounts available to ensure the health and well-being of aquatic life in your tank.

The Fluval Sea range of marine supplements consists of seven different treatments including Alkalinity, Calcium, Magnesium, Iodine, Strontium, 3-Ions and Trace elements.

However, before considering these supplements in more details let's look first at the role played by partial water changes using Fluval Sea Marine Salt. Although the main purposes of periodic water changes, using sea



salt mixes, is to manage the accumulation of nitrate, phosphate and other organic substances and to maintain adequate pH levels they also assist in maintaining natural sea water concentrations. Fluval Sea Marine Salt is ultra

pure and ultra consistent and as well as containing optimal salt levels at an SG of 1.023 is equally generous in amounts of alkalinity rated at 2.9-3.5(meg/L) calcium at 460(ppm), magnesium 1250-1350(ppm) and strontium 8-12(ppm) are also included.

Whilst regular water changes of 10-25% using a salt mix with this kind of high calcium levels and additional buffering capacity can be a practical means of raising calcium levels and maintaining an inexpensive calcium and alkalinity management system it may not fully keep up with the demands of growing corals. The range of Hagen Sea supplements are designed to avoid any discrepancies in this area and also to micro manage the levels of the other essential elements.

The whole Fluval Sea range has been researched and developed with long term performance in mind and offers the marine aquarist a detailed and comprehensive package of products meeting stringent stability requirements to ensure that captive vertebrates and invertebrates alike can enjoy ocean-like condition.



2015 EVENTS DIARY

**All information correct at date of publication.
FOR FULL AND UP TO DATE DETAILS VISIT:**

www.fbas.co.uk

BLA Spring Auction 10am, The Rockingham Ctr, Sheffield Rd, Hoyland, Barnsley South Yorkshire S74 0PY.	20/03/15
Catfish Study Group Convention	19-22/03/15
Derwentside AS Open Show & Auction	22/03/15
A.S.A.S. Open Show	22/03/15
Greater Manchester Cichlid Group Auction 1.15pm	29/03/15
Ryedale A.S. 30th Anniversary Day	29/03/15
Castleford Open Show and Auction 1.00pm	19/04/15
North East Tropical Society Show and Auction	26/04/15
MID-SUSSEX A.S. Open Show	26/04/15
West London and Kent B.K.A Auction	26/04/15
North East Tropical Society (NETS) Open Show & Auction	26/04/15
EASTLEIGH & SOTON A.S. Open Show	09/05/15
Bradford Spring Open Show Auction	10/05/15
CORBY & D A S Open Show	17/05/15
Derwentside AS Auction	17/05/15
Glenrothes A.S. Open Show	17/05/15
SOUTHEND, L & D A S Open Show	30/05/15
Greater Manchester Cichlid Group Auction 11.15pm	31/05/15
STAMPS Open Show & Auction	31/05/15
BRACKNELL A.S. Open Show	13/06/15
Ryedale A.S. Open Show and Auction	14/06/15

HOUNSLOW & D.A.S	20/06/15
OASIS Auction	21/06/15
S.E.CICHLID GROUP/BCA Convention	28/06/15
Y.A.A.S Open Show	05/07/15
Castleford A.S. Catfish and Loach Show/Auction	12/07/15
N.E.Yorkshire Group (BKA) Open Show	19/07/15
N. E. Goldfish Society Open Show	19/07/15
TTAA Fish Only Auction	26/07/15
Friends of Yorkshire A.S. Open Show and Auction	16/08/15
North East Tropical Society (NETS) Auction	16/08/15
Castleford A.S.Night Auction	19/08/15
BCA Convention	06/09/15
Catfish Study Group Open Show	20/09/15
West London and Kent B.K.A Auction	20/09/15
FESTIVAL OF FISHKEEPING	3-4/10/15
Bradford A.S. Open Show and Auction	08/11/15
Castleford A.S. Night Auction	18/11/15

IF YOU ARE PLANNING OR RUNNING AN AQUATIC EVENT SUCH AS A SHOW OR AN AUCTION THEN WHY NOT GET IT PUBLICISED FOR FREE BOTH IN THIS MAGAZINE AND / OR ON THE FBAS WEBSITE.

CONTACT

BULLETIN EDITOR: Les_the_Fish@sky.com

WEBSITE: webmaster@fbas.co.uk

BUILDING A NATURAL SWIMMING POOL

PART 2



MICHAEL LITTLEWOOD
Photos: ALAN LAMBOURNE

We are now well into the New Year and all the digging is complete. You may well have the deepest part of your pond filling up with rain water already. This will need to be either taken out with a bucket or better still use a pump. Maybe you could hire a sump pump, this type of pump can take the water to the last drop, well almost.

At this stage I find it easier to cement the bottom of the pool as this will give a solid base to build up the sides with breeze blocks. One can use railway sleepers standing upright side by side. New so called

sleepers are cheaper than the originals. You may wish to use “ready-mix” to make things easier, but take care to order the correct amount. Too little, what can you say? Too much and you just don’t know what to do with it.



Now let it take a few days to completely “go off” and you can start to build up the sides with cemented in breeze blocks. Always hunt round for the cheapest. Bring this inside wall up to a level that will be four to six inches below the highest water level of the planted area.

There is no need to cement the marginal area, but that’s up to you. Building an extended decking at this stage is easy. It is made so that the starting edge is firmly on the ground and reaches over to be supported on the diving wall between the swimming and the marginal areas. Remove this before you start placing the pond liner in place.

Before you fit the liner you will need an underlay, some pond builders use old carpets or sacking, but a professional lining material is not only cheap, but is much easier to work with. Cover all the areas that the liner will cover and sweep out the base and sides before you start. With this size of pond you will not get a rubber liner that covers the whole area due to the restricted width on a roll at your aquatic outlet. You will need to take the pond measurements, including the sides and marginal areas, to the water garden specialist. It would be a big help to them if you can supply either a drawing or photographs of what you have done. As it looks like an overgrown upside down top hat, the manufacture can make it tailor-made. When it is ready for collection ask if can they deliver it, at this stage the liner is not only very awkward, but very heavy due to its size.

When you have the liner on site, try to get as much help as possible. If possible up to six strong men, and do not start at the end of the day but early in the morning while they are all fresh and ready to help. It



takes a lot of care not to move the underlay so start by getting the main swimming pool area of the liner into place first. Then pull the sides up and over the dividing wall into the marginal area. There may be lots of crinkles over the base, but do not jump in wearing hard soled shoes and place the base of your ladder on a plank of wood to stop it digging into the liner in the same way that your shoes would. Once you are sure that you don't need to get into the base of the pond any more, you can start to fill up with water. As the water level rises, ask all your helpers to keep pulling up the sides to keep it all straight with no crinkles. Once the water level reaches the top, or very near, stop the water. Maybe have a cup of tea and give yourself time to look and think how it is all going.



If you are going to finish with grass right to the edge of the marginal area you will have to lift the lawn edges by at least 30cm (12") to place the trimmed liner edge under the grass. For those building the side walls of ether brick or wood do not trim the liner until this area

is also filled with water. While this is being done it is a good time to get a qualified electrician in to lay all the wiring, waterproof plugs and sockets etc. He or she will add an extra fuse box isolating the pond installations from the main house supply.



Next time, in part three, we will be finally installing the pond pump and filling up the marginal area with aquatic plants. Then you can go for a swim. Keep your fingers crossed!



THE TROPICAL LILY

Nymphaea sp.

THE
GREEN
CORNER

Information: Tropica, Denmark
Photos: Malcolm Goss



Many of us buy or see lily bulbs in our local aquatic shop and pass them by. They look nothing, just lying in an aquarium on the gravel and this is not surprising as they most likely have no species name either. Most times, even if they had their leaves you would still not be able to say what species they were until they come into flower.

These lilies are not what you see in public glass houses like Kew Gardens with big leaves and large flowers.

Before forming floating leaves they form underwater leaves. If you don't want floating leaves, prune both the roots and leaves. With this attention the plant can grow underwater leaves for many years. Flowers can be more fully appreciated in open top aquaria. A nutritious bottom substrate encourages growth. This can be done by rolling some clay into a small ball and pushing it into the gravel about 25mm down and close to the bulb without disturbing it, so forming a slow fertiliser.

Next Issue: Plants needs shade, light plus CO2.



TRUE BLUE

Article & Photos by:
MALCOLM GOSS

With it being election year and the general election itself only weeks away you may be excused for thinking the Bulletin has gone all gaga. But the Fighters (*Betta splendens*) down my local shop are just getting better and better. The males, many of the large finned type with fantastic colours, are not only multi-coloured but there are single colours of red, green and different shades of blue. Many of these type of Fighters were to be seen at last years Festival of



Fishkeeping and many were on sale there as well. These being at a fraction of the price of those in my local shop.

All too often female fighters are not on sale at the same time as the males and after asking my shop, they then got in some females that matched the males. I have only FBAS Booklet No. One (Cultivated Tropical Fish Standards) as the Federation's guide to the show standards of Fighters so I hope the Federation's Judges & Standards committee soon print an update on these new fantastic Fighters.



EDITOR'S NOTE:

The FBAS J&S Committee are, indeed, in the process of updating and expanding the standards and guides to accommodate the many different varieties of *Betta splendens* that we are seeing more and more of on the show bench and several drawings have already been produced for judges use. Watch this space!



AQUARAMA AND PET ASIA 2015 RETURNS HOME



Yes, Aquarama and Pet Asia are returning to Suntec Singapore Convention & Exhibition Centre, its home for several editions prior to 2013.

At the time of the 2013 event, Suntec was undergoing major refurbishment and was, consequently, not available. However, we

are happy to announce that the S\$180-million modernisation programme has now been completed, opening the way for the return of Aquarama and Pet Asia to a venue that is highly popular with both trade and public visitors.

Aquarama 2015 is scheduled to be held from 28th to 31st May 2015, in Halls 401-403 on Level 4. Pet Asia 2015 will follow suit, re-enforcing its close association with Aquarama, at the same time, emphasising its own identity by being housed on Level 3 Concourse.

In the words of Jennifer Lee, project manager for both events, “There are many reasons why we are delighted to be returning to Suntec. For a start, it’s a venue where we have enjoyed great success, despite the challenging economic climate we’ve had to face in recent years. It’s also a world-class venue located at the heart of Asia’s most integrated meetings, conventions and exhibitions hub.”

Conveniently located in the Central Business District, and minutes away from Singapore’s entertainment and cultural attractions, Suntec’s great accessibility offers direct access to 5,200 hotel rooms, 3,100 parking spaces (the largest parking facility in Singapore), 1,000 retail outlets, 300 restaurants and 6 museums. The venue is also only 20 minutes from Changi International Airport.

As part of its ongoing initiative to use technology to change the way people look at the MICE (Meetings, Incentives, Conferences/Conventions, Exhibitions/Events) business, the new-generation Suntec now offers high-quality WiFi connectivity to delegates, allowing free, high-speed WiFi that permits up to 6,000 devices to be connected simultaneously throughout the entire facility.

Thus, Suntec is a world-renowned venue of technological excellence for events such as Aquarama and Pet Asia – a perfect location, all in the heart of thriving, exciting Singapore.

For further information on Aquarama and Pet Asia event, please visit the shows’ respective websites: www.aquarama.com.sg and www.petasia.com.sg.

FEEDING TROPICAL FISH

DR. DAVID POOL



A quick search of the internet or flick through an aquarium book will quickly reveal the large number of different fish species which can be kept in a tropical freshwater aquarium

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

In the confines of an aquarium the fish rely on us to provide the correct food and in suitable quantities. Fortunately there are a wide range of dried, frozen and living foods available, which allows the natural diet of the fish to be recreated and results in healthy, lively and colourful fish.

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

An indication of which of the many foods should be given to a particular fish can be obtained by considering what the fishes natural diet is comprised of and where they feed.

On the basis of their diet it is possible to divide all fish into three broad categories: Herbivores, Carnivores and Omnivores.

Herbivores.

Herbivorous fish are those which consume mainly or exclusively plant material and include species such as the Flying fox, Otocinchlus, tinfoil barbs,

plecostomus and Malawi cichlids..

These fish have a number of characteristics which allow them to feed on plant material. One of these is their intestine, which may be 2-3 times as long as their body and which has no recognizable stomach. The long intestine allows the fish to make maximum use of plant and algae material, which is very difficult to digest. Despite their long intestine, herbivores need to feed regularly if they are to obtain sufficient nutrition to survive. This behaviour can be seen by anyone who keeps mollies or plecs, for example. These fish can be seen to graze continually on any algae that is growing in the aquarium.

In order to keep herbivorous fish it is important to provide a diet that is rich in vegetable material. There are a number of flake, stick, pellet and tablet foods available which make an ideal base for the diet. This can be supplemented by algae based treat tablets and fresh vegetables such as slices of cucumber or peas.



Mini Algae Wafers

Because digesting plant material is relatively inefficient, herbivorous fish tend to produce a lot of waste - but fortunately it has a relatively low protein content and so does not pollute the water too badly.

Carnivores

Carnivorous fish are those which eat meat. They can be subdivided into piscivores, which feed largely on fish (eg pike cichlids and pike top livebearers) and insectivores, which feed on insects and their larvae (eg hatchet fish and archer fish).

Compared with herbivores, these fish have very short intestines, often only as long as their body. They also have a muscular stomach, which can expand to accommodate a large meal. This short intestine is all that is required to digest and absorb a diet which is rich in proteins.

Unlike herbivores, carnivorous fish do not feed continually. Instead they feed for short periods and then remain inactive for several hours or even days while the meal is digested.

It is relatively easy to distinguish a piscivorous fish just by looking at it. These species are adapted to catch fish, with large mouths and teeth to stop their prey escaping. They also tend to have lots of their fins towards the back of the body, allowing them to suddenly accelerate and catch their prey.

Insectivorous fish also have teeth (even neon tetras!), but they tend to be less well developed and less obvious than in the piscivores. However they are still important to ensure that the living food items don't escape

Carnivorous fish require a diet which is rich in protein so that it can be digested in their specialized stomachs. Again there are a range of flakes, sticks, pellets and frozen foods specially formulated for these fish. The foods are often in bigger pieces to replicate the size of food eaten naturally. For some of the more specialised species, manufactured diets are often ignored - particularly when you first get them. They need to see something that moves to trigger the feeding response. For these fish live foods such as bloodworms or shrimp may be needed.

Omnivores.

The majority of fish kept in a tropical aquarium are classed as omnivores. These tend to be opportunistic feeders which will feed on whatever food they come across, including both plants and animals (fish and insects).

These opportunistic feeders tend to be easier to feed within an aquarium as they will eat most foods providing it is of a suitable size and at the correct level within the tank.

Food Size

In selecting a suitable diet for our fish it is important to consider not only what type of food they would eat in the wild, but also the size and where it should be given in the water.

The size of food to give a fish is largely governed by the size of its mouth. If



Tropical Fish Flake Food



Tropical Fish Granular Food

the food particles are too large the fish will either break it up or ignore it. On the other end of the scale, large fish will ignore small particles of food or cause many of them to sink to the bottom of the aquarium where they remain uneaten. In either scenario, we end up with uneaten food which may decompose and pollute the water.

Flaked foods, either crumbled or fed whole are ideal for small and medium sized fish. The flakes may be eaten at the water surface, as they sink or from the bottom, depending on the fish species concerned. Sinking granules offer the same possibilities, though they don't stay on the surface for very long.

Larger fish (greater than 10cm) are best offered a stick or pelleted food. These foods are in bite sized pieces with no small particles which may remain uneaten.

Position in the Water

The fish which we keep in our aquaria will naturally feed at different levels in the water. Fish which prefer to feed at the surface have upturned mouths eg swordtails, mollies and hatchet fish. This allows them to feed whilst remaining almost horizontal in the water. Such behavior provides an obvious advantage if danger threatens, when they can swim quickly away without having to straighten up first. Floating foods such as flakes, sticks and pellets are the best choice for these fish.

Bottom feeding fish tend to have down turned mouths for the same reason as the surface feeders. Tablet foods, sunken flakes or sinking pellets are the required for these species.

The remaining fish feed in midwater, but can also take food from the surface or substrate. These species tend to have forward facing mouths and have to point up or down when feeding at the surface or bottom. All types of food can be given to these fish, though those which float and then gradually sink are perhaps the best (eg flakes and slowly sinking granules)

Quality Vs Quantity

With so many foods to choose from it is difficult to know what is a good food and what is not so good. Unfortunately the fish don't help here as in many cases they will eat any food you give them if they are hungry. However it is what they do with the food that is important. Poor quality foods may be eaten, but little will be absorbed by the fish resulting in a lot of waste. This waste needs to be removed from the water before it decomposes and results in raised levels of potentially dangerous pollutants (ammonia and nitrite). In addition it can cloud the water and/or encourage unsightly algal growth.

Developing a good fish food costs money, as do high quality ingredients, so it will come as no surprise that a good quality food costs more per gram than one of lesser quality.

Don't be mislead into thinking that an 'inexpensive food' is better value than a higher priced option. The food conversion ratio is a measure of the amount of fish tissue (in grams) that is formed by every gram of food eaten. Good quality foods will have a low Food Conversion Ratio of between 1 and 2, meaning that most of the food is used by the fish to form tissue. As a result there is very little waste. A poor quality food, by contrast may have a FCR of 4 or more - meaning that if 4g of food is given, only 1g is formed into fish tissue and approximately 3g passes through the body of the fish as waste. The figure is actually slightly less than 3g of waste, as some of the food will be used for energy production (to allow the fish to swim, breath etc). The 3g of waste in this example needs to be removed by the filter or manually to avoid it decomposing and polluting the water.

Continuing with our example - to get your fish to grow by 1 gram you would need to add 1 - 2 grams of a good quality food, or 4 grams of a poor quality food. Is that good quality food twice as expensive as the poor quality one?

Assuming you are using a good quality food, you will only need to feed your fish once or twice a day on as much as they will eat within 1 minute. That may not seem very much food, but commercially available foods are very concentrated. Look at the moisture content and you will see that it is between 6 and 10% in a flake or granular food. Natural foods are around 90% water - that is 10 x less nutrition per gram of food.

Adding Colour

The colouration of a fish is produced by three colour pigments which are largely contained within cells called Chromatophores. The 3 pigments are Erythrin (Red), Melanin (Black), and Xanthin (Yellow) each of which occurs in different chromatophores. Complementing the colour pigments are irridocytes, which are best described as tiny reflective spheres within the skin.

All of the colours we see in freshwater fish are a mixture of these components. For example orange is a combination of red and yellow chromatophores, brown is a mixture of black and yellow and red is just the red chromatophores. If there are no chromatophores the fish will appear white due to the presence of the irridocytes or the background colour of the skin and muscle will show through.

In general fish cannot make their own colour pigment, therefore they have to consume it in their diet. In the wild these pigments would originate from eating algae, shrimps, snails etc. In the confines of an aquarium there is not enough algae or other natural supplies of pigment, so it has to be included in the food that you provide. As with all foods it is important that the colour enhancing food given is of high quality to ensure that the pigments are in a form that the fish can absorb into its body.

The colour enhancing ingredients in fish food can be either natural or artificial, but all are a source of the pigments mentioned previously. Natural ingredients which are rich in colour pigments that can be utilised by our fish include krill, spinach, spirulina algae and carrot. It is worth looking for these ingredients in your fish food if you wish to optimize their colouration.

An Occasional Treat

Many of the commercially available foods are described as 'complete foods' on the packaging. This means that they have been formulated to provide all of the nutrients that the fish requires to live. However there is a growing trend to add a complementary or treat food to the aquarium to create some variation for the fish, bring them to the front of the tank or perhaps





condition them following illness or to get them ready to breed.

Treat foods come in a range of formats, from live foods to living organisms. Tablet foods that stick on the aquarium glass are a great treat as they bring the fish right to the front of the aquarium where you can view them. Feed such treat foods 2 - 3 times per week, using them instead of the normal food on that day.

The choice of foods for your aquarium fish is a large one, which can be confusing to all fishkeepers. I would suggest using a selection of 2 or 3 food types to ensure that all of the fish in your aquarium get a good diet. But don't feed everything at each feed - alternate the foods, and take great care not to overfeed.



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