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THE FISHKEEPER

For the Aquarist: Freshwater & Marine

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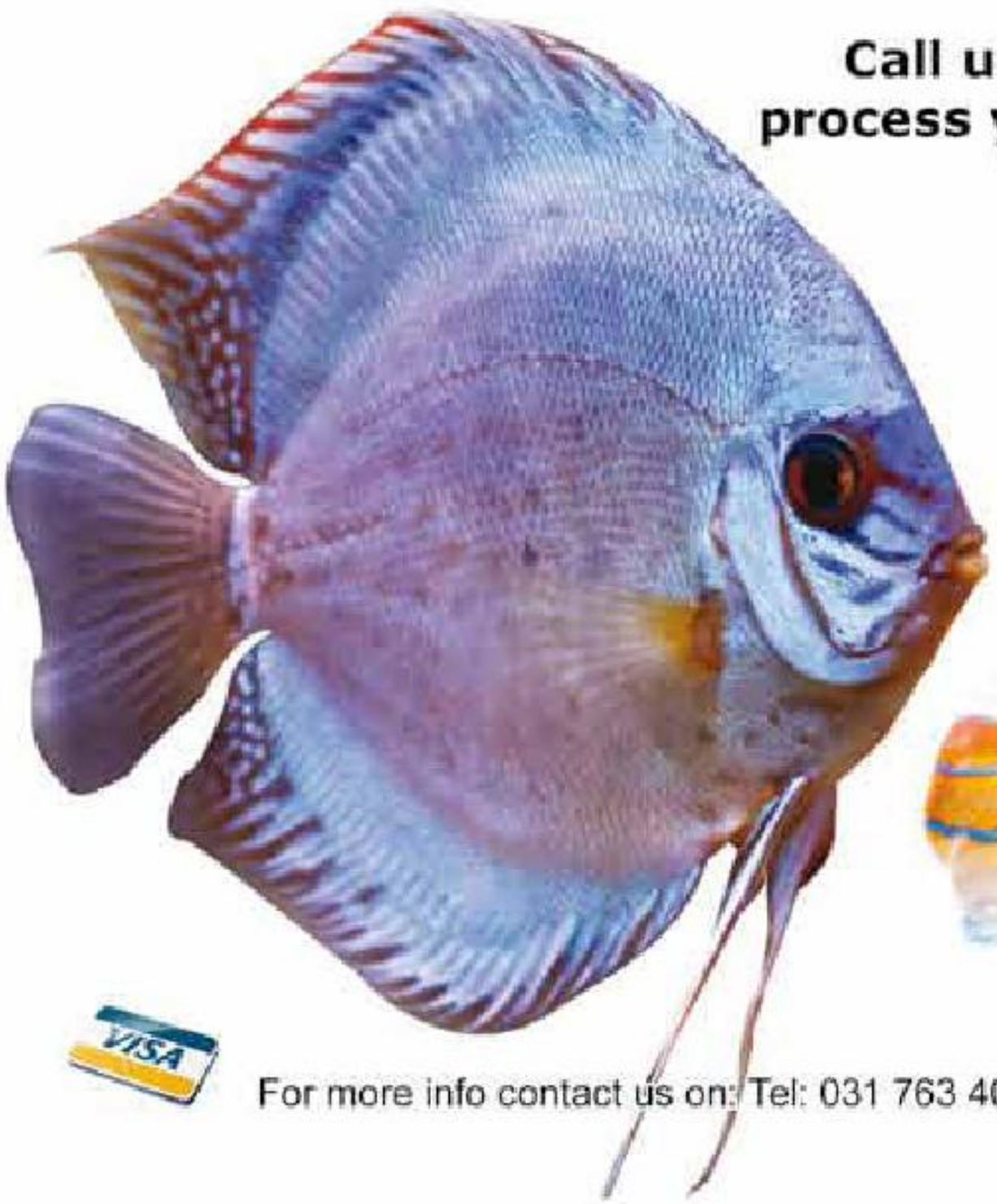

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THE FISHKEEPER
For the Aquarist: Freshwater & Marine

Contents

Africa's only magazine for marine and freshwater aquarium hobbyists.

July/August Vol 6 / No 5 / 2015

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regulars

Editorial

Overfeeding is a common problem we experience in the aquarium hobby. Overfeeding is understandable, because feeding your fish is the primary way in which you interact with them – and besides, they are always so pleased to see you coming with a can of fish food.

However, more aquarium fish probably die from overfeeding than from underfeeding, and I am pretty sure that even if they were fed very little, very few aquarium fish have ever starved to death. Fish in our aquariums get more food, with less work, than would ever be the case in the wild. In addition, your aquarium fish don't have to worry about becoming a meal for some other creature.

The cardinal rule when it comes to feeding your aquarium fish is to make sure they eat everything you feed them. Usually, this is put in terms of "all they can eat in 'X' minutes," where "X" is a number between three and five. My opinion is that "X" should be .5. Yes, that's right - half a minute. If your aquarium fish have really cleaned up all the food in half a minute, then it's alright to give them the same amount of food again. Feeding your aquarium fish like that once a day is fine; if you want to feed them twice a day, or even more frequently, that's fine, too – as long as they eat it all in half a minute.

Even without lots of aquatic plants, aquarium fish are fine without fish food for a week. In fact, one of the best things you can do for your aquarium fish is to not feed them one day a week. My aquarium fish often will go unfed two or even three days in a week.

All of the prepared fish foods that are available in your local fish store are high in quality and provide good nutrition for your aquarium fish. You should supplement the diet of dry prepared fish foods with some frozen or freeze-dried fish foods three or four times a week. It's also a good idea to use a number of different dry prepared fish foods. For example, the aquarium fish in my 1000 litre display aquarium get fed three different dry foods: spirulina algae wafers, high-protein shrimp pellets, and frozen mysis shrimp and bloodworms. The aquarium fish are fed once a day, five days a week.

The bottom line is to feed your aquarium fish a varied diet, feed them only as much as they eat in half a minute, and don't feed them at all one day a week. The reason that overfeeding is a very bad thing for your aquarium fish is that it pollutes the aquarium if there is uneaten fish food left to decay on the bottom of the aquarium. Uneaten fish food just adds to the ammonia levels of the aquarium, and it can very easily result in more bacteria than the nitrogen cycle can handle. It's like when the bowl of fruit you have sitting out on the kitchen table goes uneaten.

Happy reading and happy fishkeeping!

The Editor

DEADLINES

Issue	Colour Adverts
September/October 2015	25 July 2015
November/December 2015	25 September 2015
January/February 2015	25 November 2015

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Rose-band Fairy Wrasse
Cirrhilabrus roseafascia
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ARTICLE:
By Rolf Dennison

Best Beginner Corals

What drew you to the idea of starting and keeping a reef tank was more than likely seeing a beautifully stocked reef aquarium with its appealing combination of colours and species. You made the commitment and purchases needed to start a saltwater aquarium. Now you have arrived at the point where you can begin populating your tank with all those eye catching corals. But now is the moment you need to show maximum restraint! There is a saying among reef hobbyists that "Only bad things happen quickly in a reef tank." Successful reef keeping requires keeping your inhabitants happy – but book knowledge is not the same as the actual experience. Do yourself a favour and start out with some easier to keep corals that are going to be a bit more forgiving while you learn the ins and outs of maintaining a tank. The species listed here are hardy, easy to care for, affordable, can survive most beginners' mistakes and still provide an incredible amount of beauty. One further benefit to these species is that they will populate quickly, and thus fill your tank with life and colour sooner than many tough-to-maintain species.

Soft Corals

Mushroom Corals

Genus: Actinodiscus or its synonym Discosoma. Common names also include Bullseye Mushroom, Flower Coral, Mushroom, Mushroom Anemones, and Disc Anemones. They are one of the easiest soft corals to find and keep in a reef aquarium. Their name describes their appearance: a stem topped by a round or ruffled cap. Generally the stem is short and not all that visible. They vary greatly in colour and can be single or multi-coloured, smooth or rough, and have knobs or stripes. They prefer lower to medium light and slow to medium water movement and are generally non-aggressive. They are less sensitive to changes in water parameters and are more tolerant of a range of water quality. They can be fed but rely primarily on their zooxanthellae. Few mushroom corals have actually been named and are referred to generally as Actinodiscus species or Discosoma species.

Leather Corals

(Family Alcyoniidae, Genus Alcyonium, Cladiella, Sarcophyton, Sinularia and Family Nephtheidae, Genus Capnella). Leather corals are octocorals having eight tentacles and eight mesentaries on their polyps and a leathery skin. Common growth forms include thick encrusting, tree-like (arborescent), and lobed. Polyps are attached to the coenenchyme (mat), have zooxanthellae but also feed on phytoplankton, nanoplankton, and bacterioplankton. Most do not have stinging cells (nematocysts). The Alcyonium genus was once joined with the Cladiella, which accounts for all the shared common names you see.

- ***Alcyonium:*** Common names include Finger Leather Coral, Colt Coral, Seaman's' Coral, Dead Man's Finger Coral, and Encrusting Leather Coral. They occur mostly in lobed and finger-like forms (hence its common names), upright with or without a stalk, and colonies tend to be small. Unlike other Leather Corals they are slimy to the touch. The colouration is mainly brown, green, yellow, red, and orange. Alcyonium corals prefer low to average water flow and moderate lighting; when in stronger currents their encrusting form is enhanced. They get their nutrition from their zooxanthellae and do not need to be fed.

- ***Cladiella:*** Common names include Colt Coral, Finger Leather Coral, Finger-Tip Cladiella, Blushing Coral, Stubby Finger Leather Coral, Seaman's Hand, and Cauliflower Coral. These corals are found naturally in the Indo-Pacific on reef flats and back reef slopes where currents and lighting are moderate. They will do well if you mimic these but are also highly adaptable to other conditions. They have smaller lobes than Alcyonium, are heavier looking, and covered with lumpy knobs. Colours run from grey-white to cream and polyps may be a contrasting colour, most often green or brown. They may release toxins that affect stony coral growth. Cladiella rely primarily on their zooxanthellae for nutrition but also may feed on phytoplankton. Like Alcyonium they are slimy to the touch.

- ***Sarcophyton:*** Common names include Toadstool Coral, Mushroom Leather Coral, Leather Coral, and Trough Coral. The polyp free stalks of Sarcophyton terminate in a broad, flared, or smooth mushroom-shaped top (capitulum). Most are brown, tan, and cream with similar coloured polyps but may also be green. Found mostly in reef flats and lagoons, they prefer low to moderate current and tolerate a range of light intensities. They get most of their nutrients from their zooxanthellae and microplankton. All shed a surface layer of dead waxy tissue from time to time and can be sick looking or withdrawn during this process but emerge larger and healthier than before. They are generally peaceful to other organisms in the aquarium. Clownfish will inhabit a Sarcophytum sp. instead of an anemone and may irritate it, possibly to death. They propagate easily from cuttings and it should be easy to find aquaculture specimens.

- ***Sinularia:*** Common names include Cabbage Leathers, Finger Leather Coral, Flat Leather Coral, Flexible Leather Coral, Knobby Leather Coral, and Carnation Leathers. They prefer and have better colouration under bright lighting and medium to strong water movement but will adapt to other conditions. They form flattened or spherical lobes or fingers; crests and stalks are vertical or absent. Colours include cream, pinkish, grey, green, brown, purple and they feel dry, tough, and leathery. They have been shown to cause damage or death to some stony corals.

/

- ***Capnella:*** Common names include Kenya Tree, Cauliflower Soft Coral, Tree Soft Coral, African Tree Coral, Tree Coral, and Nephthea. The names come from their tree-like structure. They have greyish trunks with lateral branches covered in non-retractile polyps of brown. They prefer medium lighting and water flow but will adapt to a range of light and flow conditions. Capnella species are known for rapid growth and self-propagation. Left unchecked they can take over, so give it space and be prepared to prune it. They do need a reef aquarium with adequate levels of micro-organisms in the water column for a food source, which can be achieved by supplementing with foods designed for filter feeding corals.

Zooanthids / Button Polyps

Family Zoanthidae and include genus Palythoa, Protopalythoa, and Zoanthid. These are colonial corals (separate polyps living together). They come in a wide range of colours, colour combinations, sizes, and will live in a range of lighting and water flow conditions. All of these corals contain a potent toxin called palytoxin that can cause serious illness or death if you get trace quantities on your lips, eyes, in a cut, or breathe it in. If you are going to touch the coral itself wear gloves, protect your eyes, and wash after touching them. Research this toxin for detailed information and safety instructions ahead of time!

- ***Palythoa:*** Common names include Button Polyps, Moon Polyps, and Sea Mat. They have large polyps or "buttons" that are embedded directly in their mat or coenenchyme with little or no stalk and grow in a crusting manner. The polyps are broad, flat discs with knoblike, short, tapered or long, thin tentacles surrounding the disk rim. Palythoa colonies are usually found in shallow waters with moderate to high water flow like the reef crest and upper back reef slope. They are usually brown, yellow, green, or cream, with the polyps sometimes being of a darker shade than the mat. They will tolerate a range of lighting conditions but are healthier beneath high light intensity.

- Protopalythoa: Common names include Button Polyps and Sea Mat. The distinction between Palythoa and Protopalythoa is in their growth form: Protopalythoa polyps are large and flat with tentacles typically longer and more numerous than Palythoa and have a larger oral disc. They are not encased in a coenenchyme or "mat" but grow stalks from the coenenchyme terminating in polyps. Sometimes the tentacle tips have a contrasting colour or fluorescence but normally are green or brown in colour. They naturally occur at many water depths but in a marine aquarium do best under higher intensity lighting and moderate to high water flow. They grow quickly and will encrust over neighbours, so give them space.

- ***Zoanthus:*** Common names include Zoas, Button Polyps, Stick Polyps, Sea Mats, and Colonial Anemones. Compared to Palythoa and Protopalythoa, they are more brightly coloured with smaller polyps (buttons), have a dividing sphincter muscle around their oral opening, and do not integrate debris into their coenenchyme. They occur naturally in a variety of water depths, currents, and lighting. They depend primarily on their zooxanthellae along with feeding on micro fauna and algae in the water and don't need to be fed directly. They are found in a wide range of colours, colour combinations, and in patterns of stripes and polka-dots. Polyps usually have contrasting colours to the stalks and coenenchyme. They come in different forms, from colourful disks to fields of feathery tentacles. Zoanthus tend to do best in medium to high intensity light and low to moderate water movement. They reproduce quickly, are easily propagated, and are among the more affordable corals.

Pulse Corals

Family Xeniidae, Genus Anthelia, Xenia. Earn their name from the pulsate motion of their polyps. They are an octocoral, having eight tentacles and eight mesentaries on their "feathery" polyps. They are generally white, yellow, green, blue, and brown. The Xeniidae members depend heavily on their zooxanthellae in addition to feeding on phytoplankton, nanoplankton, and bacterioplankton.

- ***Anthelia:*** Common names include Glove Coral, Waving Hand Coral, and Pulse Coral. Anthelia corals differ from other Xenids in that they lack a common stalk and branches; polyps grow directly from an encrusting mat. They are typically white, grey, pink, or brown but do occur in other colours. Anthelia prefer a moderate indirect flow and moderate to higher intensity with brighter colour variants generally needing higher light intensities. They have been noticed to do well in tanks with slightly elevated nutrient levels. They are normally non-toxic, peaceful, and other corals can out-compete with them for space. Captive bred varieties tend to be easier to keep than wild collected specimens. These corals do not need to be fed directly, relying on their zooxanthellae.

- ***Xenia:*** Commonly called Pulse Coral, coming from the habit of the colonial polyp heads to open and close quickly and rhythmically. They prefer moderate water flow and moderate to bright light and will "walk" to move to a spot they like best. They are very fast growing, sometimes encrusting over other corals, and some are toxic to stony corals. Cream, white, ivory, brown, and light green are common colours and most have a thick,

short, smooth, unbranched stalk. There is a high mortality rate for wild collected specimens so look for ones which have been aquacultured. Some crustaceans, nudibranchs, and worms will feast on Xenia and clown fish will use a Xenia as a host.

Star Polyps

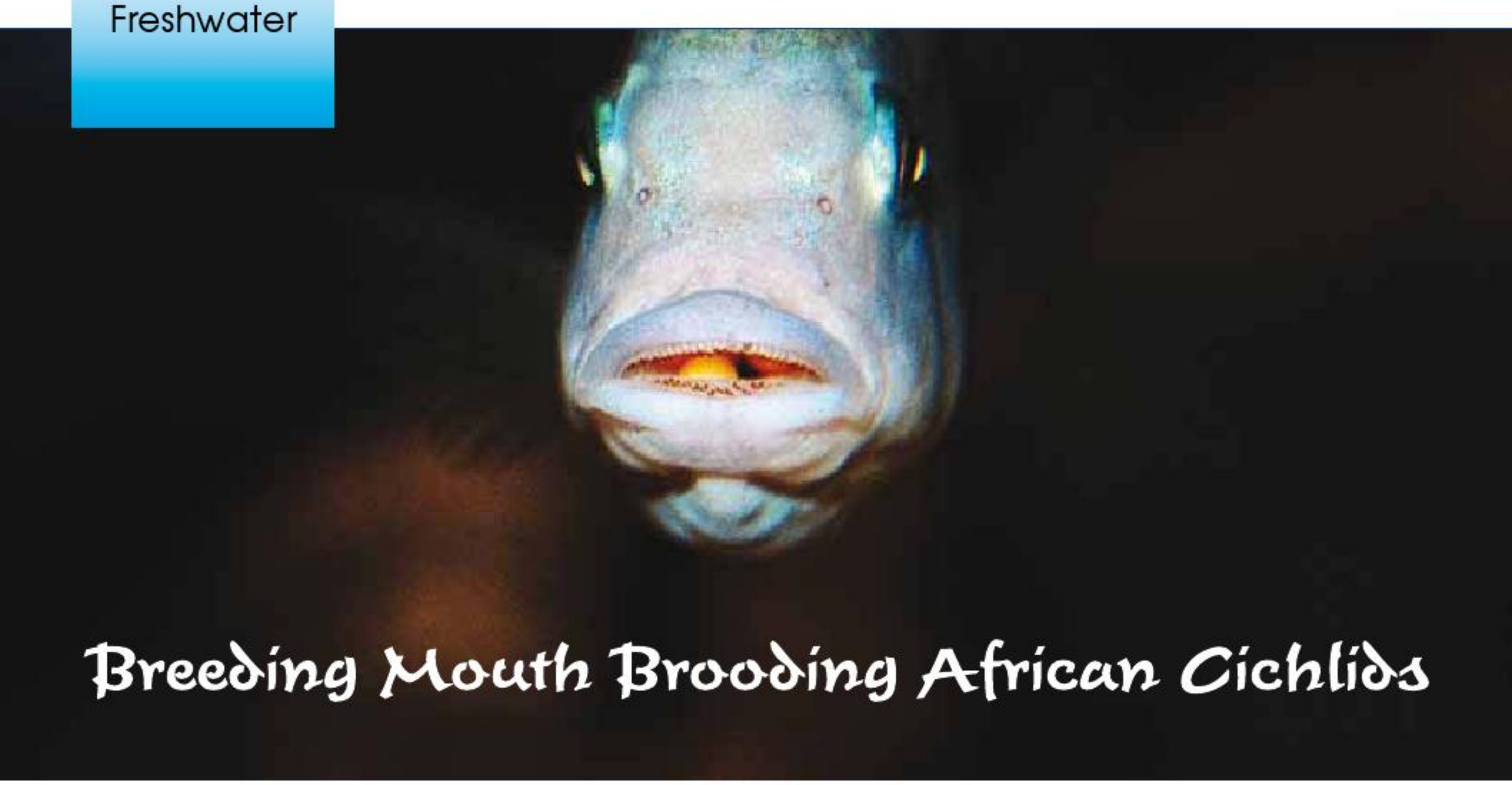
Pachyclavularia: Common names are Star Burst Polyps, Star Polyps, Eight Tentacle Polyps, Mat Polyps, Green Star polyps, Grass Coral, and Daisy Polyps. Native to Indo-Pacific regions, their purple to reddish-violet mats are a distinguishing feature of the genus. Polyps are normally brown or bright green but other variation may occur and white, yellow or green polyp centres may contrast with the polyp tentacle. These corals are tolerant of both low and bright lighting but will do best in bright light and moderate to high water flow. Its encrusting growth pattern can rapidly encroach on rock work, aquarium glass, and coral neighbours. They do not need to be fed, relying on their zooxanthellae.

Stony Corals

If you are really, really, really set on starting out with some of the stony (hard) corals – or better yet, you have successfully kept some of the soft corals above, you can try these generally considered to be overall the least demanding:

Montipora Species: These are small polyp stony (SPS) corals and are the second largest genus of corals, Acropora being the largest. They come in all colours, many growth forms, and can have several forms in a single colony. They are adaptable to many light and current conditions and are a good candidate for learning about stony coral propagation. Once established they are hardy and fast growing.

Turbinaria peltata: A small polyp stony (SPS) coral. Common names include Pagoda Coral and Pagoda Cup Coral. Grows in a conical or cup shape and is commonly green or brown. Place this coral in medium to high light and medium to high water movement and where it won't collect debris.



Breeding Mouth Brooding African Cichlids

Cichlids are one of the largest family of freshwater fishes, containing over 2 000 different species. Not only are these fish colourful and entertaining, but they are also relatively easy to breed in captivity – some breed readily with little to no effort on the part of the aquarium hobbyist! Breeding cichlids can be both entertaining and educational due to their unique breeding practices; mouth-brooding varieties are especially interesting as their process of spawning is so unusual. Typical mouth brooders include Yellow Labs, Red Zebras, Yellow-tailed Acei, and other Lake Malawi cichlids. While most mouth brooders are found in Lake Malawi, some are found in Lake Tanganyika and Lake Victoria as well. This article will discuss the overall process of mouth brooding and will offer several suggestions to successfully hatching African cichlid fry.

What is Mouth Brooding?

Mouth brooding refers to the fact that the female incubates her eggs in her mouth. After the female releases the eggs and the male fertilizes them, she gathers them carefully in her mouth. The eggs will remain inside the female's mouth until they hatch into fry. Additionally, the female will allow the fry to enter and exit her mouth for a period of time after they hatch due to protective concerns. However, once they reach a certain size, the female stops letting them enter her mouth.

The Courtship Process

The courtship process may vary slightly for different species but it is very similar in most species of mouth-brooding cichlid. Typically, the male cichlid will be relentless during the courting process and will consistently chase the females around the tank. He will also attempt to lure the female back to a flat rock or sandy spawning area he has dug out by shaking his entire body in a seizure-like fashion. If the female ignores his behaviour, she is chased away. If she accepts it, then they proceed to the spawning area.

Once at the spawning site, the female and male will swim around in circles and she will be enticed to lay her eggs. Once she lays the eggs, she immediately tries to scoop them up in her mouth. The male has egg spots on his anal fin. He will shake these spots to make the female think they are some of her eggs that she missed. She will open her mouth behind him and try to scoop up his "fake eggs". He will then fertilize the eggs in her mouth. This encircling process will continue for about an hour.

After the mating, the female will have a mouthful of fertilized eggs. Her jaw will look very bloated and it is easy to tell that she is holding (the term used to describe the process of a female carrying her eggs in her mouth).

After the Courtship

Once the mating process is complete, the male will continue to constantly harass the female. This is a good time to remove the female to a separate tank because the male is no longer necessary. You will need to set up a fry tank. It will work the same for mouth-brooders as for other cichlids, except that instead of just putting the fry in this new tank, you will remove the female and put her in there as well.

Separating the female serves several purposes. Firstly, it allows the female to get away from the harassing male. Secondly, it ensures that the fry will not be released into the main tank where they could be eaten. Lastly, it allows you to keep the female secluded for a week or so after she releases the fry. This is important because she will not eat while holding the eggs in her mouth. Therefore, she may go 3-4 weeks with no food and will obviously become very weak during this time. This extra week of seclusion allows her to regain her strength before being reintroduced into the main tank.

It is usually a good idea to provide a couple of flakes every once in a while to the separated female. She will sometimes eat these flakes if they are small enough that she can do so without swallowing her fry. Typically, drop the flake in there and give her a little while to eat it. If she does not eat it, take the food out so it does not cloud the water. Also, she may eat some flakes during the last week of


Yellow Lab female holding fry

keeping the fry in her mouth. Some people have speculated that she is actually feeding the fry with these flakes.

If you do not remove the female, she will often go into hiding. If you do not see a fish during feeding time for several days, it may be that she is hiding down in the rock work. As stated previously, she will not eat while holding the eggs so do not expect her to come out during feeding.

The female will typically wait 3-4 weeks before allowing the fry to become free swimming. She may allow them to re-enter her mouth if they are threatened, but eventually they will be on their own.

Aggression Issues

African cichlids tend to be very aggressive, especially mating dominant males. If you have cichlids, you probably will notice that one male in each species will become dominant and will wreak havoc on the other males and females. This behaviour becomes intensified during the mating process; I have often seen a male cichlid that usually only bothered his own species start chasing anything and everything in the tank when he knew a female was ready to lay her eggs. If you start to see your male go crazy, it may very well be that he is getting ready to mate.

It is also important to generally provide 3-4 females per male. This forces the male to spread his aggression and chasing around, thus allowing the other females some rest. If you put a 1:1 ratio of male to female African cichlids in your tank, that one female will be chased nonstop and will eventually die.

Stripping

A popular method for getting the female to release the fry early is called stripping. This is used by breeders in order to ensure the


Red Zebra cichlid holding eggs

fry are not released into the main tank and in order to force the female to not become so weak. However, stripping can be quite stressful to a female as you are catching her, forcing her jaw open, and then dipping her in and out of the water so the fry can swim out. In general, letting the female go to term is the best choice.

Advice for Getting Your African Cichlids to Mate

The first thing you need to do before mating your cichlids is to ensure that your cichlids have reached sexual maturity. If the females are not big enough, it does not matter how much the male shakes, she is not going to mate with him. If, however, your females are big enough, there are several things you can do to entice them to mate.

- Mouth brooders typically mate on a flat, clean rock. Therefore, it is imperative that you provide them will several of these. They also prefer them to be in secluded areas of the tank so try to match this condition as well.

- Many cichlids cannot resist mating after a water change. Lower the water and let the filter splash into it for 30-45 minutes. Then refill the aquarium will water that is slightly cooler than the tank water (1-2°C). This simulates a rain and your cichlids will often start mating right away.

- Provide them with somewhat clean water. While cichlids tend not to be too picky, i.e. they have a very wide range of pH and other parameters they will mate in, they do need relatively clean water. Therefore, keep your aquarium clean with regular water changes and vacuuming.

Conclusion

Mouth brooding African cichlids are fascinating to watch; the extreme care the mother gives to her fry is nothing short of noble and her dedication in most cases is quite a spectacle. Even if you don't have to do much to entice your cichlids to mate, you may feel a sense of pride upon the release of your female's first batch of fry. Even though the process is exciting, it can be a little tricky - many new moms may swallow their fry by accident. Do not be discouraged, after several attempts, most will catch on. Also the typical size for the first couple of hatching is 8-10, but with maturity, the female will soon start having 30 or so fry per hatching.


Make sure that your cichlids are mature before trying to mate them


Yellow-tailed Acei holding eggs

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Compiled by
The Fishkeeper

The Fairy Wrasse in the Aquarium

Fairy wrasses, among the most beautiful marine fishes, are known for their vibrant colours and striking patterns. They also happen to be generally peaceful, with interesting behaviours and bold personalities, which makes them great residents for the fish-only community or reef tank. In order to learn the basics about Fairy Wrasses (*Cirrhilabrus* spp.), it's best to start by understanding their natural habitats and behaviours.

The various species of Fairy Wrasse naturally occur in the Red Sea through to the Indian Ocean and across the Pacific to the Pitcairn Islands, as far north as Hawaii and the Ryukyu Islands of Southern Japan.

Cirrhilabrus wrasses are typically encountered in small groups feeding on zooplankton a few feet above the substrate, often over rubble. Depending on the species, they can be found from a few feet beneath the surface to depths of over 600 feet. They may swim in groups of their own species or form mixed aggregations with other Cirrhilabrus, Flasher Wrasses Paracheilinus, or other planktivores such as Pseudanthias. Within typical single-species groups, most individuals are females, with a single male in attendance. However, there are exceptions to this and some all-male groups are found in some species.

Male Cirrhilabrus wrasses are always larger than females and are usually more brightly coloured. In many species, the males can intensify their colours or change patterns rapidly when displaying to females or to other males. As no small male Cirrhilabrus wrasses have been found, it is believed that all individuals begin life as females, but some, probably the dominant individuals, become males. This is known as protogynous hermaphroditism and is common among wrasses.

Cirrhilabrus species have unusual eyes: the cornea is split into two distinct parts. It is believed that the centre of the cornea acts as a close-up lens that helps the wrasses spot small prey. This feature is also found in some other wrasse species, such as Paracheilinus, Pseudocheilinus,

Cirrhilabrus lubbocki

Terminal male *Cirrhilabrus roseafascia*
(Photo credit: Dr. Hiroyuki Tanaka)

Cirrhilabrus roseafascia in nuptial display
(Photo credit: Kevin Kohen)

Terminal male *C. roseafascia* in the field
(Photo credit: Kazumi)

Pseudocheilinops, and Pteragogus.
Another curious feature of Cirrhilabrus wrasses is their secretion of mucus cocoons, which they sleep in. These cocoons are believed to prevent nocturnal predators from being able to detect the sleeping wrasses by scent.

As if this genus didn't have enough stunning fishes to offer, new Cirrhilabrus species are still being discovered regularly. In fact, most Cirrhilabrus species haven't been known to science, let alone the aquarium hobby, for long. Of the 46 Cirrhilabrus species currently listed as valid by FishBase.org, only 9 were described before 1980. In contrast, 11 new species have been described since 2000, the most recent being *C. naokoae* in 2009.

In fact, new species are sometimes identified on the basis of fishes collected for the marine aquarium trade. *C. naokoae* is one example of this, where the type specimen was collected off Sumatra and was probably destined for the aquarium trade in Japan. Despite being newly described, this species can be found on sale in the United States at a fairly high price.

A great thing about the Cirrhilabrus species is that there will always be a colour and size that will fit in your aquarium. If you have a 50cm long aquarium, choose from the smaller 6.5cm to 7.5cm species, but if you have a larger tank, you can choose from the wrasses that are over 7.5cm. One of the smaller species is the 6.5cm Yellowfin Fairy Wrasse (*Cirrhilabrus flavidorsalis*) and a large wrasse would be the 13cm Scott's Fairy Wrasse (*C. scottorum*).

Some the most outstandingly coloured wrasses, and a few favourites, are the Laboute's Wrasse (*Cirrhilabrus laboutei*), which has amazing striping, and the Flame Wrasse (*C. jordani*), with intense sunset colourings of red, orange and yellow. The Purple-Lined or Lavender Fairy Wrasse (*C. lineatus*) is beautifully adorned with yellow and red fins on a greenish yellow body with blue to purple lines. Another favourite is the Temminck's Wrasse (*C. Temminckii*), which seems to have the qualities of a Flasher Wrasse. Its body has many colours of the rainbow with bluish green dotted lines along the top, reflecting the reef line in your tank. It's not hard to see why these are some of the most sought after Fairy Wrasses, and their price tags at times will reflect that fact!

If you are limited on space but you are chomping at the bit to own a Fairy Wrasse, no problem. The smaller species will do well in a 120litre, or even a 50cm long. They are movers and shakers though, so will do better with length over depth in a tank configuration. The larger species need at least 200litres, which should be at least 120cm long. Be sure to have a lid on the aquarium. These wrasses do jump, and they will carpet surf at some point if the tank isn't covered. An Atlantic Tang juvenile actually sparred with my Solar Fairy Wrasse, and chased him up and out of the tank!

The substrate is also no problem; you can choose whatever substrate you want. In fact you don't need substrate since the Cirrhilabrus species do not bury themselves at night. They spin a slimy cocoon to sleep in. Provide lots of rockwork with crevices or caves for them to spin their cocoon in at night. The cocoon prevents their scent from being detected by predators, but will not affect water quality. Speaking of water quality, Fairy wrasses are quite disease resistant, but dirty tanks can still result in a sick wrasse, so be sure to do proper maintenance.

Fairy Wrasses are very active, and with that high-energy output there needs to be quality input. Provide them with a wide variety of meaty foods and feed them several times a day. The more you feed them, the less they will be inclined to chow on any copepods you have built up over the months. In smaller tanks you may need to add copepods periodically.

Terminal male *Cirrhilabrus roseafascia*
(Photo credit: Dr. Hiroyuki Tanaka)

Cirrhilabrus lanceolatus
(Photo credit: Kazu)

Cirrhilabrus lanceolatus in nuptial display
(Photo credit: Kenyu)

Cirrhilabrus lanceolatus in the field
(Photo credit: Kyo's Dive Log)

Cirrhilabrus jordani in nuptial display
(Photo credit: Dr. Hiroyuki Tanaka)

These wrasses don't usually fill up too much on copepods when there's lots of rockwork unless you have a large number of wrasses. I had about 5 Fairy Wrasses and a mandarin in a 560litre tank that was teaming with copepods, and the copepod numbers never seemed to dwindle. Other species, like Halichoeres Wrasses, are much harder on copepod populations.

Here are some considerations for keeping different Fairy Wrasse species together: Fairy Wrasses are some of the few saltwater fish where you can easily mix species. A great thing about keeping Cirrhilabrus wrasses together, is that there is no fight to the death, just chasing. Then, after a hierarchy is established, life goes on. At the very worst a dominant wrasse will chase, and then the subordinate fish will hide. I had a Solar Fairy Wrasse that hid for a week under a rock when I added the Scott's Fairy Wrasse. The Solar Fairy eventually got used to the idea and came out. You will only need to remove a subordinate fish if the chasing situation has not resolved itself in over 2 weeks.

You can keep multiple Cirrhilabrus species if you follow a few guidelines. First, the tank should be larger than the minimum size. When mixing sizes, the 6.5cm Fairy Wrasses like the Lubbock's (*C. lubbocki*) and Longfin or Social Fairy Wrasse (*C. rubriventralis*), should be added first and become established before adding wrasses in the 10cm size category.

The Solar or Red Headed Fairy Wrasse (*C. solorensis*) is an exception, it can be added at the same time. What I really like about the Solar Fairy Wrasse is that although it is one of the bigger ones, they seem to do okay with the smaller species because they have more mellow personalities. They will get along with the larger wrasses too.

Allow several months for the smaller wrasses to grow a little and adjust. Add the largest 10cm Fairy Wrasse species last, and add them as small juveniles so they are similar in size to your smaller and more timid wrasses. These larger ones would be like the Scott's Fairy Wrasse (*C. scottorum*), Temminck's Fairy Wrasse (*C. temminckii*), and Yellowstreak Fairy Wrasse (*C. luteovittatus*). I suggest that order for these larger wrasses because experience showed me the *C. luteovittatus* can be quite aggressive, and that was in a 560litre tank!

If you are unsure about compatibility between species, or do not want to try and remove fish after adding them, your safest bet is to not house smaller wrasses, that are only 6/7cm, with the larger

Cirrhilabrus claire. A terminal male from the Cook Islands (Photo credit: AquaTailor Jp)

Cirrhilabrus claire. A terminal male from Tahiti
(Photo credit: LemonTYK)

Cirrhilabrus jordani
(Photo credit: LemonTYK)

A nuptial *C. jordani*
(Photo credit: Doug Perrine)

10cm wrasses that are more aggressive. You can house 8-10cm wrasses together without a problem provided you add the 10cm size last, and after the 8cm sized wrasses are settled and older.

Adding two females has resulted in one turning male for many an aquarist, though they may not become a "super male". Super males are a premium fish with the most outstanding coloration, as reflected by the money you pay for them.

Keeping Fairy Wrasses with other fish

Cirrhilabrus species get along with most other fish, except the very aggressive fish that may bite at them if they enter their territory, like dottybacks. Do not house them with fish large enough to swallow them whole.

Here are a couple other considerations for other fish you may want to house with Cirrhilabrus species:

Do not house with Flasher Wrasses (*Paracheilinus* spp.), since for some reason, the Fairy Wrasses do not tolerate them. It may be they are competing for similar foods. Very small Fairy Wrasses may be okay with Flasher Wrasses, but that is only in a very large tank over 380liters or at least 150cm long. Smaller Halichoeres species will be attacked by Fairy Wrasses as well. Keeping species of these two genus together may work as juveniles, but only if the Halichoeres is larger. Halichoeres Wrasses differ in their sleeping behaviours, too; they bury themselves in sand while the Cirrhilabrus species do not.

You just can't go wrong with a Fairy Wrasse. They are rarely the troublemakers of the tank, and if they are, it's with their own kind. So save those pennies and get yourself a beautiful Fairy Wrasse!

"What I really like about the Solar Fairy Wrasse is that although it is one of the bigger ones, they seem to do okay with the smaller species because they have more mellow personalities"

ARTICLE:
By Takashi Amano of Aqua Design Amano

Special Feature: Master the Layout Tools

To create a beautiful and sophisticated Nature Aquarium layout, we need the tools to build and maintain an aquascape. These tools must offer excellent usability and workability. ADA Layout Tools have been developed through the actual experiences of producing Nature Aquarium layouts. From the basic line of Pinsettes and Trimming Scissors, a wide range of variations with different shapes and sizes were added to the lineup. Pursue a layout with greater perfection by mastering these highly professional tools!

Layout Expressing Perspective with Driftwood and Cosmetic Sand

When cosmetic sand is used for a layout, the long-term maintenance of the layout is less hassle as the maintenance of foreground plants is not required.

Long-term maintenance of layout is made easier by planting shade-loving plants such as Microsorum and Anubias in the mid-ground in addition to the use of cosmetic sand. What we need to remember here is that the clumps of stem plants on both sides require frequent pruning and eventually replanting of the cuttings of stem plants will be necessary. Trimming Scissors (Straight type) are ideal for pruning of stem plants. During pruning, keep in mind that the trimming line of stem plants in the background is an important guide in producing a concave composition. Cosmetic sand has another beneficial effect. On top of using a concave composition which is suitable for expression of perspective, this layout emphasizes the perspective by spreading cosmetic sand on the foreground and the open space in the center. An arch of driftwood created in the open space in the center adds an accent to the typical concave composition.

DATA:

Tank: Cube Garden W180×D60×H60 (cm)
Lighting system: Solar I (NAG-150W-Green) × 4; lighting for 10 hours a day
Filter system: Super Jet Filter ES-2400 (Bio Rio L, NA Carbon)
Substrate: La Plata Sand, Aqua Soil-Amazonia, Power Sand Special L, Bacter 100, Clear Super, PENAC W, PENAC P, Tourmaline BC
CO2: Pollen Glass Beetle 50Ø, six bubbles per second with CO2 Beetle Counter (CO2 Tower used)
Air: Aeration with Lily Pipe P-6 for 14 hours while lighting is OFF at night
Additives: Brighty K & Green Brighty STEP2
Water change: 1/3 water change once a week
Water quality: Water temperature 25°C, pH:6.8, TH:20mg/ℓ

Plants:
Cyperus helferi
Crinum calamistratum
Cryptocoryne retrospiralis
Hygrophila polysperma
Rotala sp. (Ceylon)
Ludwigia glandulosa
Microsorum sp. (Trident)
Anubias barteri var. nana "Petit"
Fontinalis antipyretica

Fish:
Hyphessobrycon rosaceus
Hyphessobrycon megalopterus
Hemigrammus bleheri
Melanotaenia boesemani
Crossocheilus siamensis
Otocinclus sp.
Caridina japonica

Point of Creation of a 180cm Nature Aquarium Layout

This section introduces the composition and planting, which are the key processes of Nature Aquarium layout created in a 180cm aquarium tank featured on the previous page. Creating an elaborate mid-ground using epiphytic aquatic plants helps conceal the unsightly bottom part of stem plants in the background and plays an important role in long-term maintenance of an aesthetic aquascape.

1. Planting of stem plants

The beauty of stem plants is brought out more if they grow in clumps. The point to achieve this is to plant stem plants densely from the beginning. Pinsettes L is ideal for planting of stem plants and dense planting is made easy with this tool. Epiphytic aquatic plants such as Anubias and Microsorum are planted in the mid-ground to conceal the unsightly bottom portion of stem plants

2. Fixing Fontinalis antipyretica

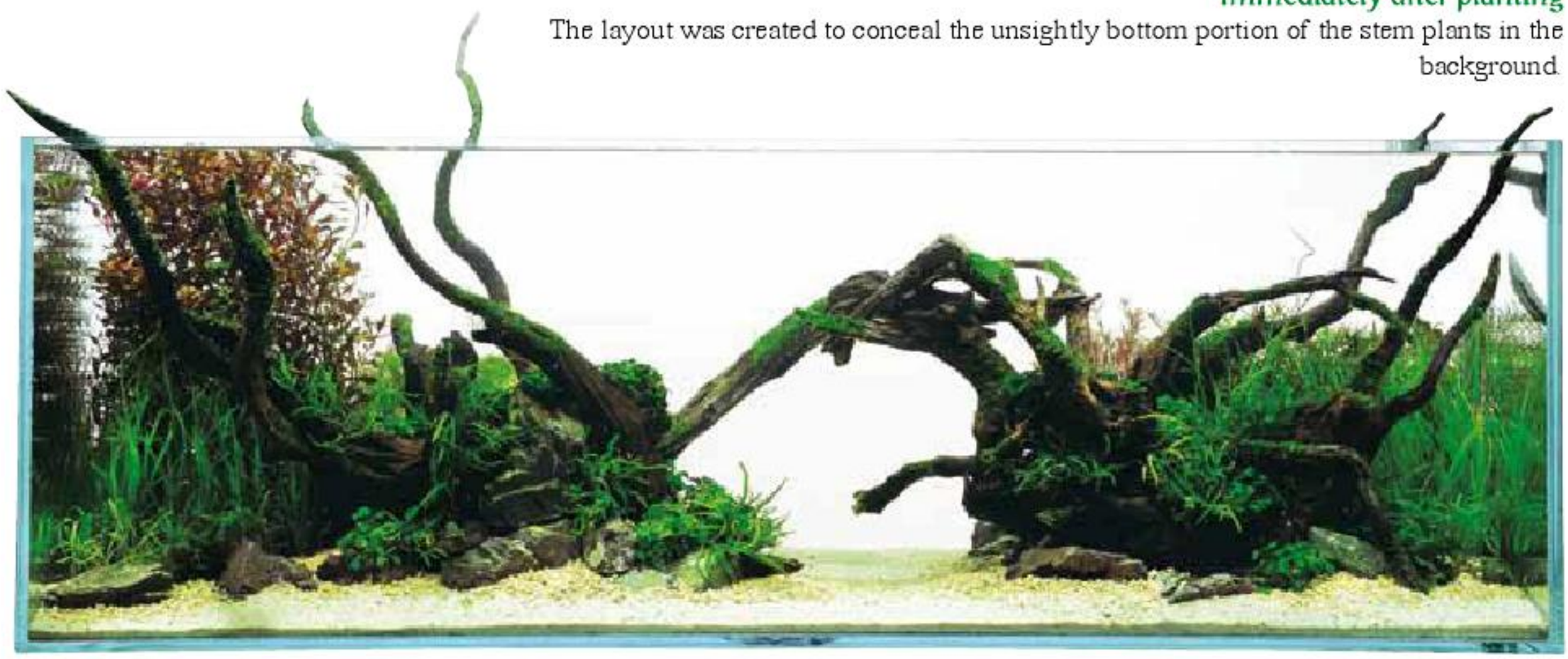
Fontinalis antipyretica grown on a part of driftwood conveys the sense of the passage of time and adds a natural feel to the aquascape. It also tones down the strong dark color of driftwood. You do not need to attach a thick layer of Fontinalis antipyretica from the beginning. Using Moss Cotton, fix a layer of Fontinalis antipyretica which is so thin that the surface of the driftwood is partially seen. Moss Cotton does not break easily, thanks to its higher twist count compared to ordinary cotton thread. It is naturally biodegradable when the Fontinalis antipyretica starts taking root to the driftwood.

3. Elaborate planting

When looking closely at planted aquatic plants, we can find that elaborate planting is used for this layout, for example, the use of three different species of long tape-like plants in combination and effective arrangement of epiphytic plants to conceal the border of stone and driftwood. Such a meticulous planting creates a natural feel in the aquascape.

Immediately after planting

The layout was created to conceal the unsightly bottom portion of the stem plants in the background.



Effective Use of Tweezers/Pinsettes for Meticulous Layout Making

Tweezers are an essential tool to create a layout with lush aquatic plants. Ease of planting depends on how you use tweezers. This section introduces you the skills for effective use of tweezers.

1. Planting of Stem Plants

Pinsettes L with long and sharp edges are ideal for dense planting of thin stem plants. It is a good idea to decide the planting space for each stem plant using bamboo sticks as a guide before starting the actual planting. This is to ensure the good balance of plants. In the planting process, the plants should be tilted to the opposite side of the planting space or leaned against driftwood as planting work might not be smooth if aquatic plants fall and cover the planting space.


Dense planting is made easy with Pinsettes L


Stem plants are neatly planted in one direction. We can see professional skills in it

2. Planting of Rosette-Type Aquatic Plants

Compared to Pinsettes with thin and sharp tips, Pro Pinsettes Grip Type L with wider tips is more suitable for planting rosette-type aquatic plants such as Echinodorus and Cryptocoryne. Particularly when these plants are large in size, Pro Pinsettes Grip Type L holds the stem tightly and helps you plant them accurately into the substrate. It is important to use suitable tweezers for aquatic plant species.

A natural atmosphere can be achieved if a certain amount of Cryptocoryne is planted together without dividing and planting them at many separate locations

3. Preparation of Aquatic Plants in a Pot

It is often thought that Pinsettes S is used for small aquarium tank or for planting short aquatic plants only. Nevertheless, the most useful application of Pinsettes S is removal of rock wool from the plant roots. Aquatic plants sold in a pot usually come with rock wool around the roots and Pinsettes S is ideal for scraping off this rock wool using its point tips. When removing rock wool, be careful not to damage fine roots to minimize the damage to the primary root.


Before planting, it is necessary to remove rock wool around the roots of aquatic plant in a pot


Rock wool can be removed effectively by inserting Pinsettes' sharp tips between the roots and scrape rock wool off

4. Planting Scene

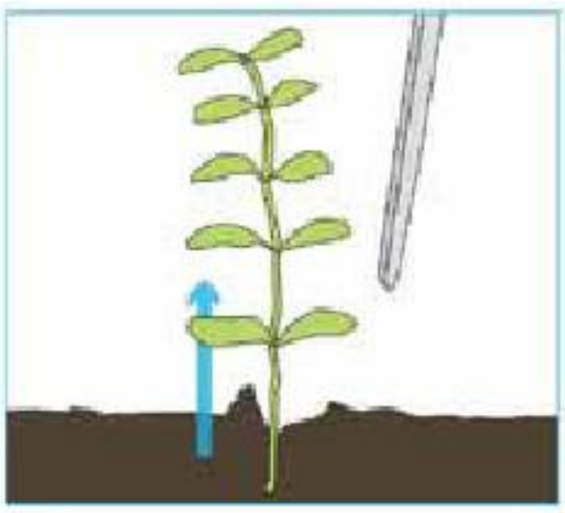
A. As a part of preparation, aquatic plants are divided into small bunches for planting with tweezers and neatly placed on a tray or Styrofoam plate to enable careful and fast planting. Ease of planting greatly varies depending on these preparations especially for large aquarium tanks which require more planting work.


B. In the planting scene by Takashi Amano, his assistant staff sprays water onto the tips of tweezers at the moment Amano pulls them out of the substrate. This helps prevent the planted aquatic plants from coming off of the substrate together with tweezers and washes off the soil on the tips of the tweezers.

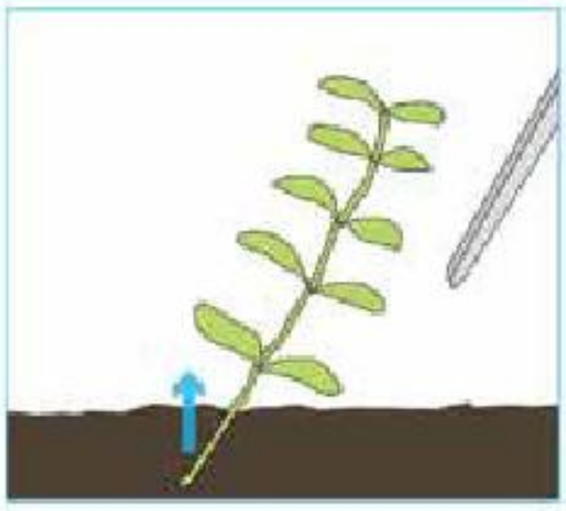

C. Planting of Hemianthus callitrichoides "Cuba" is made easy by lightly holding down the plant when pulling out the tweezers.

5. Basic Planting Techniques

Planting technique to suppress buoyancy of plant



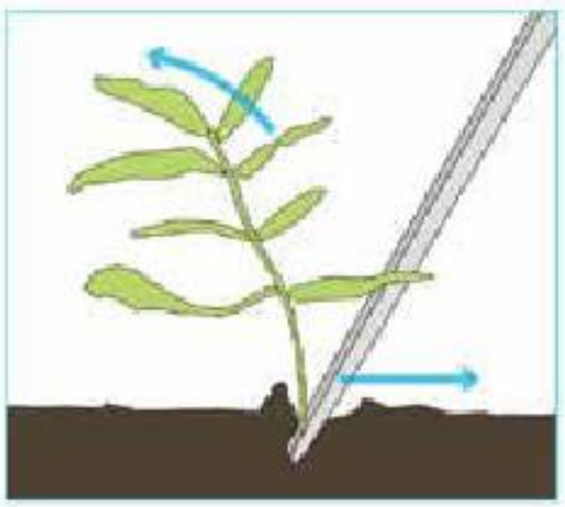
Stem plants without roots may float out of the substrate if they are planted upright. (Buoyancy great)



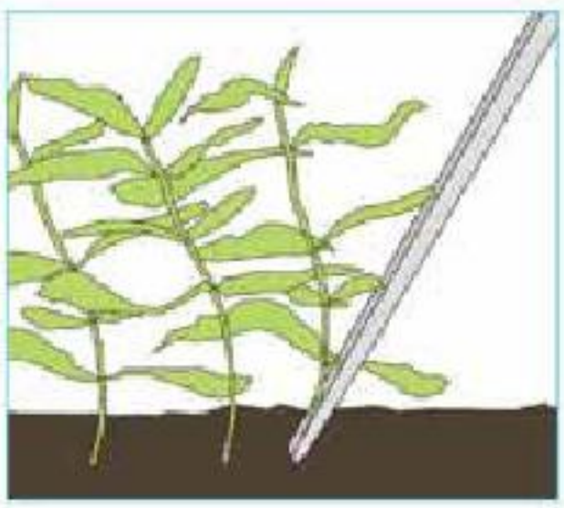
If the tweezers are inserted in the substrate at a slight angle, the buoyancy of the plants decreases by the substrate. (Buoyancy slight)

A space is created by tilting the plants against the planting direction

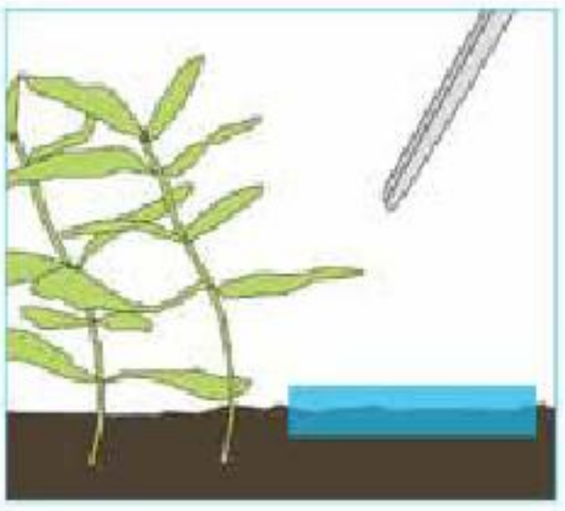
Dense planting technique



While planting, slightly tilt aquatic plants against the planting direction



While planting, slightly tilt aquatic plants against the planting direction



Planting of aquatic plants becomes easier as the planting space becomes open and offers better visibility

Water level during planting

During planting, pour just enough water until the substrate is covered. Doing so makes planting easy and prevents your hands from getting wet unnecessarily.

Select Layout Tools Suitable for the Purpose

ADA offers a wide array of professional layout tools for various purposes and applications. By making full use of these tools, you will have fun time doing daily maintenance work and enjoy quality hobby time. Mastering the use of tools is also an important factor of maintaining a beautiful aquascape.

6. Remove Algae on Glass Surface with Pro Razor

Use Pro Razor for scraping and cleaning glass surface with algae. You can do this work without wetting your hands even for deep large aquarium tanks by using Extender.
(1 Pro Razor; 2 Extender)

7. Scrape off Stubborn Algae with Pro Picker

Removal of black beard algae grown on stone and driftwood is quite troublesome. Stubborn algae can be removed effectively by scraping them off with Pro Picker.

8. Clean glass pipe with Spring Washer

Spring Washer is a convenient tool which cleans the curvy glass pipe with ease. Use this tool for cleaning of Lily Pipe and hose.

Clean Bottle (left) for soaking small glassware like Pollen Glass and Superge (right), the detergent specifically designed for glassware, are convenient maintenance goods.

9. Cutting of Thick and Hard Stem Is Made Easy with Pro Scissors Force

Mature stems and leaves of Anubias and Bolbitis are thick and hard. Pro Scissors Force powerfully cuts them.

10. Each End of Sand Flattener Offers Different Applications

Large triangle is used to flatten and even out the substrate. The other end can be used for untangling aquatic plants.

11. Accurately Inserts Sticks of Substrate Nutrients with Bottom Release

Bottom Release is a convenient tool to accurately insert Iron Bottom and Multi Bottom into the substrate. These sticks of nutrients should basically be inserted at the position right below the leaf tips.

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ARTICLE AND IMAGES:
By Moolis Moolman of Pet Stop SA

A MOZAMBICAN COLLECTION AND IMPORTING TRIP

My first experiences at a new collection station by Moolis Moolman @ Pet Stop SA

A few months back a person with an export permit contacted me to buy all his live marine aquarium stock from him with the intension to export to the USA and Europe, but before you can walk you have to crawl, so after a lot of irritation and more red tape than you could believe, we at last got all the documentation in order and could we do our first shipment.

The first trial shipment could not be seen as a success, due to the fact that he did not know what we (marine aquarists in SA) needed nor did I have a clear perspective of what he could deliver.

So it was decided that I would visit him for a few days to see first-hand what he can source and also part with some of my shop knowledge regarding species that have commercial value as well as health and maintenance schedules.

Leaving Pretoria later than expected and feeling totally unprepared for an endeavour as large as this. I drove to the Lebombo border post that was open 24/7 due to public holidays. We arrived at the last filling station at 8 that evening, a bit earlier than expected as we were told that it is quarter after 10, but the crossing took us less than 20 minutes. We entered Mozambique with a very optimistic and happy feeling as the crossing was extremely fast and friendly. We decided to drive through the night and this proved to be a wise decision as we had no roadblocks, traffic or problems of any sort along the way. The only difficulty was to keep to the speed limits that seem to be changing every kilometre and some chickens that had not read the "chicken manual" and roamed around after dark.

Arriving at dawn we were able to enjoy an incredible view of a beautiful sunrise over pure white sands. This invigorated us to get into the ocean a.s.a.p., but first we had to wait for our host to wake up and we had to go through the courteous ritual of greeting and getting a bit acquainted over a nice hot cup of coffee and a rusk.

Introductions and so forth done, we headed off over 500 metres of marshy area of the bay into the warm water. Me being a novice that only snorkelled the tidal pools of KZN, I found this calm and warm water swamped with sea grass and dead mangrove leaves quite strange. At first seeing any life at all in this alien environment was a daunting task and I felt that this marsh/lake would not deliver anything worth my while and that our venture was doomed to fail due to a lack of quality stock. After I saw my first wrasse I forgot all about this and started to explore every nook and cranny as we snorkelled along right in front of our lodge.

That afternoon we discussed the obstacles of this venture but more importantly the next day's trip out into the lake. High tide came so close to us that my car's front wheels were within 2 metres of the high tide line. So after having made lots of new friends and even meeting an old one again, we went off to an early night to be rested for the next morning's excursion.

The second and third days were really an eye opener. I was introduced to a variety of marine environments that were literally a few hundred meters from each other and each of these environments contained totally different species. These two days were a blur of snorkelling, training, system planning and of course some R&R time.

We saw a lot of species not regularly available to us in South Africa as well as species that we do not order due to their price. We (South African marine hobbyists) do not do a lot of species-only aquariums, fish-only systems, or buy strange species that are not regularly available, you could say we are a bit "conservative". These are all things that this opportunity can start to change. How, you ask? Well, for a start the landed costs are a lot cheaper from this supplier than any other supplier we have in South Africa, thereby making these types of aquariums much more affordable in the future and therefore they should take hold in the market.

Some of the species we are getting from this exporter that I see a great future for are:
Domino damsels selling @ only R25!!;
Cow fish;
Tobies;
Puffer fish;
Frog fish;
Angler fish;
Wasps;
Mono angels;

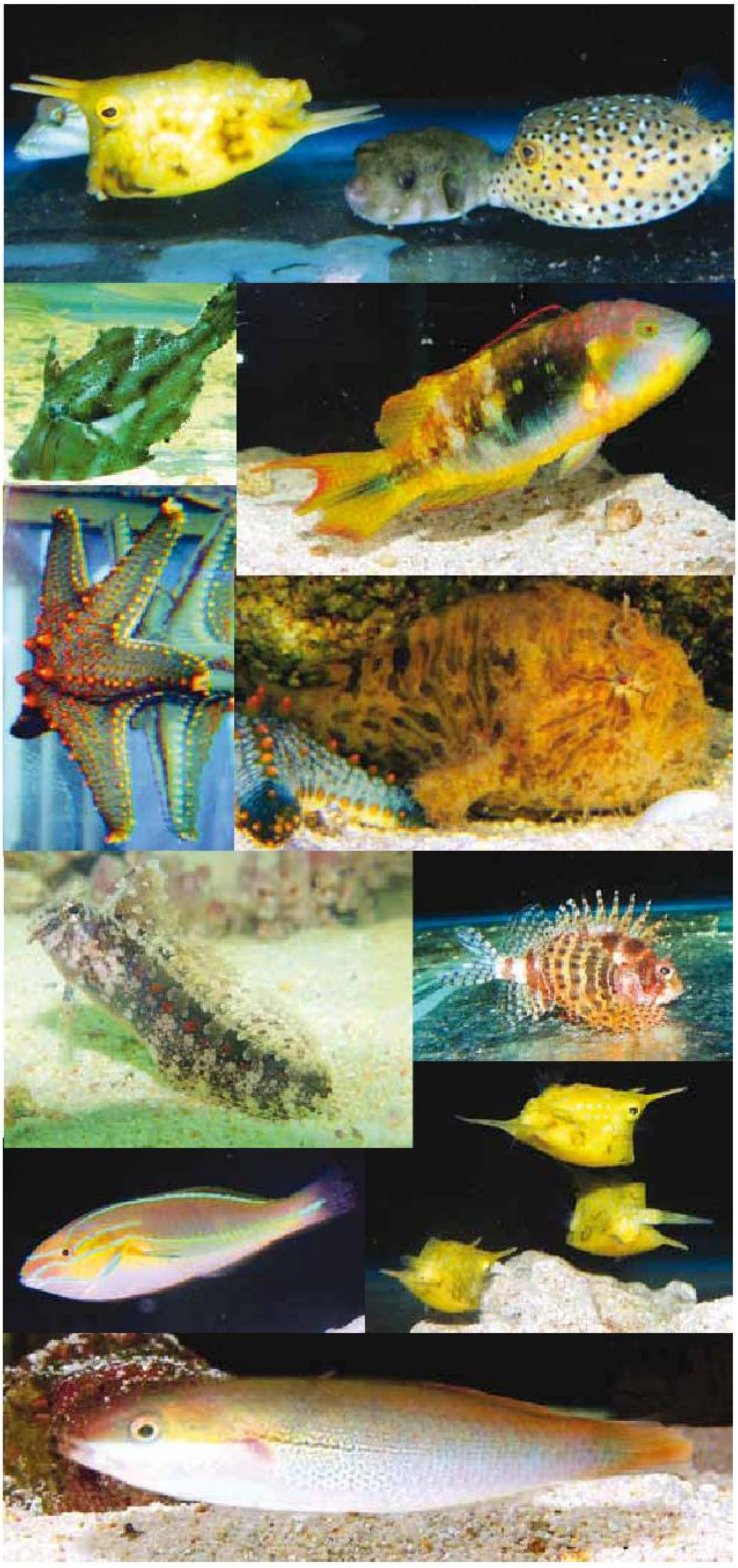
Goatfish;
Parrot fish;
Moray eels;
Snowflake eels;
Sea urchins;
Protoreaster starfish (in colours I have never seen before);
Harlequin shrimps (now possible to keep with their food);
Titan triggers;
Sweetlips;
Groupers;
Batfish;
Butterflys;
Naso tangs (a variety of species);
Cowry snails small & large;
And lots more!

After analysing the feedback the holder of the export permit gave me regarding the European and USA market, I realized that the South African market's needs are totally different from those overseas, as a lot of these species are more sought after in these markets. All of this combined made me optimistic for the future of this venture.

The visit was like all working holidays, much too short. Not only did I want hours and hours more time to snorkel and explore, but I also felt that I did not give them nearly enough training or assist them enough with the planning of their next system, which still needed a lot of tweaking, but life goes on with or without you and I needed to get back to South Africa and the daily management of my pet shops, various other endeavours, and, of course the most important, my clients.

Since this visit we landed a few test shipments at Pet Stop SA and sorted out the major kinks. Now we are on the brink of supplying other pet shops all over South Africa with stock at lower prices than they could get from the existing suppliers, so watch out for these fish in your local marine shop in the near future. The exporting of these fish are in the pipeline for later this year.

Other exciting news is that we are investigating the possibility that you can go and catch your own fish while your family can have their own very exciting Mozambican holiday. Truly a win/win situation! But more on that later, advertising of this opportunity will be here in The Fishkeeper magazine when it's available.



ARTICLE:
By Roland Schreiber

Egg Development and Hatching

The tiny eggs of *Microctenopoma fasciolatum* are almost circular; 2 hr. after egg-laying

The strategy to shelter the own offspring against external influences (dirt, damage, heat, cold, variations in temperature, diseases, et al.) with the aid of a protective wrapping (egg) can be found everywhere in the animal kingdom. This is a very common way for reptiles, birds, arthropods, worms, some Urodela species as well as bony fishes (Osteichthyes) to shelter their brood in their first days of life. Besides the viviparity (latin: viviparus = viviparous) and the ovoviviparity (latin: ovum = egg; vivus = living; parere = to bring forth), a special form of reproduction, the oviparity (latin: oviparus = oviparous) is the most frequent reproduction strategy among the teleosts.

Newly hatched larvae of *Microctenopoma fasciolatum*

The answer to the question how is it possible for a single fertilised egg cell to develop into a complete organism and, as a consequence, how an egg originates, is nowadays basic knowledge in biology lessons of every school. But the embryo has to get rid of this ovarian membrane as soon as the growth continues and important anatomical developments are completed. When it comes to the question of how the living creature can get out of the chorion, then it starts to get really complicated. This procedure, commonly known as hatching, is much more difficult than it appears. Only a few aquarists develop ideas about how and when it is possible that the embryo or juvenile breaks through the hard ovarian membrane. For this purpose, the teleosts developed their own remarkable strategy. By the help of this knowledge we might be able to understand and manage some problems occurring during fish farming.

To be as alike as two peas in a pod

The dictionary soberly observes this issue: "An egg is a shell in which an embryo of oviparous animals (e.g. birds) is developing".

But no egg is exactly the same as another. We know the multiple manifestations of eggs in regard to the form, size or colour as well as the number of eggs laid by the females. A lot of aquarists already wondered at the purple-red or bright red eggs of some Apistogramma cichlids. In contrast, most of the spawn laid by tetras or barbs are very bright and almost transparent. Most of the East-African mouthbrooding cichlids (e.g. *Tropheus*) lay large eggs with a glowing golden yellow yolk. The well-known longnose gar (*Lepisosteus osseus*) displays spawn that is coloured deep green.

The typical "egg-shape" that is formed by most of the (open) substrate-spawning cichlid eggs is not necessarily the rule. The majority of tetras and barbs "pack" their offspring in ball-shaped egg membranes. Some of the freshwater gobies, e.g. *Schismatogobius* or *Glossogobius*, are known to lay "rod-like" spawn which rather remind us, over the course of their development, of an elongated tube than on an egg. And if you are facing a curious, rectangular, pillow-like entity in the sea you probably just found a ray egg.

While some fish species (e.g. much of the coral reef fishes) release thousands of tiny eggs, almost invisible for your eye, into

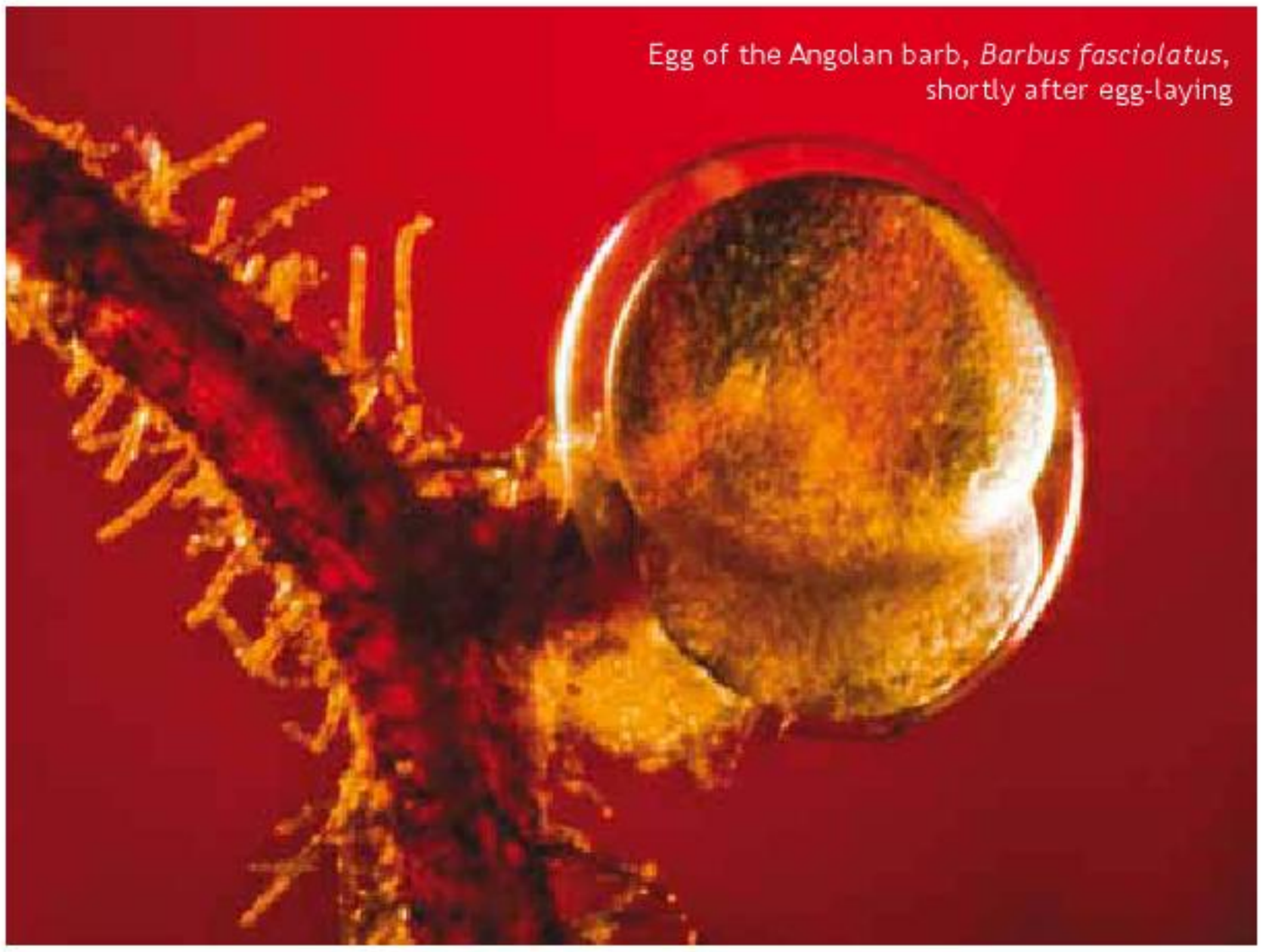
the water, the few eggs of an Arowana (*Osteoglossum* sp.) can reach a total length of just over an inch. For certain shark species they even reach impressive 30cm.

Various fish species also differ vastly from each other by the number of eggs laid in each clutch. Some shark species only produce one or two eggs and therefore look somewhat enviously at their pelagic conspecifics. Some of the marine fishes are known to spawn enormous numbers of eggs. Thus, for example, the female sea lamprey (*Petromyzon marinus*) produces up to 250 000 of living offspring, while some of the well-known flatfish species (family *Pleuronectidae*) even creates up to 500 000 eggs. The absolute front-runner are *Mola mola*, the pelagic Ocean sunfish: they are found in the temperate and tropical regions of the Mediterranean, Atlantic, Indian, and Pacific Oceans and their spawn consists of more than 300 000 000 (300 million!) eggs each breeding season, making them the most fecund extant vertebrate. Obviously the aim of this apparent extravagance is to conserve the own species despite high mortality rate caused by predators or adverse environmental conditions (dry season, sickness, lack of food, etc.).

Not every species practices intensive brood care and, thereby increase the probability for their offspring to survive and to manage to get through the day intact during their first stage of life. Mostly fish leave their spawn alone and abandon them to their fate. In some cases (e.g. saltwater fish) not only the eggs but also the newly hatched larvae are going through pelagic stages. Comparable to marine plankton, they drift freely in water for a very long time until the fin-development is finished and they are capable of moving around on their own and find shelter and food supply. In rare cases this phenomenon can also be observed in freshwater fish, like the South American puffer (Colomesus asellus).

Fishes are very inventive when it comes to protecting their genes. Sometimes the female carries the eggs along with it for some time after spawning (*Oryzias*, *Loricariichthys*) or hides them somewhere between the sand-gravel-scree (e.g. salmon). Others provide protection to their fry by building foam nests, laying their eggs out of the water, like the Splash Tetra Copella arnoldi, or depose them for months under a thick layer of clay or mud during the dry season (killifishes). Some of them apparently ignore their own genes, on principle, and distribute huge amounts of eggs in open waters at random. Anyone who wants to be on the safe side carries the eggs (ovophil) or larvae (larvophil) around in his mouth for some time. But also the attachment of the spawn to aquatic plants for a better supply of oxygen or hiding them deeply in caves seems to be a common practice. This ensures that the clutches of eggs are deposed on places that are optimal for further development. Rhodeus amarus, the European bitterling, developed an unusual and exceptionally clever tactic (symbiosis): During spawning season the females places their eggs inside the branchial cavity of the swan mussels where the embryos develop for 3-6 weeks until the larvae leave the mussel. At this location the fry is absolutely save of predators. As special thanks in recognition of the mussel, the bitterling allows the young mussel larvae to attach on his fins and gills where they find nutrition and protection for their first days of life.

The date on which the small organisms finally see the light of day for the first time is completely different. While some of them will already hatch the day after



Egg of the Angolan barb, *Barbus fasciolatus*, shortly after egg-laying

Larva of *Barbus fasciolatus*

fertilisation, others stay within the chorion for several months, like annual killifishes. The gestation period (length of pregnancy) of the viviparous basking shark (*Cetorhinus maximus*) is even estimated to be more than 42 months.

This enumerating could be continued endlessly and clearly demonstrates that we should correctly say "no two eggs are exactly alike".

D-Day

After the embryo inside the egg has undergone several developments, there finally comes a time at which he has to "cast off" the egg membrane (Zona radiata or chorion). Generally this process is known as hatching.

Some years ago the question has been raised in an Austrian internet forum as to how the fish larvae are able to break through the egg shells.

Therefore they carried out a survey among the internet users and some days later the results were published. The possible responses to this question were:

a) they use a kind of egg tooth situated at the head
b) they use the first fin ray of the vestigial dorsal fin
c) the egg absorbs water by using the osmosis method, swells up and finally the ovarian membrane bursts
d) the embryo excretes a digestive enzyme which dissolves the inner chorion
e) the embryo blasts the ovule envelope by organic growth alone

Well! Did you know the correct answer?

Some days later the evaluation of the ballot showed the following result:
answer a: 11 %
answer b: 5 %
answer c: 5 %
answer d: 44 %
answer e: 35 %

Although this voting was not representative because of the low number of participants, the majority was correct (answer d). Enzymatic hatching of fish embryos is a well-known process in biology nowadays. The Japanese natural scientist MORIWAKI (1910) was one of the first who provided evidence for the sensational fact in the Chum Salmon (Oncorhynchus keta). Until this time, researchers believed that the strong movements of the embryo, just before hatching, had been responsible for the chorion to burst and the emergence of the larvae. These studies revealed that in reality the embryo secrets an enzyme which is responsible for solubilisation of the egg chorion by digesting its inner layer at the time of emergence. Only the thin, outer layer (gelatinous layer) bursts because of the excessive movements of the embryo.

The key to successful hatching

In order to understand the hatching process, you first need to understand how a fish egg is structured. All eggs (egg cells) of teleost fishes are surrounded by a chorion, which is, upon closer inspection, divided into two parts: The thick (inner) layer (Zona radiata interna) and a thin (outer) ovarian membrane (Zona radiata externa). In many fish species the Zona radiata externa is also necessary to attach the eggs to a substrate (aquatic plants, stones, et al.) during the spawning process. Although an antibacterial effect had also been observed, the main purpose of the Zona radiata interna is obviously the mechanical protection of the embryo. The inner layer, being initially very soft, consists mainly of protein and runs through a curing process after fertilisation. In this way the mechanical strength (thickness) of the chorion can significantly increase by as much as a thousandfold. The basic intention of this change is to adapt the fish egg to species-specific burdens. If you take a closer look at the differing natural circumstances, this sounds reasonable. For example, the eggs of salmon, being swirled on the sandy, pebbly ground and sometimes even buried in gravel by a strong current, must be capable of withstanding severe loads. On the other hand it is obvious that the eggs of mouth brooding cichlids or livebearers require only a very thin membrane for the protection of the embryos. Certain fish species, e.g. the tropical killifishes, also need a strong egg membrane to protect their fry against evaporation during the long-lasting dry season. But, how is it possible for the tiny embryo to penetrate this hard egg shell?

In 1910 Moriwaki noticed that at the time of hatching the inner layer of egg envelope was dissolved by the contents of perivitelline fluid. An undigested outer layer remained like a fragile veil that was then broken by the embryo. In the course of his studies, the Japanese scientist was also the first who noticed a large number of gland cells spread all over the body of the small embryos. For this reason he

assumed, that from these special glands ferments (enzymes) had been secreted shortly before hatching which were crucial for the dissolution of the inner egg layer. Depending on the specific fish species these glands are located, for example, on the yolk sac, the mouth or parts of the head. An accurate proof of this as well as a detailed analysis of the enzymes involved had been provided only some years after Moriwaki`s observations. This was also the time when Wintrebert (1912a, b; 1926) and Bourdin (1926a, b, c, d) made extensive studies on the hatching of fish such as rainbow trout, goldfish and perch. They even found that the movement of an embryo was not necessary for hatching, as an embryo whose movement was inhibited with narcotics was still capable of hatching. The term "hatching enzymes", which is nowadays used for these enzymes, was first settled by Needham (1931) in his "Chemical Embryology".

It is known today that the hatching enzyme of fish has a proteolytic (protein-decomposing) activity in addition to its egg envelope-dissolving activity (choriolytic activity). As soon as a specific stage of embryonic development is reached, the enzyme is secreted and the embryo breaks through the egg membrane.

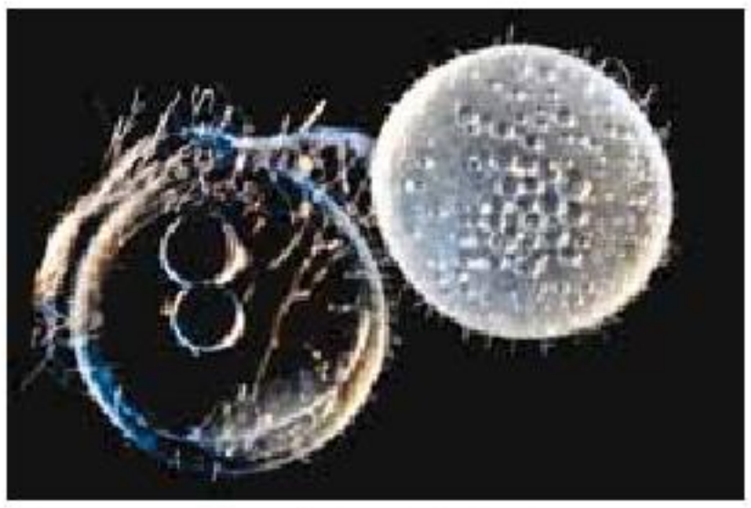
The only issue which remains to be determined is how do the embryos know that it is time to excrete this enzyme? The onset of hatching in teleosts is a complex phenomena and there have been many factors or treatments that are reported to either stimulate or suppress the hatching of fish. According to the current state of knowledge the following factors are all believed to decisively influence the secretion of the fish hatching enzyme. Thus, for example, it has been demonstrated repeatedly that rising temperatures, increasing amounts of light or high breathing frequency of the embryo (due to hypoxia) leads to an accelerated hatching. Conversely, lower temperatures or darkening of the aquarium shows the opposite effect and cause a decrease of hatching out ratio and/or delayed eclosion. Riehl (1995) reports on eggs of salmon whose hatching inhibited for 12 days as soon as the temperature was lowered by 34 - 41°F. Especially the factor hypoxia is often used by killifish-enthusiasts whose killifish eggs are "unwilling" to hatch after a long storage. Some dry feed strewed on the water surface will lead to strong hypoxia over night and some of the "delayed" annuals will hatch the following morning. That advice also works fine for rainbow- or armoured catfishes. Why not try this trick on your delicate fish species?

With some experience and skill you can determine the exact time of "birth" by monitoring data concerning the embryonic development. It is often seen that the embryo moves very quickly, almost hectically, shortly before hatching. In addition you will notice that because of the dissolved inner egg layer (Zona radiata interna), the embryo turns darker and is more recognisable (especially the eyes).

Hatching mechanisms of this type are mainly found in teleost fishes, but they are also found in amphibians, insects and even mammals.

Laboratory acting as a nursery

The beloved zebrafish (*Danio rerio*) as well as the Asian rice fish genus Oryzias have become popular objects of study for developmental biologists due to their transparent larvae which enable scientists to observe the growth of cells in the larvae. Moreover these species are able to spawn daily under laboratory conditions and,



Oogenesis in Daisy`s Ricefish *Oryzias woworae*: Fertilised eggs (translucent) after 3 hr. - (the white "fungus" are sticky attaching filaments)

Oogenesis in Daisy`s Ricefish *Oryzias woworae*: Development of the first somites (primitive vertebrae) after about 30 hr

Oogenesis in Daisy`s Ricefish *Oryzias woworae*: from the 5th day the blood circulation and major organs increasingly develop

In the following I will show the most striking evolutionary stages of the eggs of Daisy`s Ricefish (*Oryzias woworae*) till hatching:

Stage	Date	Development
0	Shortly after egg-laying	Unfertilised egg (egg opaque)
1	After about 3 min.	Fertilisation (egg is getting more translucent; oil droplets larger but fewer; egg membrane becomes thinner and hardens)
2	After about 30 - 60 min.	Blastodisc stage: The male and the female pronuclei migrate toward and associate with each other at the centre of the thick cytoplasmic disc at the animal pole
3 - 7	After about 1,0 - 3,5 hr.	First blastomeres (cells) visible. Various cell stages (2, 4, 8, 16, 32) after cleavage
8-9	After about 4,5 - 6,0 hr.	Morula-stages: inner and outer mass of cells separating from each other. Oil droplets completely merged
10-11	After about 6,5 - 8,5 hr.	Blastula-stages: The blastula (from Greek blastos meaning "sprout") is now a hollow sphere
12-16	About 10,5 - 21 hr.	Gastrula-stages: The blastoderm (a term for cell layers) increases more and more and moves into the yolk. Later the embryo develops out of this
17-18	About 25 - 26 hr.	Neurula-stages: Head, brain, nerve cord and body of the embryo are formed
19-30	After about 27,5 hr. - 3,5 days	Somite-stages: First somites (primitive vertebrae) are formed
31-32	After about 4 days	First gill blood vessels develop as well as the swim bladder
33-38	After about 4,5 - 8 days	Further development of major organs as well as the blood circulation
39	Day 9	Process of hatching: The embryo dissolves the inner layers of the chorion, tears the single outer layer by moving the body and escapes from the chorion tail-first
40	Following days	Larvae stage: This period extends from hatching until first fin rays appear in caudal and pectoral fins. From that moment it is called juvenile
41-44		Further juvenile stages: This last period begins after the first appearance of fin rays of anal and dorsal fins and continues until the appearance of ray nodes of caudal and pectoral fins. Development of secondary sexual characteristics

above all, reach maturity very early.

The Oryzias species is even more attractive since the eggs laid by the females go through long-lasting stages (about 8-9 days) of development. The growth of the embryo is, observed under the microscope, clearly visible because of the nearly translucent chorion. An oogenesis spread out over some days or maybe two weeks is, of course, more interesting than embryos hatching 24 hours after fertilisation. The developing eggs of Oryzias enables us a closer look at the different stages of embryonic development as if in slow motion.

Ready for the adventure of life

In bony fish (Osteichthyes) - as well as in other animals and even humans - the new organism, developing out of a fertilised egg-cell, is defined as an "embryo". However, this applies only so long as he stays inside the embryonic membrane or the mother. A soon as the embryo peeled itself out of the egg membrane, it is called larva, although this frequently-used term is (in a narrow sense) not correct. An independently living juvenile is called larva, if it is clearly distinguishable from the adult by his body shape and a particular life-style. This is the case, for instance, if the larva has special organs for breathing, attachment, feeding or better locomotion. In a broader sense even juveniles showing fin margins and egg yolk after hatching are called larva. The yolk sac is a first supply of food for the newly hatched larva and consists of the remaining vitelline mass of the egg. Some fish species such as, for example, the Congo tetra (Phenacogrammus interruptus) is already far developed at the date of hatching and there is hardly any egg yolk. Other species, like the Squarehead catfish (Chaca chaca), have a huge yolk, even for some time after hatching. In some species, for example cyprinodonts, livebearers or silversides this final development stage took place inside the egg during the oogenesis. These

Oogenesis in Daisy`s Ricefish *Oryzias woworae*: beginning with the 8th day the inner layer of the chorion is dissolved, the larva is hatching

Oogenesis in Daisy`s Ricefish *Oryzias woworae*: Juvenile, 1 week after hatching; caudal and pectoral fins are already well developed

juveniles are able to swim and pick up food immediately as soon as the chorion is dissolved, respectively after the parturition.

It is becoming essential for the juveniles to look for alternative, important nutrient sources when they have used up their first food reserves. Now the juvenile is ready for the first excursions into the new world. And maybe it will take care of its own offspring ... some day!

Oogenesis in Daisy`s Ricefish *Oryzias woworae*: the larva, 24 hr. after hatching

Hermit Crabs


Clibanarius tricolor

Usually the first janitors that aquarists place in their aquariums are hermit crabs and snails, as these are because they are some of the best animals to have for controlling common algae problems.

About Hermit Crabs

Phylum Arthropoda
Subphylum Crustacea
Class Malacostraca

Did you know that hermit crabs are scavengers? Yep, most species will eat just about anything they can find.

For this reason, they make ideal cleaners for a reef tank, as long as you choose a Reef Safe Hermit Crab.
Properly chosen hermit crabs should have no negative impact on a reef system. In fact, they are solely beneficial. Small species that do not grow more than a couple of inches in size are most desirable, as they usually do not disturb other tank life, and they are able to get into tiny cracks and crevices where algae grows that larger hermits cannot access. They can also access spaces under rocks and corals where detritus or debris accumulate to remove it.

Large species such as the Anemone Carrying Hermit (*Dardanus pedunculatus*), Yellow Hairy Hermit (*Aniculus maximus*) and Halloween Hermit (*Trizopagurus strigatus*) are undesirable as reef janitors, as they may cause unwanted damage to your reef system. These types of hermits can disrupt tank life by climbing on everything, and because of the large clumsy, bulky shells they live in, cause the toppling of rockscape arrangements and the moving of corals.

Besides, they may attack or eat other tank inhabitants. If you desire to keep large hermit crabs, do so only in a tank of suitable environment and size, and remember they will outgrow their shells. You need to provide them with new housing (larger shells) as they moult and grow, otherwise they may attack other shelled animals to get a new shell. One commonly imported species that has this trait is the *Clibanarius vittatus*, most often sold as the Striped Hermit Crab.


Clibanarius digueti


Anomura


Paguristes erythrops


Paguristes cadenati

Popular Algae Eating Hermit Crabs

- Small hermit crabs of the Genus Calcinus found in Hawaii are extremely efficient little critters. Some remain very small, only 1-1.5 cm in size, while other species in this group reach a length of less than two inches. Because of their tiny size, these hermit crabs can really get into those small spaces in a reef tank that other hermits cannot. The Left-Handed or Dwarf Zebra Hermit Crab is one of the best examples of a great reef safe algae eater.
- The Blue Legged Hermit (*Clibanarius tricolor*), as well as other similar species are quite popular, but some such as the Anomura sp. will kill Astraea snails to obtain their shells.
- The Red Legged Hermit (*Clibanarius digueti*) is said by some to be a much better algae eater than the Blue Legged Hermit, less aggressive, and has been reported to eat red slime algae.
- Aside from eating algae, the golf ball sized Blue Eyed Hermit Crab (*Paguristes erythrops*) spends its time stirring up the top layer of substrate of the aquarium.
- The Scarlet Hermit Crab (*Paguristes cadenati*) is one of the most popular hermits with reef keepers, because of its colorful appearance, and because it will eat all kinds of algae, such as red, green and brown slimes, as well as green hair algae.


Trizopagurus strigatus


Clibanarius vittatus

Coral Red Pencilfish

(Nannostomus mortenthaleri)

The Coral Red Pencilfish is one of the most beautiful species of Pencilfish. This species is not very common, although I personally feel that in the future we will start to see more of these around as the demand increases and there are more of them bred in captivity. This species is still new to the hobby and was only scientifically described in 2001. It was discovered and named by Martin Mortenthaler, the owner of the Austrian export company in 2000. This pretty little fish was first described as a sub-species of the Dwarf Pencilfish (Nannostomus marginatus), but then shortly after as its own distinct species.

The intense red colouration of this species is what has caught the attention of aquarists who are not generally interested in the lebiasinids (splashing tetras and pencilfish). The soaring popularity of planted nano tanks in the aquarium hobby has also added to the demand for this fish, which is perfect for such a setup. It is reportedly extremely limited in its natural range, but fortunately the availability of tank-bred specimens has lessened the demand for wild harvesting.

Adult males are noticeably less stocky and far more colourful than females, plus they exhibit a white marking at the anterior dorsal-fin base from quite a young age. The Coral Red Pencilfish has a red body colour with two strong horizontal black lines, giving it a broadly striped appearance. It is also known as the Red Arc Pencilfish, Peruvian Red Pencilfish, and Ruby Red Pencilfish. This is one of the most beautiful characins available today. Yet it competes for this position with an even more recently discovered pencilfish relative, the Purple Dwarf Pencilfish (Nannostomus rubrocaudatus), described in 2009. These two are very similar in colour, but only the Coral Red Pencilfish has a white belly. They are small fish only reaching sizes of around 25-30mm.

The Coral Red Pencilfish naturally occurs Peru in the small tributary of Rio Nanay at the village of Alvarenga, Loreto, Province of Maynas and this species appears endemic to the Nanay basin in Loreto Department, Peru, plus the Río Tigre system a little further west.

Their natural habitat consists of sluggish tributaries, small rivers and swampy areas, particularly in areas with dense growth of aquatic vegetation or submerged woody structures and leaf litter. It's often found in areas of flooded forest and floodplain lakes in blackwater regions.

Typical habitats contain shallow, near still water with very little detectable hardness, low conductivity, and a pH of 4.0-6.0, with other fishes comprising small characids, other lebiasinids, and dwarf cichlids of the genus Apistogramma.

This is one of the most attractive pencilfish in the hobby

In 2010 Tom Christoffersen and Mark Breeze collected it from several jungle streams in the Río Tigre basin. These typically had thick marginal vegetation and substrates of leaf litter and fallen branches. Water parameters were pH 4.54-5.78 and temperature 25.3°C-26.8°C.

Aquarium care

Coral Red Pencilfish are moderately hardy. They are not exceptionally difficult to care for provided their water is kept clean. Water should be changed on a regular basis, especially if the tank is densely stocked. At least 25 - 50% of the tank water should be replaced every other week. This fish is an active schooling fish and should be kept in groups which will also help to diffuse aggression (try to get a group of at least 6 fish). Base dimensions of the aquarium should be a minimum size of around 90 x 30cm if you wish to keep a mixed-sex group of this species since males have known to be aggressive towards one another.

This species should ideally be kept in a heavily-planted set-up, preferably with a dark substrate. The broken lines of sight that exist in such a display allow it

Due to its timid nature, it is not recommended to keep this species in a community tank

Driftwood branches are beneficial in a tank for the Coral Red Pencilfish

to display natural behaviour as well as helping to reduce skittishness and offering refuges for sub-dominant individuals. Temperature should be around 24-28°C, pH: 4.0 -7.0 and hardness: 18 – 90ppm.

Floating plants are a useful addition, as are driftwood branches and dried leaf litter, the latter in particular driving establishment of microbe colonies as decomposition occurs. Such microorganisms can provide a valuable secondary food source for fry, whilst the tannins and other chemicals released by the decaying leaves are also thought beneficial. Use gentle filtration; an air-powered sponge-style unit should prove adequate in most cases. This species requires stable water conditions and should never be added to an immature aquarium.

When it comes to feeding this species, one must keep in mind that they are micro predators, feeding on tiny invertebrates and other zooplankton in nature. In the aquarium it will accept dried foods of a suitable size but should also be offered daily meals of small live and frozen foods.

This species is peaceful but is not ideal for a community aquarium due to its small size and timid nature. It won't do so well with larger peaceful fish, simply because it is easily intimidated and won't be able to

This species should ideally be kept in a heavily-planted set-up, preferably with a dark substrate

compete with them for food. Of course its small size could also make it a nice little snack for larger Angelfish, Gouramis, or Catfish species.

This species is only recently starting to be bred by aquarists and it does not appear to be too difficult to spawn.

This species is still rare in the aquarium trade, but because it is such an attractive species and due to the fact that it is well suited for planted aquariums, I think that this species will be well sought after and captive bred animals will be imported for the aquarium trade. You can imagine how impressive these beautiful bright fish will look in your tank! If you can't find any, speak to your local fish store and ask them if they can get this species for you.

Advertiser's Index

ARTICLE:
By Angela Beckx

Koi Show Time and How to Quarantine Your Koi

Koi show time is a great time for hobbyists to get together and participate and show off their koi in a competition. Koi shows attract new koi lovers to come and view all the koi that are placed on show. Koi shows bring dealers around the country together and there are always great specials and deals on koi and koi related products. It is a great way to spread the hobby of koi keeping.

Judges come from around the world as well as local to judge the Koi that are placed on show. The koi are judged on a point system. The Koi is awarded points based on their body shape, fin age, head shape, center line, side profile, colour, pattern, well-marked edges, intensity and purity. The Koi that wins Grand Champion will be the Koi that has the best points on the day.

When you go to a Koi show there are many dealers that are selling new Koi fish. It is very important to quarantine your new Koi before you place them into your existing Koi pond for your safety. If you mix from multiple dealers you will mix different pathogens and parasites. The most affordable way to quarantine your koi is to hire a porta pool from your local Koi dealer and set up a small filter and pump.

Tips on setting up a porta pool

1. Hire or purchase a porta pool.
Fill up the pond with water and remember to De-chlorinate the water to get rid of chlorine and chloramines and heavy metals. If you don't de-chlorinate the Koi will be very stressed as the tap water burns them and they can die.

2. Purchase a net cover
Koi tend to jump when they are moved to a new environment and having a net will keep them save in the porta pool. The net will also protect them from the birds and children falling into the pond.

3. Add some coarse salt.
Add 3kg of salt per 1000L of water. The course salt is good to de-stress the koi and is commonly used around the world for quarantining koi.

4. Heaters
If your water is very cold you will need to heat the water to make sure any viruses that may be on your koi are active. Some viruses are only active in warm water.

5. Test kits are vital.
Moving Koi into a new environment can cause them to spawn or stress. Both spawning and stress will change the water chemistry. Test kits test the pH, Ammonia, NO2 and NO3 levels. The test kits will tell you your water levels and if they are wrong you can correct the water quality issues.

6. Adding medication
Caution must be exercised when adding any medication to your Koi pond. The pond volume is important, as if you over dose with a general anti parasite it can burn and harm the koi. If, on the other hand, you under dose then the medication is not effective and the parasites on the koi will remain.

7. Four weeks of quarantining in a separate pond.
After four weeks you can transport the koi from your quarantine pond into your main pond. Make sure you test the water in both ponds and get the pH levels in both ponds as close to 7.2 – 8.5 as possible. Adding some bicarb of soda can increase the pond's safely to the correct pH levels.

Now you can sit back and enjoy your new additions to your Koi family.

JPD 鯉

Premium KOI FOOD

Maintain optimum koi health with over 200 years of Japanese Koi expertise. JPD has a rich and proud history of koi and goldfish breeding and fish food production in Japan. The full range of foods have been properly registered in South Africa under Act 36 of 1947 and have stickers with V-Numbers and full details on each pack.

JPD foods are expertly formulated using high quality ingredients for the maintenance of healthy koi. Specially selected ingredients support overall koi strength and vitality, strengthens the protective mucus layer and develops balanced coloration in koi. Highly nutritious floating pellet food contains high-quality ingredients PLUS added vitamins and minerals for superior nutrition and palatability.

JPD Koi foods are a easy-to-digest, low-waste formula. Pellets will maintain its shape and will not cloud or discolour pond water. Floating pellets come in Medium (4mm) and Large (7mm), and 3 different pack sizes (2kg / 5kg / 10kg).

The packaging is designed in Japan and manufactured in the EU with the latest packaging technology (such as the one-way vent valves). The material consists of a three-layer aluminum-foil for protection against water and air. All colors, designs and symbols on the packaging are deliberately chosen to ancient Japanese traditions of the samurai period.

Fujiyama
Highest quality Staple Koi food. Contains all basic ingredients for maintaining healthy Koi.

Yamato
Highest quality color enhancing Koi food. Contains pre digested proteins, shrimp & krill meal, algae & seaweed, and is based on wheatgerm.

Shori
Highest quality growth enhancing Koi food. Contains shrimp & krill meal, pre digested proteins, digestive stimulants for stomach-less fishes, and multiple ingredients to aid with digestions have also been added.

Fujizakura
Highest quality health stimulating Koi food. Contains immune stimulators, pre digested protein, special yeast cultures and algae.

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- 4mm pellets for koi up to 30cm;

5mm pellets for koi larger than 30cm.

Koi Sticks

Contain 38% protein and are formulated to provide complete nutrition to young, fast-growing koi.

TIP TO REMEMBER:
Water quality ultimately determines the health of your fish. Ensure that your fish are not overstocked and that the biological filtration system is working efficiently. This will aid in keeping your fish healthy and disease-free.

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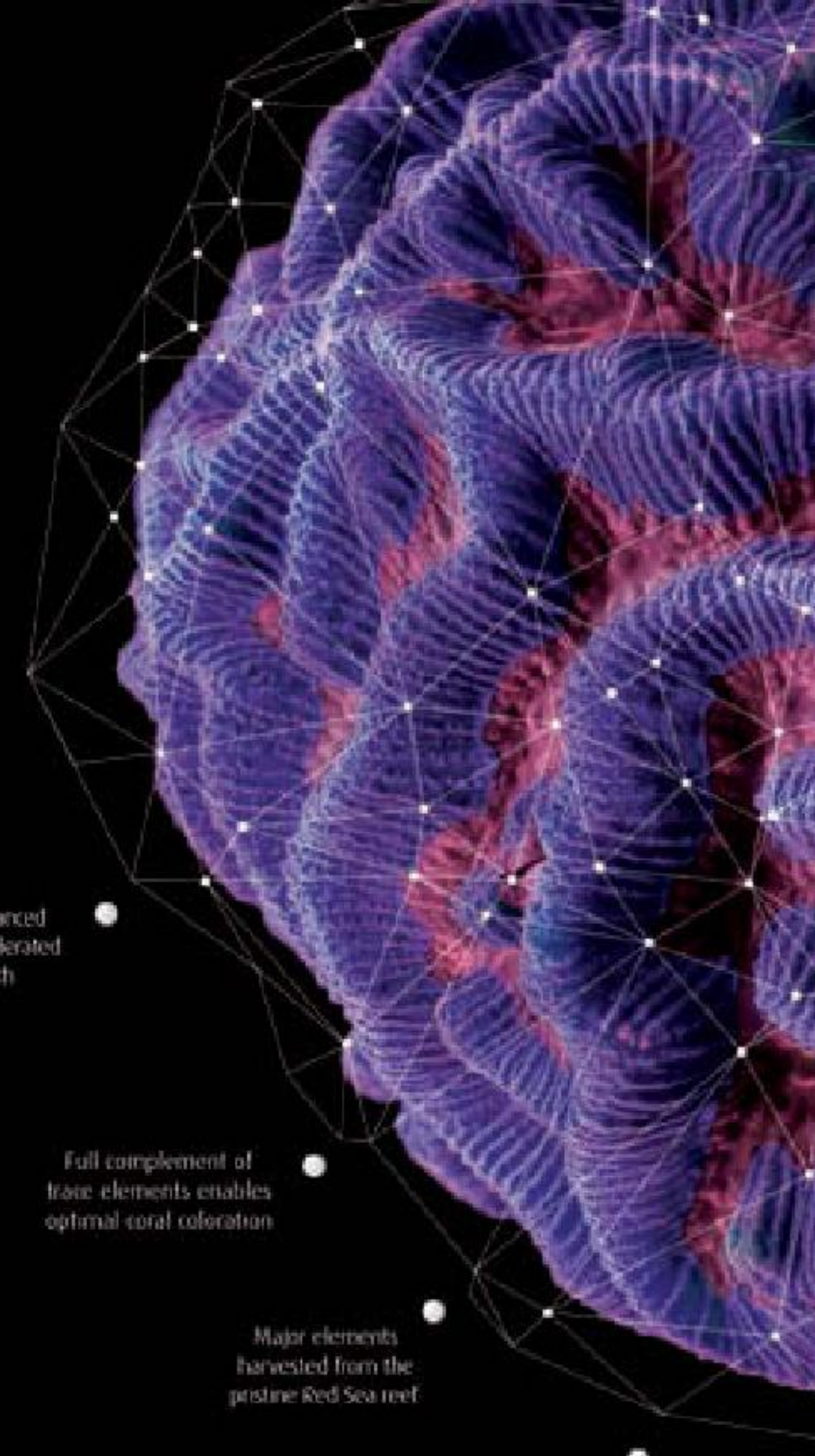

Reef Foundation Elements

Aquarium type	Salinity	Alk (°dKH)	Ca (mg/l)	Mg (mg/l)
Soft/LPS corals	33.0 ppt	11.8 - 12.2	430 - 450	1280 - 1340
SPS/Giant clams	35.0 ppt	12.3 - 12.7	455 - 475	1360 - 1420

Trade Enquiries:
Marltons Pet Products
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The AquaCare-System

Healthy water has never been so easy!

Tetra's AquaCare-System is a range of care products that work together to provide balanced, clear water and healthy fish.

AquaSafe
Turns tap water into safe, nature like water that is ideal for fish and plants.

SafeStart
For the safe introduction of fish.

TetraTest 6in1
Dip tests quickly test the quality of aquarium water in seconds.

EasyBalance
Keeps aquarium water healthy, balanced and reduces the need for frequent water changes.

For more information: www.tetra.net