M-PROCESS

A COMPREHENSIVE STEP-BY-STEP GUIDE ON HOW TO ESTABLISH & MAINTAIN A THRIVING REEF-TANK ECOSYSTEM

Zayn Sibda & Daniel Shepherd

POWER LAB
SYSTEMS

The M-Process

PowerLab's M-Process is a simple 36-month step-by-step programmed for establishing a reef aquarium. It introduces the fundamental elements of modern reef-keeping, based on extensive research and development.

Step One: M-Range Tank

Select your tank based on size and colour. The M-Range systems are pre-configured and include tank, stand, cabinet, canopy, salt, sand, plumbing, electrical, sump filter, heater, flow, lighting and protein skimmer. For further information, please refer to an M-Range manual.

Step Two: M-Range Upgrades

Upgrades reduce maintenance costs and time and increase livestock holding.

Upgrade Modules in order of importance:

- carbon and phosphate reactors
- nitrate reactor
- automated water top-up system
- kalk stirrer
- calcium reactor
- additional light and water flow via pumps
- UV and Ozone reactors
- plankton reactor
- electronics.
-

For further information, please refer to an M-Range manual.

Step Three: M-Scape

Aquascape Design: Pre-designed options are well researched and overcome common problems.

Livestock Selection: Based on our research the animals located in this section are suitable for captivity.

Stocking Process: Covers the correct order in which animals are to be introduced.

Step Four: M-Guide

Systems description: Basic line item break-down of all components.

Service Kits: What you still need: accessories, supplements, foods, and test kits. (For further information, please refer to an M-Range manual.)

Maintenance Schedule: How to maintain your ecosystem: water changes, servicing equipment, media replacement and general cleaning.

M-Range Tank: See Page 7 for images

M40 Desktop unit – Nano – Educational
M40S Same as above but featured with cabinet.
M60 Desktop unit – Nano – Educational
M60S Same as above but featured with cabinet.
M90 Complex ecosystem potential - Up grade kits available - Ideal for starting an advanced reef tank system – Compact and user-friendly.

Aquarium Placement:
The system is best placed in the area where most time is spent.
Ideally in a semi-lit area, although direct sunlight is not a serious issue, provided temperature is maintained.

M-Upgrades on M40 – M90:
Reduce cost, maintenance time, and increase livestock holding capacity.

Stage One:
Optional: Freshwater purifier
Level 1: Carb/Phos Reactor
Level 2: Nitrate Reductor
Level 3: Auto top up and Kalk
Level 4: Calcium Reactor

Stage Two:
Level 1: Additional light and water flow
Level 2: Zeolite Reactor
Level 3: UV Sterilizer
Level 4: Ozone Generator

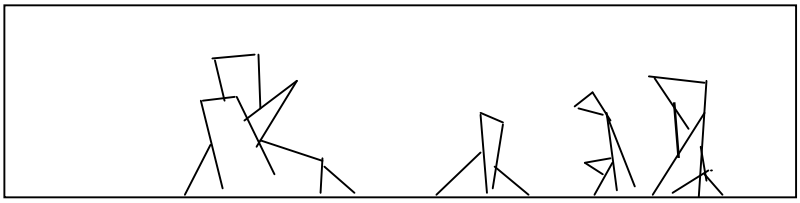
(See systems description for further info.

M- Scape: Aquascape design

M-Scapes are focused on moving beyond recreating natural views. Its aim is rather to create a sense of emotion, developing living art. However strict scientific formulas exist within the design core to ensure healthy ecosystem development by achieving:

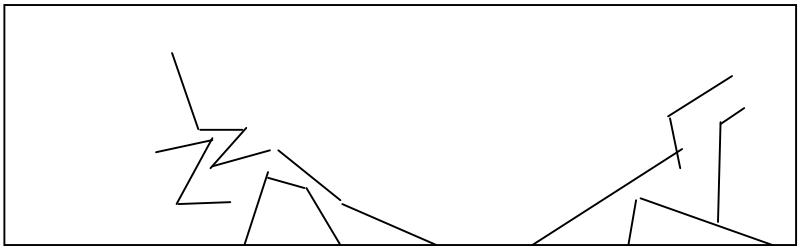
Non-development of sediment/detritus build up.
Strong circulation around most rock surfaces.
Extraction of de-oxygenated water.
Replenishment of oxygen values.
Space for future growth of animals.

1. Zen Garden – Viewed all around



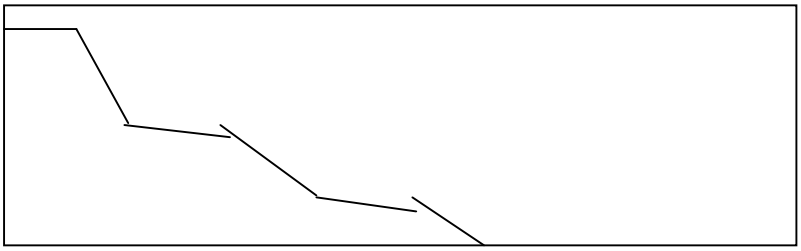
M40/S: 2- 5 kg live rock
M60/S: 4 – 7 kg live rock
M90/S: 10 – 15 kg live rock

2. Riff Gorge – Viewed via two main panels



M40/S: 2- 5 kg live rock
M60/S: 6 – 12 kg live rock
M90/S: 10 – 25 kg live rock

3. Reef Slope – Viewed via two main panels and one side



M40/S: 2- 5 kg live rock
M60/S: 6 – 12 kg live rock
M90/S: 10 – 25 kg live rock

Stocking Process:
M40, M60 and M90 Only

1. Live rock: 24 hours after installation or salt level and temperature are correct.
2. Clean-up Crew: 48 hours after live rock, including snails, crabs, etc. depending on available packages.
3. Coral: one week after clean-up crew, including stage one soft and fleshy hard coral.
4. Fish: one week after clean-up crew, including any stage one fish.

Total Fish stocking levels:

M40 3 fish
M60 5 fish
M90 9 fish

Average stocking rate for fish:

M40 – 1 fish per 10 days
M60 – 1 fish per 10 days
M90 – 1 fish per 10 days
Phase 2 fish should only be considered 90 days after chemical stability has been reached.

Average stocking rate for coral:

Corals can be added fairly quickly and added to the entire rock surface.
Phase 2 coral should only be considered 90 days after chemical stability has been reached and module 2 additives are being used.

Maturation Process:

Cycle One: Calcium build-up on front glass panels from salt mix.
Clean using magnets and blade scraper in service kit.

Cycle Two: Brown dusty algae build-up.
Snails, crabs and algae-eating fish will consume this.
If it persists, check water supply (RO water).

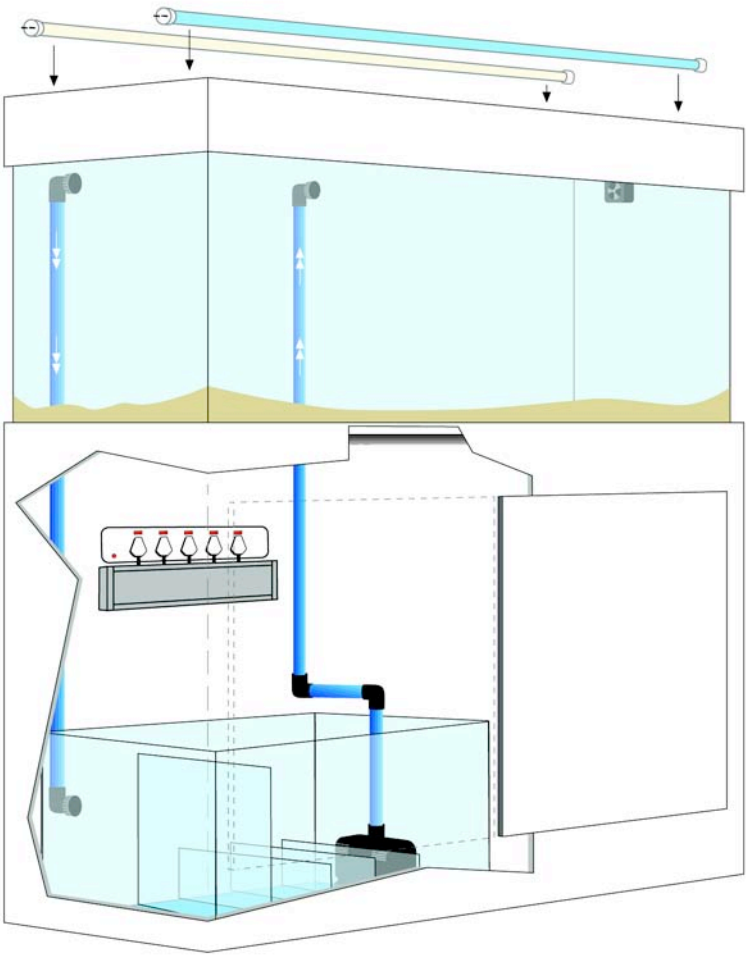
Cycle Three: Slime algae (Red, Green, Black)
This will subside as the system stabilizes chemically and biologically.
If it persists, check the nitrate and phosphate (see manuals for more information.)

Cycle Four: Pink, calcium-based algae start to grow. They begin as small white spores.
This might occur simultaneously with the growth of small fern-like structures.
At this stage small organisms are visible in the rock and sand.

Parasitic Cycle: Within the first few months it is normal for parasites to appear on fish,
These would be seen as small white spots or 'salt crystals' on the fins and body of the fish. This is due to a lack of natural micro-organisms that are still to develop, which feed on these parasites and keep their populations under control.
See Refugium for further information.

Note: It is therefore crucial to follow stage guides on fish selection and the rate of adding fish, as certain species are more susceptible to infection. For control mechanisms, see UV filter in Systems Description.

M 90



M 120

M-Range Tank:

M120	Highly recommended for beginner enthusiast.
M120S	Great value for large reef.
M150	Serious feature.
M150S	Full blown design potential.

Aquarium Placement:
The system is best placed in the area where most time is spent.
Ideally in a semi-lit area, although direct sunlight is not a serious issue, provided temperature is maintained.

M-Upgrades on M120 – M150S:
Reduce cost, maintenance time, and increase livestock holding capacity

Stage One
Optional: Freshwater purifier
Level 1: Carb/Phos Reactor
Level 2: Nitrate Reductor
Level 3: Auto top up and Kalk
Level 4: Calcium Reactor

Stage Two
Level 1: Additional light and water flow
Level 2: Zeolite Reactor
Level 3: UV Sterilizer and Ozone Generator
Level 4: Plankton Reactor

(See systems description for further info.)

M-Scape: Aquascape design

M-Scapes are focused on moving beyond recreating natural views. The aim is rather to create a sense of emotion, developing living art. However strict scientific formulas exist within the design core to ensure healthy ecosystem development by achieving:

- Non-development of sediment / detritus builds up
- Strong circulation around most rock surfaces
- Extraction of de-oxygenated water
- Replenishment of oxygen values
- Space for future growth of animals

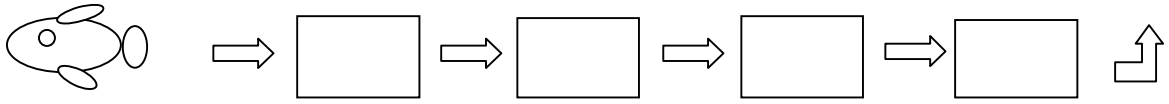
Initially aquascaping refers to the placement of live rock. These are rock pieces that have been collected off natural living reefs. During the collection process, divers are only allowed to harvest pieces that have broken or fallen off the actual reef. The collection of these rubble bits is therefore a sustainable practice and does not impact the natural reef ecosystem. Today however several large live rock farms have been established which produce high quality rock (A-grade live rock.) Live rock in most cases consists of dead coral skeleton or compressed layers of different calcium-based algae species. In a short span of time they become covered internally and externally with a multitude of diverse micro and macro life forms These include bacteria, protozoas, hydroids, worms, mussels, tiny shrimp-like organisms called isopods, copepods and amphipods, various species of algae and seaweeds and in some cases live coral to name a few. These organisms

contribute to the ecology of the system and allow for dynamic food webs and natural biological filtration.

The use of live rock in a captive system is therefore important as it immediately introduces a range of life forms to the initial, sterile aquarium. Because of this some organisms may die upon introduction into new water or during transit. Therefore freshly imported live rock is housed in isolated systems. This process is called 'curing of live rock.' Much of the external foliage may die but the spores remain embedded in the rock and this will germinate later. Over many years we have discovered that the maturation process can produce many seaweed species. These are then later replaced by calcium-based algae, causing the rock to turn a pinky purple color. However if the rock, even after many years, is moved back into a new aquarium it will regerminate these seaweeds and then repeat the same cycle. There are varying opinions as to why this happens. It is probably connected to the nutrient and micro-nutrient values of the water and that on introduction of fish and coral these algae species are out-competed for nutrients and space and eaten.

Live rock and the nitrogen cycle

The nitrogen cycle refers to the braking down of harmful waste material by bacteria. Fish waste, uneaten food and dead matter gets converted from ammonium to ammonia, then through to nitrites and lastly nitrates by bacteria that live on the outer surfaces of the rock. The nitrates are then reduced to nitrogen gas by denitrifying bacteria that live in the inner pores of the rock on low oxygen values. The nitrogen then bubbles out of the aquarium's water and re-enters the atmosphere. In time these strains of bacteria spread to the sand bed also.



Placing live rock

Because live rock is shipped dry all the water in the inner pores drains out. Therefore new rock must be re-hydrated by twisting and turning the rock underwater. Once no more bubbles exit the rock it is safe to start with placement. By following one or combinations of the designs below, a biologically sound AQUASCAPE can be created. It is important to maintain large open spaces between rocks and the sand bed with minimal contact points. In time the coralline algae that develop on the rock will help glue and bind structures of rock together. Rock slides are therefore often unavoidable in a new aquarium. Cable ties and aquarium safe putty (Power Putty) can be used to secure rock pieces together.

Placing coral

Always handle coral gently and avoid touching their fleshy sections. Corals purchased attached to small rock pieces are easier to place. Fleshy hard coral can be placed directly relying on the weight of their skeleton to hold them in place. Unattached soft coral can gently be wedged between rock spaces. Stony coral are best puttied into place using an aquarium-friendly product. (Power Putty.)

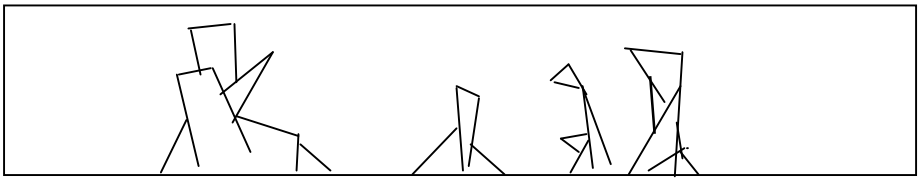
Live rock and parasitic or harmful 'hitch hikers'

In our opinion, stories of 'harmful organisms' discovered in the reef system in most cases are based on exaggerated reports and are largely misunderstood experiences. Brittle worms often seen as a great threat are an important part of the system. They will only feed on dead, dying or ailing coral, fish or clams. Often an explosion in their populations can be linked to over-feeding or

insufficient protein skimming. Aptasia anemones pose a more serious problem and should be removed either mechanically or using a chemical and syringe. Often little crabs can be found sitting (and eating) on freshly imported stony coral. These need to be removed manually as quickly as possible.

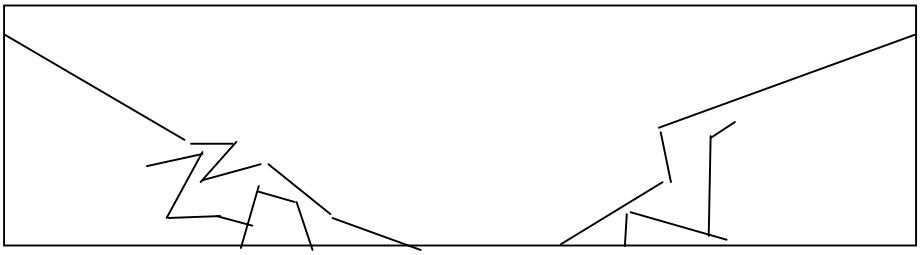
M-Scape designs

1. Zen garden - viewed all around



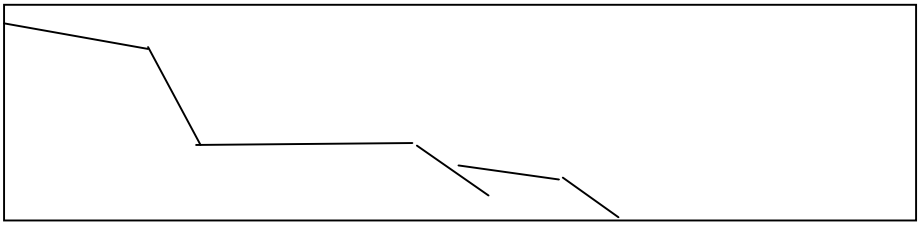
M120: 10 – 15 kg live rock
M120S: 15 – 25 kg live rock
M150: 20 – 35 kg live rock
M150S: 25 – 55 kg live rock

2. Rift Gorge – viewed via two main panels



M120: 15 – 25 kg live rock
M120S: 20 – 35 kg live rock
M150: 25 – 55 kg live rock
M150S: 35 – 65 kg live rock

3. Reef Slope - viewed via two main panels and one side



M120: 15 – 25 kg live rock
M120S: 20 – 35 kg live rock
M150: 25 – 55 kg live rock
M150S: 35 – 65 kg live rock

Stocking Process M120/S and M150/S only

1. Live rock: 24 hours after installation or salt level and temperature are correct.
2. Clean-up Crew: 48 hours after live rock, including snails, crabs etc. depending on available packages.
3. Coral: one week after clean up crew, including stage one soft and fleshy hard coral.
4. Fish: one week after clean up crew, including any stage one fish.

Total Fish stocking levels:

M120	7 fish
M120S	14 fish
M150	19 fish
M150S	26 fish

Average stocking rate for fish:

M120	1 fish per 07 days
M120S	2 fish per 07 days
M150	3 fish per 07 days
M150S	3 fish per 07days

Phase 2 fish should only be considered 90 days after chemical stability has been reached.

Bio-Loads:

Damsels:	6 damsels to 1 fish
Clowns:	6 clowns to 1 fish
Anthias / Goldies:	3 anthias / goldies to 1 fish
Small Wrasse:	6 small wrasse to 1 fish
Chromis:	6 chromis to 1 fish

Average stocking rate for coral:

Corals can be added fairly quickly and added to the entire rock surface.
Phase 2 coral should only be considered 90 days after chemical stability has been reached and module 2 additives are being used.

Maturation Process

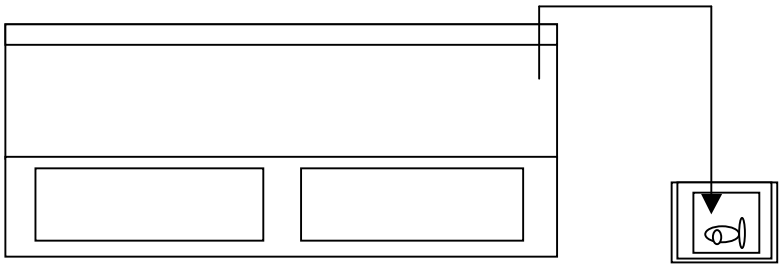
Cycle One:	Calcium build-up on front glass panels from salt mix. Clean using magnets and blade scraper in service kit.
Cycle Two:	Brown dusty algae build-up. Snails, crabs and algae-eating fish will consume this. If it persists, check water supply (RO water).
Cycle Three:	Slime algae (Red, Green, Black) This will subside as the system stabilizes chemically and biologically. If it persists, check the nitrate and phosphate (see manuals for more information.)
Cycle Four:	Pink, calcium-based algae start to grow. They begin as small white spores. This might occur simultaneously with the growth of small fern-like structures. At this stage small organisms are visible in the rock and sand. At this stage small organisms are visible in the rock and sand.

Parasitic Cycle: Within the first few months it is normal for parasites to appear on fish, These would be seen as small white spots or 'salt crystals' on the fins and body of the fish. This is due to a lack of natural micro organisms that are still to develop, which feed on these parasites and keep their populations under control. See refugium for further reading.

Note: It is therefore crucial to follow stage guides on fish selection and the rate of adding fish, as certain species are more susceptible to infection. For control mechanisms, see UV filter in systems description.

Introducing new livestock

New livestock must slowly be introduced allowing them to acclimatize from the bag in which they have been shipped to the water of the aquarium into which they are to be introduced. This is best achieved by placing the bag containing the new fish or coral upright in a bucket and then opening the bag by removing the elastic band. Using a Power Drip Line introduce water to the bucket at a rate of one drop per second until the bag is full. This should take no quicker than one hour.



Livestock selector

1. **Fish**:
   Various species - tangs, surgeons, foxes, triggers, angels, blennies, clowns, damsels, gobies, wrasse
2. **Coral**:
   Growth Formations:
   Soft coral – finger, mushroom, tree, fan-shaped, groundcover.
   Fleshy hard coral – branched, plating and boulder shaped, inflated type
   Stony coral – branched, plating and boulder shaped
3. **Invertebrates**:
   Various species - snails, crabs, shrimp, clams, urchins, anemones, tubeworms, coco worms.

FISH

Introduction

If a reef aquarium is compared to an underwater garden, fish are butterflies and colorful birds, soaring against the backdrop reef structure. Movement and interest is added, and whilst fish are very aesthetically pleasing, they are needed in maintaining the ecosystem from the inside.

The key to having a successful and thriving fish population in a reef tank is to select healthy fish from the very start. This can be difficult, as fish can look fine and healthy in the aquarium store,

but their internal systems may be damaged or contain viruses which are not externally visible. The trained eye of a skilled observer may pick signs of distress, but there are occasions on which a fish acts perfectly normally, but is unhealthy.

The worst thing that can be done is to start your fish population with an unhealthy specimen. Thankfully there are a number of things to look out for when purchasing fish from the aquarium outlet.

1. Look closely through the glass at the fish's body, making sure that the fins are healthy and eyes are clear.
2. The fish needs to be well proportioned.
3. The fish needs to look comfortable swimming around the holding tank.
4. The fish should generally be curious of your presence.

Note: Certain species are more bold/shy then others, so whilst this is the rule, there are exceptions.

The requirements of fish differ from species to species. Do not be shy to research fish or question the shop where it is being purchased about specific requirements.

- After observing whether the fish you like is healthy or not, make sure that your system is ready for such an addition. In our experience in reef-keeping, we have drawn up a list of Phase One and Phase Two fish, briefly commenting on the fish species and stating how many should be purchased and when they should be purchased.

- According to the German reef-keeping school, the first fish to be added are herbivores, so they can help to control potential algae outbreaks in the system, which are often much easier to prevent than to deal with when it becomes a problem.

- The other main method is to add tough, cheap fish to 'break in' the aquariums chemical and biological cycles.

- After much research we have come to the conclusion that neither one system works better then the other, but rather that a combination of the two be incorporated.

- Certain fish like tangs and angels should be added in a specific order or all the same time so as to prevent fighting amongst species over territories.

- Note that comments on the fish are general and there may be exceptions where an individual fish of that species acts differently to another fish of the same species.

- It is important to identify and understand which fish in your in your setup is the alpha fish, as doing this can give you insight into the fish's individual behavior in the aquarium and their aggression. The role of the alpha fish is to keep other fish in line, preventing fights rather then initiating them.

- Problematic fish are purchased every now and again accidentally, and although catching a fish in a developed reef tank is hard, it may need to be done. Alternatively you can add a fish which is larger and which will become dominant, and suppress the previous alpha's aggression, whilst not being aggressive towards other fish. If the fish needs to be caught, a trap can be purchased from your closest Phuture Lab outlet.

- All fish will conquer new territory from time to time, as it is natural. You will find fish swimming up to each other and shaking or flaring their fins, and tangs and surgeons shake their spines near to the tail, but this is normal behavior.

- It is generally only a problem when the aggressor prevents the victim from coming out and eating, or stresses the fish to such a degree that it contracts a disease like whitespot.

Fish Disease

Fish in a new tank are often prone to parasite cycles. This is part of establishing an aquarium. In nature we suspect that parasites are kept in control by micro and macroscopic organisms that feed on them. However, in a new aquarium these organisms haven't developed yet and as a result parasite outbreaks can occur. Therefore it is crucial to follow the stocking process on the livestock selector so as to introduce hardy fish with more capable immune systems into the new aquarium. This will kick-start the growth of these parasite-consuming organisms without the fish themselves dying.

Disease	Symptom / Condition	Solution
Tattered Fins	Can occur during transit. Can be as a result of aggressive or territorial fish.	Ensure fish are well fed with food soaked in Power Lab Multi Vitamins. Fins will grow back within a few days to a few weeks.
Bacterial Infections	Noted as white, filmy patches on the body of the fish. Often settle in on torn or damaged fins if the regeneration process is taking too long, which will normally happen in systems with poor water quality (fluctuating levels, high nitrates).	Water levels need to be stabilized and nitrates reduced via water changes and making sure all hardware and life support systems are running adequately. Ensure fish are well fed with food soaked in Power Lab Multi Vitamins.
Pop Eye	Noted as a radical swelling of the eye of the fish. Normally subsides within a few days. In extreme cases fish can lose the eye.	Ensure fish are well fed with food soaked in Power Lab Multi Vitamins.
Lymphysitis	Noted as a large cauliflower-like growth on the body of the fish, covering eyes, lips or scales. It is a viral infection, and often looks worse then it is. Often found on newly imported, large angel fish.	Ensure fish are well fed with food soaked in Power Lab Multi Vitamins. Ensure correct salt and temperature levels are maintained. It should go away naturally with time. Worst-case scenarios occur when the fish cannot eat due to mouth infections, but the disease is seldom fatal.
Whitespot	Noted as a white 3D spot on the fish. Can appear on new surgeons and tangs, therefore crucial to follow the stocking process. Occurs in both new and established aquariums. Whitespot population will finally settle out.	Usage of recirculating UV will be very beneficial and can save fish. In sterile tanks or tanks with too many fish and no UV sterilizer the losses can be devastating (the whole fish population). So add healthy fish at the correct intervals to prevent this from happening.
Flukes	Similar plague to whitespot. Appearance of fish as if the fish has been dipped in salt.	

General

We never advice the usage of medications in reef tanks, as coral, inverts and micro and macro organisms are killed when this is done. Stick to the stocking guides to prevent losses. Buy healthy specimens from dealers where fish are correctly acclimatized and quarantined, with minimal stress.

At worst the entire fish population can be lost and the tank would have to run without fish for at least 4 weeks to cycle out the parasite.

Phase One Fish: first 90 days (unless shown otherwise)

Gobies
These fish are extremely tough and serve the purpose of consuming algae in the reef setup. Although not always aesthetically colourful, they make more then up for it in their 'lawnmower-like' behaviour as well as their charm.

Salarius Goby	A must for all tanks, excellent first fish, will consume most algae.	Single
Diamond-back Goby	Will clean sand bed, easily fed artificial foods	Pairs
Valencia Goby	Will clean sand bed, but can be sensitive to feeding.	Pairs
Bi-colour Goby	Excellent as first fish, colorful and will consume most algae.	Single
Midas Goby	Will consume algae, colorful and hardy.	Single
Fire Goby	Initially shy, colourful, will not consume algae, but very aesthetic.	1, 3 or more
Rocket Goby	Will not consume algae, purely aesthetic	1, 3 or more
Chinese Goby	Will not consume algae, purely aesthetic	1, 3 or more
Purple-eye Goby	Can be sensitive, expensive, wait 60 days	1, 3 or more
Neon Goby	Clean fish of parasites, but can be sensitive.	1 or more
Okinawa Goby	Avoid, can destroy stony coral	None

Tangs & Surgeonfish
Tangs and Surgeonfish are a family of fish that all possess spines in their tails for defence. They are very active, and after initially being added they may 'pace' up and down the aquarium glass for a day or two. They are aggressive algae-consumers, which coupled with their amazing patterns and colourations, make them the most popular species of fish for reef aquariums. The general difference between Surgeons and Tangs, named after their spines in the tail, is that Surgeons are more compressed and oval, whereas Tangs are more diamond shaped.
These fish can be territorial and aquarists need to add them all together ideally or in the correct order to successfully keep them.

Scopas Tang	Excellent as first fish, will consume most algae.	1, 3 or more
Lopezi Tang	Will consume algae, wait 60 days.	1, 3 or more
Flamingi Tang	Will consume algae, wait 60 days.	1, 3 or more
Sailfin Tang	Excellent as first fish, will consume most algae.	1, 3 or more
Bristle-tooth Tang	Excellent as first fish, will consume most algae.	1, 3 or more

Dwarf Angels
These are truly spectacular fish, hence the name 'angel' fish. They possess beautiful shapes and colour and are often show-fish in aquariums. They are generally very intelligent and curious about their surroundings. They consume algae and may nibble at coral, but shouldn't if kept well fed.

They require oxygenated water with good skimming and need to be fed daily to do well in captivity. That said, they do adjust readily and make excellent additions to reef setups.

Coral Beauty	Excellent as first fish, will consume most algae. More often then not first angelfish purchased by new comers.	Single
Multispinis Angel	Excellent as first fish. Will consume most algae.	Single
Eibli Angel	Excellent as first fish, will consume most algae. Best purchased from Sri Lanka.	Single
Nox Angel	Excellent as first fish, will consume most algae. Otherwise known as Midnight angel due to its unusual pitch-black coloration.	Single
Jumping Bean	Excellent as first fish, will consume most algae.	1, 3 or more
Bicolour Angel	Excellent as first fish, will consume most algae, may peck at coral.	Single
Rusty Angel	Excellent first fish, highly adaptive. Eats algae, may peck at coral.	Single
Keyhole angel	Excellent as first fish, will consume most algae. Striking coloration being black with a white “key hole” mark in the centre. May peck on coral if not regularly fed.	Single

Dwarf Damsels
Damsels are known around the world for their hardiness and beautiful colour. Some have given this species a negative stereotype as being aggressive when this is not always the case. They are inexpensive and often used to ‘break-in’ a new aquarium.

Humbug	Great value options	1, 3 or more
Yellow Tail	Great value options	1, 3 or more
Neon Blues	Great value options	1, 3 or more
Honey Damsels	Great value options	1, 3 or more
Sergeant Majors	Great value options	1, 3 or more
Chromis Damsels	Lots of movement, eats small food particles, the more Chromis the , the schooling effect. Often change colour from a light blue to silver as they move direction in the aquarium and the light catches a different angle on the fish. A favourite of many.	Schools of 4 and more
Dominos	Great value options, can be nasty bitters	1, 3, or more
Goldbelly Damsel	Great value options	1, 3 or more

Clownfish
Although Phase One, wait at least 30 days. These prized fish are best kept with anemones to show their natural characteristics and to help them feel secure. They swim in a unique manner, giving rise to the name ‘clown’ fish. They contain a film of slime around their bodies allowing them to swim in and out of anemones, which is their natural defense. They are very colourful and are

awesome additions to the reef tank. Please note that individual species of clownfish may have different coloration and slightly different patternage dependant on the source of capture.

Common Clownfish	Well, every body loves nemos!	Singles, pairs and schools
Tomato Clownfish	Can become aggressive, add last or very small.	Single or pairs
Skunk Clownfish	Lovely, but need host anemones	Pairs only
Assorted Two Band Clownfish	Hardy, but can be aggressive, add last or very small.	Singles, pairs and schools
Clarkii / Sebae Clownfish	Hardy, but can be aggressive, add last or very small.	Single, pairs and schools
Maroon / Goldstripe Clownfish	Hardy, but can be aggressive, add last or very small.	Single

Rabbits and Foxfaces
These colourful, elongated fish are employed into the system for their aggressive consumption of algae. The tops of their dorsal fins are poisonous so handle with care. Tough, they are good early additions to the reef tank.

Common	Excellent as first fish, will consume most algae.	1, 2, 3 or up
Black spot	Excellent as first fish, will consume most algae.	1, 2, 3 or up

Grammas
These fish are tough and hardy, and can look after themselves. However they may target smaller fish that are added after them. They swim at different angles and it is not uncommon for them to swim upside down under a cave. Very interesting fish that add splashes of colour to the system. Ideally you want to add all the grammas that you would like to keep at the same time. They stay small and colourful and do not bother invertebrates, what more can one ask for! Readily accept foods.

Strawberry Gramma	Hardy, but can be aggressive	Single
Flashback Gramma	Hardy, but can be aggressive	Single
Half-and-Half Gramma	Hardy, but can be aggressive	Single
Royal Gramma	Regal in colour. Collected from Hawaii only.	Single
Back Cap Gramma	Regal in colour - magnificent purple. Highly sought-after.	Single

Wrasse
Loads of movement and colour. Sleep in sand bed in the evening. Get up at the same hour every day as they are programmed to do in nature.

Tamarin Wrasse	Active and colorful, stay small	1, 2, 3 or more
Leopard Wrasse	Colorful reef dwellers, popular choice	1, 2, 3 or more
Peacock Wrasse	Active and colorful, stay small	1, 2, 3 or more

Six-line Wrasse	Active and colorful, stay small, consume parasites off coral and rock	1, 2, 3 or more
Disappearing Wrasse	Colorful popular additions, safe with coral	1, 2, 3 or more
Banana Wrasse	Active and colourful, consume parasites off coral and rock	1, 2, 3 or more
Fairy Wrasse	Colorful plankton eaters, great addition	
Cleaner Wrasse	Consume parasites off of fish like a dentist	Single
Radiant Wrasse	Colorful reef dwellers, popular choice	1, 2, 3 or more
Harlequin Tuskfish	gets larger then previous wrasses, very regal	Single or Pairs
Bird Mouth	up to a foot in length, will consume small snails and possibly nip at coral.	Single or Pairs
Dragon Wrasse	Fish Only setups, will consume coral and move rock	Single

Avoid! Lunar Wrasse, Two-spot Wrasse, African / clown Wrasse

Triggers
Hardy but can become destructive and aggressive with age, barring a few individual species. The temperament of the individual fish as apposed to the species will determine whether they are a successful addition. Highly intelligent and sociable.

Blue Throat Trigger	Well priced, hardy	1 male, 1 or more females
Clown Trigger	Regal fish, but can be aggressive	Single

Parrotfish
Tough, regal fish that consume coral. Recommended for fish-only setups only.

Bicolour Parrot	Take food readily. Tough, consume coral.

Butterflyfish
Generally consume coral and are finicky, though a few individual species are suitable to captivity. Feeding can be problematic. Try sticking cut pieces of banana to the glass in the tank. The banana has an attractive smell and is very healthy for the butterfly, and it replicates a sponge which is part of the natural food consumed, so this often works. Otherwise a mussel cracked open or with a piece of frozen food attached to the shell can encourage these fish to feed. Frozen bloodworms, although not very nutritious, have also been known to get them to feed.

Copperband	Will generally consume problematic aptasia anemones, although this is not always the case. Tough fish, provided feeding can be achieved. See above. May eat tube and coco worms if underfed.	Single
Long-nose Butterfly	Will generally consume problematic aptasia anemones, although this is not always the case. Tough fish, provided feeding can be achieved. See above. May eat tube and coco worms if underfed.	Single

Threadfin and Raccoon	Very hardy and readily accept foods. Consume coral however and need to be placed in a fish-only system.	1, 2, 3 or more
Wimple	Very hardy and readily accept foods. May consume algae depending on the individual and where it is collected. Not to be confused with the Moorish Idol.	1, 2, 3 or more

Cardinals
Tough fish, fairly inactive, swim in schools, baring the Bengaai Cardinal. Readily breed in captivity in a similar fashion to mouth-brooding Malawis. Often under-appreciated.

Pyjama Cardinal	Tough, colourful. Readily eat. Stay at the bottom of the system and hover.	1, 2, 3 or more
Bengaai Cardinal	Originate from the Banngaai Island in Indonesia only. Tough fish, one male and many females need to be kept. Young fry cluster around certain anemones and urchins	Pairs and more

Hawkfish
These fish are highly entertaining to watch. They do not 'swim' but rather perch on rocks and coral at the top of the aquarium. When they see something they wish to investigate they swoop down to the bottom of the tank much like a hawk, hence their name. They are tough, readily accept food and are fairly inexpensive, barring the Flame Hawk. A great choice.

Dwarf Hawkfish	A personal favourite. Tough and full of personality. They possess a red colour which is hard to come by in most fish. Readily eat artificial foods.	Single
Flame Hawkfish	Extremely regal, its colours are hard to match in other fish. Very tough. Very sought-after, not often available. Fetch a high price when landed. Collected in Hawaii only.	Single
Long-nose Hawkfish	Very tough and colourful. Similar colour patterning to the Dwarf Hawkfish, but has a long nose for hunting micro inverterbrates in the reef. Readily accept artificial foods.	Single
Arc Eye Hawkfish	Very tough, interesting arc around the eye hence the name. Readily accepts artificial foods.	Single

Phase Two Fish: minimum 90 days

Dwarf Angels
These are truly spectacular fish, hence the name "angel" fish. They posses beautiful shapes and color and are often show fish in aquariums. They are generally very intelligent and curious about their surroundings. They consume algae and may nibble at coral, but shouldn't if kept well fed. They require oxygenated water with good skimming and need to be fed daily to do well in captivity. That said they do adjust readily and make excellent additions to reef setups.

Argi angel	Not imported regularly due to lack of availability, but is a beautiful fish that adapts well to captivity and takes foods readily. Stunning coloration	Single

Flame angel	Very striking fish, with bold orange and red coloration and dark blue to black tiger stripes. Consumes algae. Only found in Hawaii. Single, Pairs
Multi color angel	Not imported regularly due to lack of availability, but is a beautiful fish that adapts well to captivity and takes foods readily. Stunning coloration Single
Purple mask angel	Not imported regularly due to lack of availability, but is a beautiful fish that adapts well to captivity and takes foods readily. Stunning coloration and not your typical dwarf angel shape. Single
Swallowtail angel	There are different subspecies available. Will all school together however which is unusual for angels. Consume algae. Pairs, schools
Heraldi / Lemonpeel	Slight difference in color. Both adapt well. Single

Large angels:
M120S and up only! Note: for large angels and tangs a recirculating UV is required. These fish are difficult to keep and should only be tried when the system is 150 days old, preferably when an MV computer run via an Ozonizer is in place, and once the coral have routed themselves into the system, possessing bright color and growth formations showing that they are in full bloom, as when the fish are added they will peck a the coral, and the coral will only survive if they are at this level. The angels will feed on the coral, but in turn need to be trained to take captive food. They are seen as the pinnacle of marine fish. We must stress that this is the last goal of the system in terms of fish additions. They are truly spectacular fish, hence the name “angel” fish. They posses beautiful shapes and color and are often show fish in aquariums. They are generally very intelligent and curious about their surroundings. They consume algae and may nibble at coral, but shouldn’t if kept well fed. They require oxygenated water with good skimming and need to be fed daily to do well in captivity. That said they do adjust readily and make excellent additions to reef setups.
Like Butterflies feeding is a very important aspect to their survival in captivity. Try sticking cut pieces of banana to the glass in the tank. The banana has an attractive smell and is very healthy for the angel, and it replicates a sponge, which is part of the natural food consumed so this often works. Otherwise a mussel cracked open or with a piece of frozen food attached to the shell can encourage these fish to feed. Frozen bloodworms although not very nutritious has also been known to get them to feed.

Koran	Best purchased at a small size. May peck at polyps, but shouldn’t if well fed. Single
Emperor	By experienced aquarist in aquariums older than 150 days. Single
Regal	With very high and stable coral loads. These fish might nibble at coral. Need to be added before yellow tangs generally as lots of aggression is normally displayed from yellow tangs towards these fish specifically. It could be due to similar color on the fish. Single
Blue face	Feed on certain coral, their dietetic requirements must be matched. Single
Majestic/Navarchus	Not as tough as the other subspecies in its genus, but once it accepts artificial foods it adjusts. Purchase juveniles. May peck at coral and algae. Single
Rock beauty	Imported form Hawaii. Need to be purchased as young and small as possible for best chance of fish adapting. Once they take food and have adapted they are very tough fish. Single

Asfur	Real beauty for large aquariums. Long levity and very intelligent. Will consume algae and artificial foods.	Single
French	Color changes dramatically as they grow. Might consume coral. Get very large. Provided you have a large aquarium they are great additions.	Single
Trimaculatus	An established reef aquarium is required. May peck at coral.	Single
Queen Angel	Initially a brilliant blue. A true queen, she is very regal. Color changes dramatically as they grow. Might consume coral. Grow very large.	Single

Butterflyfish:
Generally consume coral and are finicky, though a few individual species are suitable to captivity. Feeding can be problematic, try sticking cut pieces of banana to the glass in the tank. The banana has an attractive smell and is very healthy for the butterfly, and it replicates a sponge which is part of the natural food consumed so this often works. Otherwise a mussel cracked open or with a piece of frozen food attached to the shell can encourage these fish to feed. Frozen bloodworms although not very nutritious have also been known to get them to feed.

Moorish Idol	Finicky fish, which require large aquariums. Do not adapt to captivity readily. Best left to experts.	Single

Tangs / Surgeonfish:
Tangs and Surgeonfish are a family of fish that all posses spines in their tales for defense. They are very active, and after initially being added they may “pace” up and down the aquarium glass for a day or two. They are aggressive algae consumers, which coupled with their amazing patterns and colorations make them the most popular species of fish for reef aquariums. The general difference between Surgeons and Tangs, named after their spines in the tail, is that Surgeons are more compressed and oval, whereas Tangs are more diamond shaped.
These fish can be territorial and aquarists need to add them all together ideally or in the correct order to successfully keep them.

Regal tang	The Regal Tang is a compressed oval-shaped Tang which boasts striking color and patternage. It stays small compared to other tangs and surgeons and is a very popular choice due to its appearance and algae consumption rates. A school of Regal Tangs in a large aquarium is a truly breath-taking sight. They adapt well, are generally not aggressive and should be one of the first tangs to be added at around the 90 days mark.	1, 3 or up
Convict tang	These algae eaters are very active in the aquarium and race up and down consuming huge amounts of algae. They adapt successfully if kept fed with a seaweed-based food containing spirulina. Beautiful black and white patterns make them popular, however they can be slightly aggressive and a smaller individual should be added after other tangs and surgeons.	1, 3 or up
Pajama/Clown tang	These fish require good water parameters and lots of water movement and surface movement as they are generally caught in the surf zone where vigorous water movement occurs. They are often seen schooling naturally with other assorted Bristle tooth tangs including the Convict tang. Consumes algae.	1, 3 or up
Yellow tang	The most common tang in reef aquariums it has become symbolic of the reef aquarium trade for many years. Bright yellow and diamond-shaped,	

	this fish eats large amounts of algae and is fairly docile. A must for all aquariums.	1, 3 or up
Purple tang	These fish are very rare in the aquarium trade as of recent years. They hale from the States where they are infrequently exported and from the Red Sea where a ban has occurred on all marine fish exports for the aquarium trade. When they do land they fetch a high price, but are well worth it. They adapt very readily, are very tough fish and consume algae. The purple coloration they posses is hardly matched in any other fish barring a few angels.	1, 3 or up
Powder brown	150 days preferably, with high coral load. Can be aggressive, add last.	1, 3 or up
Powder blue	150 days preferably, with high coral load. Beautiful but a very healthy specimen needs to be purchased to ensure that it is a successful addition.	1, 3 or up
Gold Rim	150 days preferably, with high coral load.	1, 3 or up
Archilles Tang	150 days preferably, with high coral load.	1, 3 or up

Rabbits and fox face:
These colorful elongated fish are employed into the system for their aggressive consumption of algae. The tops of their dorsal fins are poisonous so handle with care. Tough, they are good early additions to the reef tank.

Magnifica Fox Face	These fish are imported rarely. They consume algae and may nip at coral although this is uncommon.	

Gobies:
Mandarins and Scooter Blennys fall under the Scooter Blenny Subspecies. They consume minute shrimp in the aquarium from live rock and therefore require a mature system. One male per tank and a harem of females. Spawning rituals are interesting to watch and are a common occurrence in an aquarium where these fish receive enough food and are breeding size.

Mandarin fish	require mature systems where they can prey on isopods	1, 3 or up
Scooter blenny	mature system needed, prey on isopods	1, 3 or up

Mischalenous:

Tile fish	very sensitive 150 days preferably, with high coral load. Will take artificially prepared foods, but jump out of the system when scarred or stressed.	Pair

Goldies:
These fish are known as “Jewels of the reef”, and are often seen in vast numbers against the reef backdrop swimming both right way up and upside down. They seek refuge in large schools are create an amazing effect as they are so colorful. One dominant fish in the school will be male, and the rest females. There are many subspecies of Goldies available, but they will all school together in the reef aquarium in the water column. Feeding is required daily for them to be a successful addition.

Assorted Goldies	Feed variety of foods daily. One dominant male to harem of females. The more added the more secure the Goldies will feel and the more they will swim in the water column.	3 and up

Groupers:
Generally a definite no in reef tanks. However the exception is the Comet Grouper.

Comet Grouper	Although not much is known about these beautiful fish regarding their feeding habits, they have been known to survive in large aquariums. Provide lots of live rock and try and feed artificial frozen foods. Can be shy.	Single

PHASE ONE FISH

SALARIUS GOBY | DIAMOND BACK GOBY | VALENCIA GOBY | BICOLOUR GOBY | MIDAS GOBY

FIRE GOBY | ROCKET GOBY | CHINESE GOBY | PURPLE EYE GOBY | NEON GOBY | OKINAWA GOBY

SCOPAS TANG | LOPEZI / VLAMINGI | SAILFIN TANG | ASSORTED BRISTLE TOOTH | CORAL BEAUTY

MULTISPINNIS | EIBLI ANGEL | NOX ANGEL | BICOLOR ANGEL | JUMPING BEAN

RUSTY ANGEL

KEYHOLE ANGEL

HUMBUG DAMSEL

YELLOW TAIL DAMSEL

NEON BLUE DAMSEL

HONEY DAMSEL

SERGEANT MAJOR DAMSEL

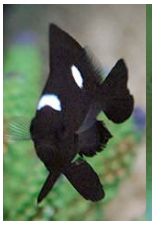
CHROMIS DAMSELS

DOMINO DAMSEL

GOLDBELLY DAMSEL

COMMON CLOWNFISH

TOMATO CLOWNFISH



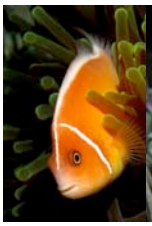
ORANGE/PINKSKUNK CLOWNFISH

ASSORTED TWO BAR

CLARKII CLOWNS

MAROON CLOWNS

FOXFACE



STRAWBERRY GRAMMA

FLASHBACK GRAMMA

HALF & HALF GRAMMA

ROYAL GRAMMA

BLACK CAP GRAMMA

TAMARIN WRASSE

LEOPARD WRASSE

PEACOCK WRASSE

SIXLINE WRASSE

DISAPPEARING WRASSE

BANANA WRASSE

FAIRY WRASSE

CLEANER WRASSE

RADIANT WRASSE

HARLEQUIN TUSKFISH

BIRDMOUTH WRASSE

DRAGON WRASSE

BLUE THROAT TRIGGER

CLOWN TRIGGER

BICOLOUR PARROTFISH JUV.

BICOLOUR PARROTFISH ADULT

COPPERBAND BUTTERFLY

LONGNOSE BUTTERFLY

THREADFIN BUTTERFLY

RACCOON BUTTERFLY

WIMPLE

PYJAMA CARDINAL

BENGAAI CARDINAL SCHOOL

BENGAII CARDINAL FEMALE

BENGAII CARDINAL MALE

DWARF HAWKFISH

FLAME HAWKFISH

LONGNOSE HAWKFISH

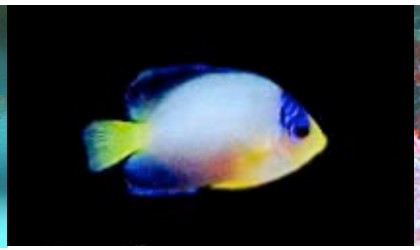
ARC EYE HAWKFISH

PHASE 02 FISH:

ARGI ANGELFISH

FLAME ANGELFISH

MULTI COLOR ANGELFISH



PURPLE MASK ANGELFISH

BLACKSPOT SWALLOWTAIL FEMALE

BLACKSPOT SWALLOWTAIL MALE

ORNATE SWALLOWTAIL FEMALE (LEFT) AND MALE

LAMARCK'S SWALLOWTAIL FEMALE

LAMARCK'S SWALLOWTAIL MALE

JAPANESE SWALLOWTAIL FEMALE (L) AND MALE

HERALDI ANGEL

LEMONPEEL ANGEL FROM JUVENILE COLORATION (LEFT) THROUGH TO FULL ADULT COLORATION (RIGHT)

KORAN ANGEL BABY

KORAN ANGEL JUVENILE

KORAN ANGEL SUB ADULT

KORAN ANGEL ADULT

EMPEROR ANGEL BABY

EMPEROR ANGEL JUVENILE

SUB ADULT EMPEROR ANGEL CHANGING OVER TO MATURE ADULT (R)

REGAL ANGELFISH

BLUE FACE ANGELFISH FROM JUVENILE (L) TO MATURE ADULT (R)

NAVARCHUS ANGELFISH BABY THROUGH SUB – ADULT TO ADULT COLORATION (FAR RIGHT)

ROCK BEAUTY ANGELFISH BABY THROUGH SUB – ADULT TO ADULT COLORATION (FAR RIGHT)

ASFUR ANGELFISH BABY THROUGH SUB – ADULT TO ADULT COLORATION (FAR RIGHT)

FRENCH ANGELFISH BABY THROUGH SUB – ADULT TO ADULT COLORATION (FAR RIGHT)

TRIMACULATUS ANGELFISH

QUEEN ANGELFISH BABY THROUGH JUVENILE TO FULL ADULT COLORATION

MOORISH IDOL





REGAL TANG

CONVICT TANG

CONVICT TANG SCHOOL

CLOWN SURGEONFISH




YELLOW TANG

PURPLE TANG

POWDER BROWN TANG

POWDER BLUE TANG



GOLD RIM TANG

ARCHILLES TANG

MAGNIFICA FOX


MANDARIN FISH

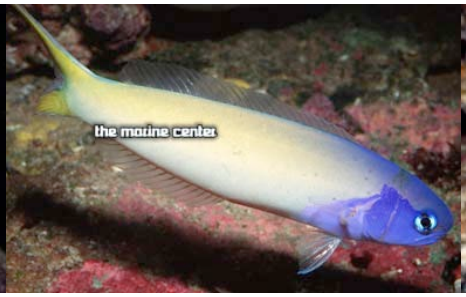
MANDARIN PAIR

SCOOTER BLENNY

PURPLE TILEFISH

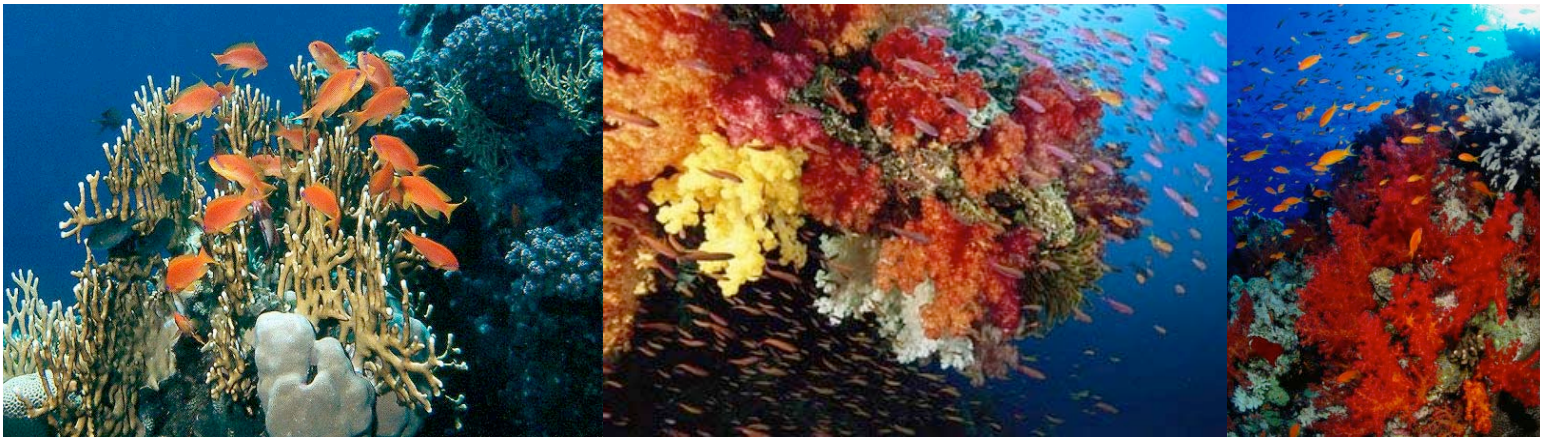
SKUNK TILEFISH

BLUE JAW TILEFISH



FLASHING TILEFISH

ASSORTED GOLDIES



ASSORTED GOLDIES

COMMET GROUPER

CORAL

Brief introduction to coral:

- Coral and anemones can be seen as modified types of amoeba.
- Can photosynthesize like plants and also trap solid food.
- Reproduce sexually by releasing sperm and gametes into the water.
- Reproduce asexually by budding, splitting and releasing off shoots.
- Soft coral are jelly like with no hard skeleton
- Fleshy hard coral have hard skeletons below their tissue
- Stony hard coral have a thin film of flesh over the skeleton
- Produce color pigments to protect themselves from u.v light
- Some pigments help bounce light between branches to maximize exposure to light.
- Expand and deflate to pump water in and out of body
- Release slime which feeds smaller organism and some fish
- Leather coral release a plastic cling wrap like membrane after closing
- Contain algae within their tissue that perform the photosynthesis
- Coral rely on photosynthesis for energy
- Contain stinging cells that help capture small prey and can sting neighboring coral to defend space.
- Can lose color (bleach) if over illuminated.
- Can lose color (bleach) if under illuminated.
- Can lose color (bleach) if over heated.
- Can lose color (bleach) if system is too cold.
- Can shrink down suddenly and remain closed
- Damaged coral can get a brown jelly infection (treat with Power Lab Coral Disinfectant)
- Lose all color if severely stressed or tissue peels off skeleton
- Soft coral rot away completely when they die.
- Stony coral turn white and their skeletons remain.
- Stony coral can be fraged by snapping / cutting the branches
- Soft coral can be fraged by cutting branches or relocating off shoots

Phase One Coral: first 90 days (unless shown otherwise)

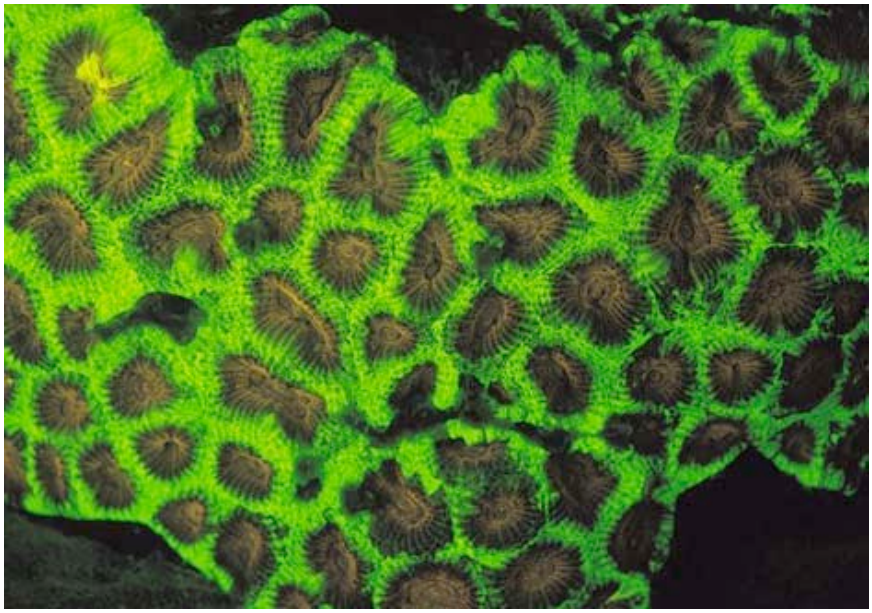
Soft coral

These coral have no hard skeleton structure and are often propagated by physically cutting the individual coral into different segments, which in turn all grow to be new corals. These coral expand and contract in accordance with the light configuration as well as water parameters. They are tough and are good first additions. When something in the tank is not in order, e.g. your chemical parameters are incorrect, these coral stay contracted for a long period of time, a day and up, which gives the indication that there is something not right in the system. These coral

gain energy from photosynthesis and do not require heavy lighting, and therefore are placed in the lower quarter of the tank where they grow along rocks and up into the water column, depending on the species. If purchased on rock place in the lower quarter of the system. If purchased loose, attach to rocks in the lower quarter via Power Lab Putty. It is not uncommon for certain soft coral such as Leathers to release a film of slime around their bodies. This is normal. Often when soft coral remain shut without polyp extension or mushroom coral jump off the rock they are placed on it is an indication that the temperature of the tank is too high. These coral do not sting each other as badly as hard coral, however certain mushrooms need to be isolated. The general rule is that corals of the same species, e.g. all the Leathers, can be in close proximity to each other.

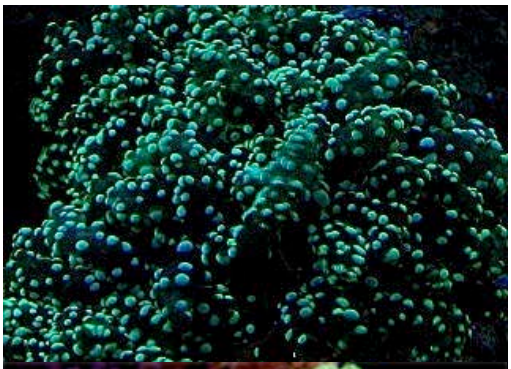
Tree coral	capnella, lithopyton (Kenya tree and pink tree)
Leather coral	sarcophyton and lobophyton (toad stools)
Finger leathers	sinularia
Xenia and anthelia coral	pulse coral, pom pom, waving hand
Clavularia	star polyps, green stars, metallic stars, creeping gorgonian
Polyps and zooanthids	polyp rocks, zooanthid rocks, palythoa, barley polyps
Mushroom rocks	rocordia, rodactis, discosoma, amplexidiscus
Avoid:	dendronepthia, see fans, sponges, gonipora

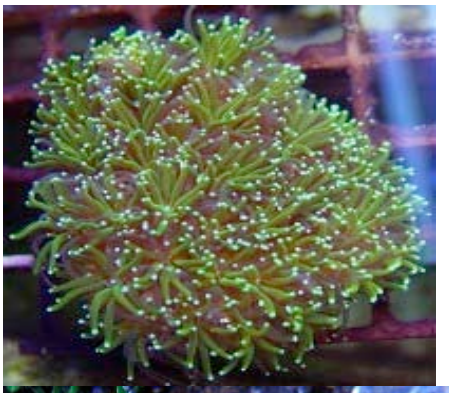
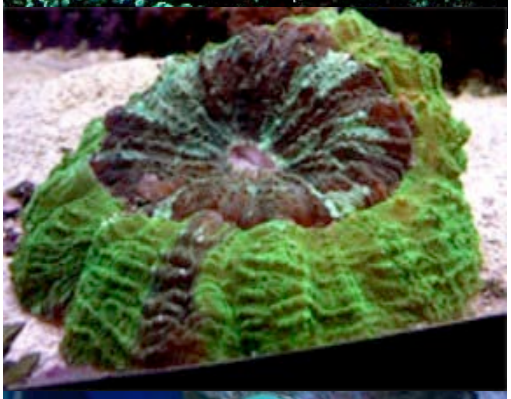
Fleshy hard coral:



These coral, despite what much literature on the topic says, are just as easy to keep as Soft coral, provided your lighting and chemistry is in order. Just as Soft coral, these Fleshy hard coral expand and contract by adjusting the amount of water their polyps contain, and in this manner certain coral like the Fungia Plate Coral can move around the tank looking for the best conditions. Unlike soft coral however, they have hard bone structure and need to be handled with care so as to not damage or scratch their skeletons. When branched fleshy hard coral are removed from water they need to first be turned upside down underwater and shaken around for 10 seconds to encourage the polyps to release the water held. The coral then needs to be lifted slowly, still upside down, out of the water and placed upside down into the bag it is being transported in. This prevents the polyps from being forced onto the skeleton of the coral that would result in the coral tearing its tissue. The outer skeleton needs to be wrapped for transit purposes, so as to prevent damage during transit to the coral. As long as the coral is not badly handled they all adapt to life in aquariums very readily, and often grow at rapid rates. Placement of these coral should be in the second and third quarter of the system, with brain coral and plate coral being placed on the substrate. Medium flow is ideal. They do posses stinging cells and therefore should not be placed within a 10cm radius of each other, unless they are the same subspecies, e.g. all hammer coral can be placed together.

Brain coral	lobophillia, traciphillia, scolimia, cynorina, favia
Branched coral	hammers, frogspawn, torch, grape, trumpet
Plate coral	lava plate, helofungia, fungia, green plate, tubunaria
Colonial	organ pipes, blastomussa, pineapple



Aquacon.com






SPS coral - 90 days plus:

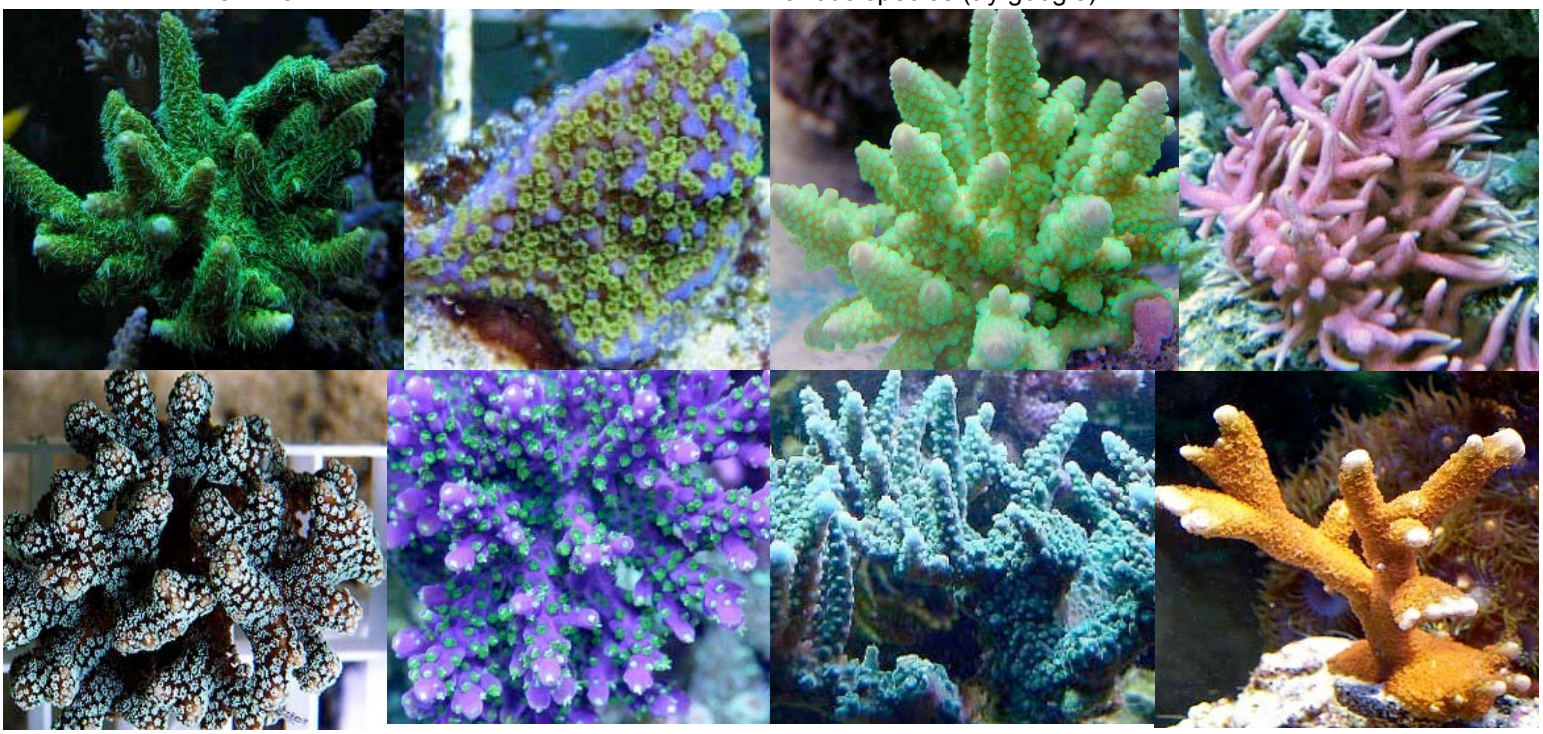
These coral look like branches that have been plucked off trees and dipped in luminous paint. Often when an aquarist has been keeping a reef aquarium for about a year they go through a phase whereby they remove all soft coral from their system and just keep Stony Coral. Stony

coral or SPS coral (Small Polyp Scleractinian or Small Polyp Stonys) are somewhat more challenging to keep in prime condition then soft coral. They consist of individual polyp colonies that live symbiotically alongside algae known as Zooxanthellae that live inside the corals tissue. SPS have two possible sources for food: There own symbiotic Zooxanthellae by using light and CO_2, or they can feed on plankton and suspended food in the water column. In most aquariums there is an inadequate level of food compared to that present on the natural reef. Due to this SPS will produce more Zooxanthellae algae to gain energy, causing them to brown, to make up for this loss of food. Increasing the available food for SPS will shift the balance towards the coral producing less symbiotic algae which will allow other pigment colors to show, and result in the coral coloring up.

The major difference between Soft coral and Stony Coral is that the Stony coral posses this ability to color-up in a fashion which is unknown to the novice aquarist, whereas soft coral generally don't. Initially when these coral land from overseas into retail stores, they are a chocolate brown due to stress from shipping and the lack of available foods. But when added to a mature system with correct bacterial and chemical levels they color up. A trained eye can look at a Stony Coral and

predict what colors it will become. There colors can be compared to sunscreen on humans, as they only show color (put on color) when they feel they are getting enough light. Coupled with this is the correct water chemistry. These coral grow at a rate that far exceeds that of other coral species when they are in ultimate conditions. Often a Stony Coral will have to be cut back and pruned to be kept in shape when the system runs, and aquarists are encouraged to leave plenty of water column available for these coral to grow up into. They require strong light, high flow, correct chemistry including stable Calcium and Alkalinity (Kh), correct bacterial loads and high nutrient spikes controlled by hardware components. With the help of Power Lab natural Color Enhancer range, individual coral color can be extracted from the coral. Due to lighting requirements place in the upper quarter of the tank with full access to light, by sticking them to rockwork with Power Lab Putty.

Montipora	capricornis, digitata, rugosa
Stylopora, poccilipora, steratopora	cats paw, birds nest, pocci, green pocci
Acropora	various species (try google)
Anacropora	various species (try google)
Pavona	various species (try google)
Liptoseris	various species (try google)
Merrilina	various species (try google)



OTHER INVERTEBRATES:

Marine Invertebrates are animals that don't contain a notochord, a characteristic of vertebrates. Therefore, in order to protect themselves, they usually have a shell or a hard exoskeleton. Each of these organisms play a very important role in maintaining a healthy ecosystem, and in the reef trade invertebrates are often known as the "clean-up crew" for maintaining an algae free environment. Some also clean parasites off of fish or scavenge and sift the sand removing debris. It is vitally important to understand the needs of individual species of invertebrates before adding them to the reef tank.

Starfish:

These invertebrates contain tube feet, and pump water through these, which allows them to move from one region to another, looking for shelter and food. When the water is pumped outwards, they move forward. They contain a mouth on the central underside of the starfish, which contain small jaws. They have a central disc, which joins their radiating arms. Starfish are one of the few invertebrates that contain an eye, allowing them to see light and dark.
Amazingly anything that falls of or is broken of a starfish grows back. They can regenerate limbs, and are unique in this regard.

Certain starfish, such as biscuit stars, sand stars, common orange stars and blue linkia stars are great for reef tanks. Even though some do not eat algae, most are scavengers that come out at night to feed on detritus and debris, and therefore are good for the ecosystem in the tank.

Some starfish however are predatory, and therefore should be avoided, such as the Horn Starfish. These inverts can be added when the nitrate level in the tank is 0.

Snails:

Snails are vitally important for the prevention of algae breakouts in an enclosed reef aquarium. Largely due to snails the natural coral reefs are so pristine. Ideally snails should be added 48 hours after the live rock has been added if the temperature and salt levels are correct. The Germans, who are well known for keeping algae free reef tanks, run a ratio of 1 snail per gallon, 1 per 4 liters. This is what a reef hobbyist should strive towards, to keep a clean system. Snail species include Nerites, Astrea, Bumblebee, and Turbo snails. The snail population may need to be topped up as snails can die due to falling over. These snails hide by day and are active by night. It's important to note that the following snails consume different types of algae.

Nerites

Astrea

Bumble Bee

Turbo

Hermit Crabs:

Although much debate exists on whether or not to add hermit crabs, through our experience we have reached the conclusion that they are vitally important, and are very beneficial to the system, as long as the correct ones are purchased. These inverts are scavengers, and therefore only dwarf species should be introduced. The larger ones may stumble across a sleeping fish and consume it, or consume coral. The dwarf hermits consume algae and food and waste materials before it has the chance to rot into the system. They are generally more active during the night. These inverts should be added at the same time as the snails. Please note it is not uncommon for hermits to kill snails that have fallen upside down, and inhabit their shells. To encourage the longevity of these inverts, we do advise adding new empty shells.

Scarlet reef hermit

Dwarf Zebra hermit

Dwarf blue-legged hermit

Dwarf Yellow tip

Electric Blue

Dwarf Orange tip

Sea Urchin:

These inverts control algae outbreaks as well as add interest to they system. It is important to note that they consume a different type of algae to snails, and should rather be added in addition to snails and not in place of them. They have been known to consume pink coralline algae, but are still very beneficial for the system. Please note that they posses poisonous spines, and while you can pick them up you should do so with care to prevent the spines from penetrating your skin. Only tropical ones from the Indian Ocean (bottom left) adjust to reef tanks. Seen below (right) is a cold-water specimen, which cannot be added. Lots of the coldwater Atlantic specimens, which are often brightly colored, die after a week or two. These inverts move with small legs below the body, and not via the spines. They contain a single eye like starfish, and contain a mouth at the bottom of their bodies. To be added after live rock has been in the system for two weeks. With time as the nutrient levels drop and the algae are consumed, they can become problematic on the coralline algae load and should be removed and swapped out.

Tropical Urchin suitable for reef tank	Local Urchin unsuitable for reef tank

Shrimp:

These inverts generally clean fish by physically consuming parasites and necrotic tissue from the body much as dentists clean humans.
They add interest and are needed to help keep fish gills and scales parasite-free. They also scavenge and prevent food and debris from rotting and becoming toxic. Note that these shrimp often shed their skin as they grow, and the exoskeleton that is released looks very similar to the actual shrimp but it is simply excess skin. Add after 30 days. Generally the more shrimp added, the more natural it is and the more often they will come out.

AVOID! Pistol Shrimp, as they are predatory and need bulletproof glass, as they can hit glass at a very rapid rate with their “pistol” breaking the glass.

Common Cleaner Shrimp

Fire Cleaner Shrimp



Coral Banded Cleaner Shrimp


Gold Coral Banded Cleaner Shrimp


Please note that Coral Banded Shrimp need to be kept singularly, unless a breeding pair is imported. Generally they should be the last cleaner shrimp added.

Sexy Anemone Shrimp

Sexy Shrimp got their name from their characteristic behavior of waving their abdomens about.
They live in groups of odd numbers of either three or more inside of host anemones. They can live without anemones, as they will find surrogate houses in coral.
They don't clean fish too often but will do if the chance arises.
They will accept all artificial foods, being flaked or frozen.
These shrimp will molt every 3 – 4 weeks at night.


Harlequin Clown Shrimp


These shrimp are definitely one of the most spectacular shrimp suited for the reef tank.
They feed solely on sea stars, so for them to be kept successfully they need to be fed sea stars every two or so months. If you live on the coast it is fine to collect Cushion sea stars and add them as a food source.
They attack and kill their victims in a “Hannibal-like” manner, flipping the sea stars on their back and consuming them live. Often a large sea star can take months to consume.
They stab the Sea Stars water vascular system with their spiny feet, so as to prevent the sea star from moving away.
Although the maintenance on feeding sounds quite tiring, they are well worth the effort and will definitely become an addition which people spend hours watching. If kept well fed they will spawn in the reef tank.

Hinge beak Dancing Shrimp

These shrimp are vigorous scavengers, and often clean the sand bed. They are found in very large schools, and should ideally be kept in groups of five and up in reef tanks. They readily accept artificial foods, and often spawn in captivity.

Monkey Shrimp

These brown shrimp are to be kept in groups in aquariums with large amounts of rockwork. They come out during the day, but feed mainly at night.

Peppermint Shrimp

These maroon shrimp hail from America. They are nocturnal and shy, and are ordinarily added to reef tanks to rid them of problematic Aptasia anemones. Not to be confused with the Hinge beak Dancing Shrimp.

Tube Worms:

Tube worms are very easy to keep and are great for beginners. They filter out certain parasites and phytoplankton from the water, and do not require feeding. Burry the soft tube in the sand bed or place it firmly in a hole in a rock, without applying too much force onto the delicate worm inside the tube. When distressed the actual worm will shoot back into the tube, and the feathers will no longer be visible. They require medium to low flow and should be placed near to the bottom of the aquarium. They contain white or brown crowns. Add after live rock has been in the system for two weeks.

Tube Worms

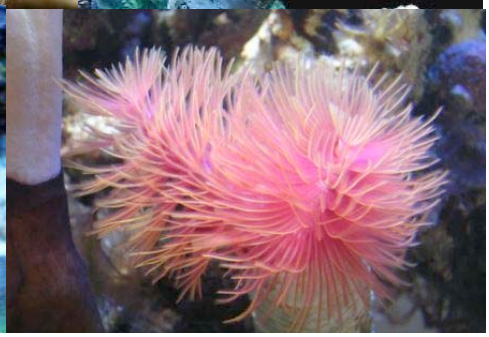

Coco Worm:

These are very similar to their Tube Worm cousins, with the exception that Coco Worms contain bi-lobe feather crowns and a hard Calcareous tube, for better protection. When distressed they also quickly extract and disappear into their tubes. They require medium to low flow and should be placed near to the bottom of the aquarium. Their crowns can be white, orange, yellow or pink, making them very aesthetic. Add after the live rock has been in place for 30 days. It's a filter feeder and extracts phytoplankton from the water column.

Coco Worms





Flame Scallop:

The Flame Scallop contains a mantel that protects its tentacles. It embeds itself inside of small rocks and sand for protection. When highly threatened, it forces its valves together, propelling it through the water. Add after the nitrates in the tank have been 0 for a month. It filters phytoplankton out the water.

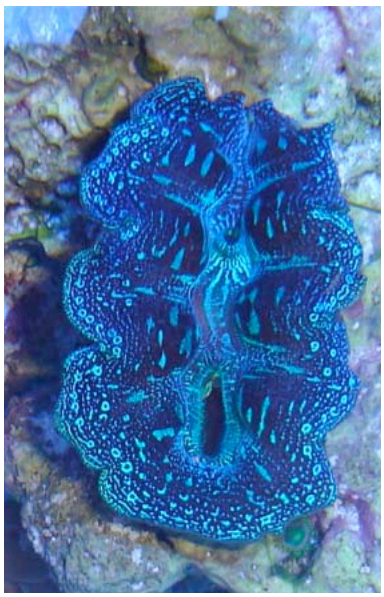
Flame Scallop

Clams:

Clams contain hard mantles, which serve protective functions of their inner organs. They posses a mouth in the center of their fleshy exposed muscle, which filters out phytoplankton from the water column. They also rely on light as a source of energy. Clams are the slowest growing invertebrates, but do possess the ability to change their color over time, and change from browns to vibrant metallic colors in ideal water parameters, which include stable Kh, Calcium and low nitrates. They are regarded as the most ornamental additions to the reef aquarium, and are known to absorb high amounts of nutrients which further enhancers the quality of the ecosystem. Clams are graded according to color and rarity, and are priced accordingly. Wait 90 days before adding.

Crocea clams

Please note Crocea Clams need to be placed on Rockwork.



Maxima clams

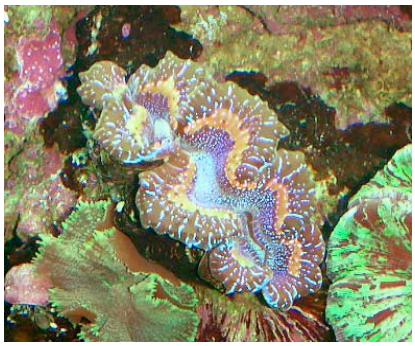
Please note Maxima Clams need to be placed on the sand bed.












Squamosa clams

Please note Squamosa Clams need to be placed on the sand bed.



Anemones:

Anemones need good water quality, high Calcium and Kh, strong lighting and weekly feeding of meaty marina mix to thrive in aquariums. If anemones are not receiving any of the following, they will inflate and move around with their single “foot”, found on the bottom of the anemone. Generally they will settle in high flow areas, but this differs from species to species. Some anemones can live to be centuries old, and there is no reason why an anemone that has been purchased shouldn’t live throughout the duration of the tank. In the reef aquarium there are no natural predators of the anemones so as long as the correct specimens are chosen, they are great additions to the reef tank, and often create the natural beauty seen on the reef when they are occupied by Clownfish, which posses a symbiotic relationship with the Anemone, protecting the anemone from danger and bringing it food in exchange for a home for the Clownfish. Generally Carpet Anemones are avoided. Anemones are initially to be added to the sand, and pumps are needed to be turned off for an hour to give the Anemone time to attach to the surface and walk around. Intakes to pumps need to have a pre-filter so as to prevent Anemones from being sucked up and tangled in pumps. Anemones are shipped dry. Anemones can be added to reef tanks that are 60 days and older.

Bubble-tip

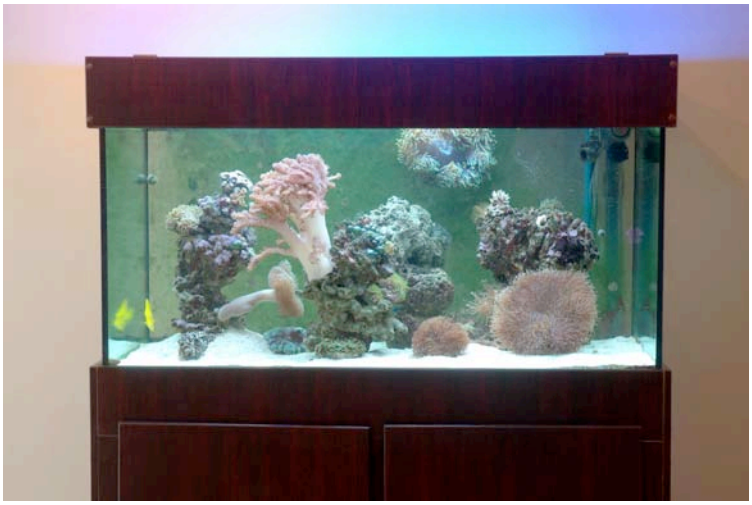


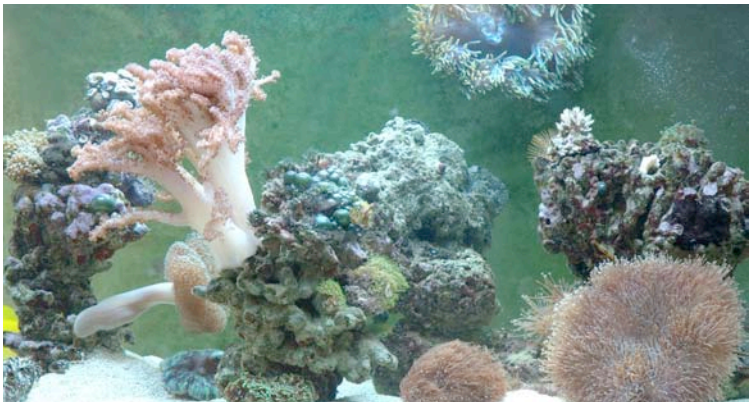
Assorted Sand Anemone

Radianthus Anemone

Amazing Reef Tanks done by Phuture Lab:

M 120





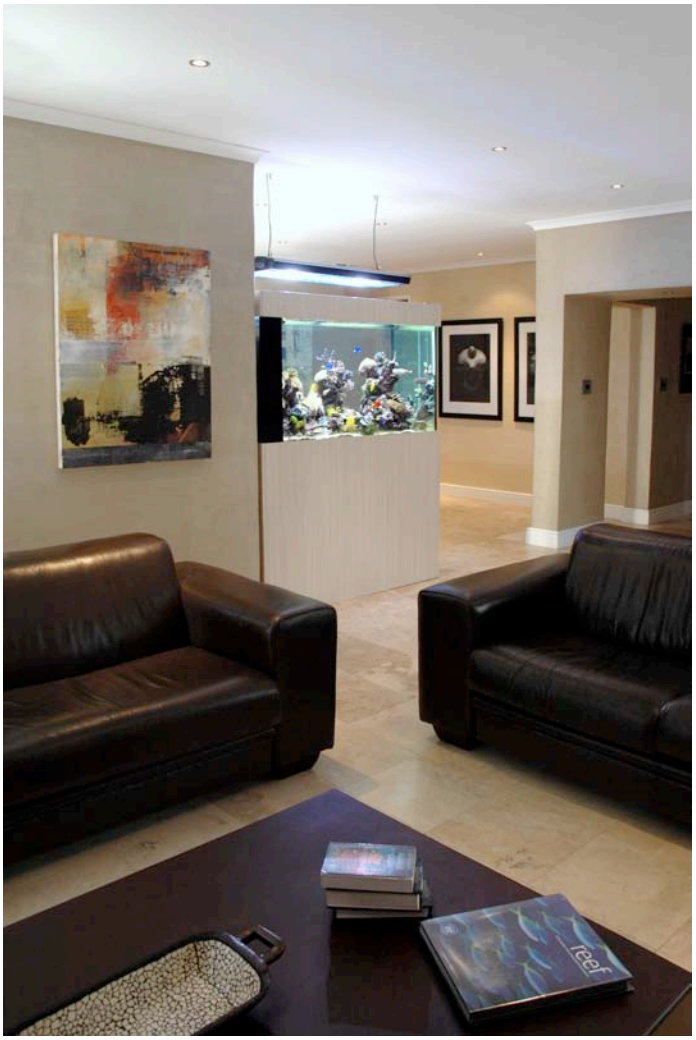
This system shows a simple execution of the M-Process by the client.
It features mainly soft coral with a few hard coral.

M 150S

Here is an example of the M-Process adapted to a 1200l system.

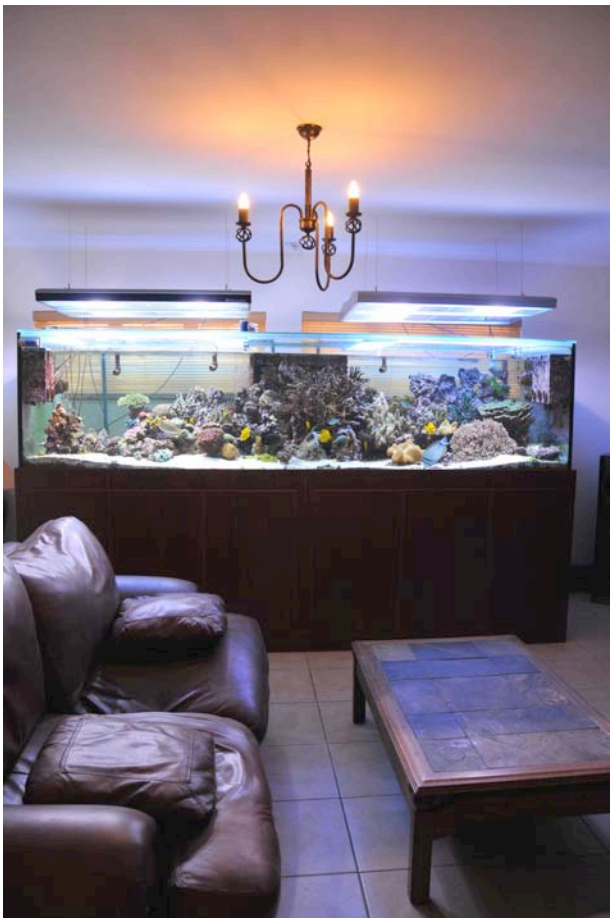
Simple elegant lines create a beautiful display, and portray the reefs true beauty.

M 150S



A beautiful example if an explosive M150S with Phase 01, 02 and 03 upgrades in place.

M 200



Here the M-Process has been followed to erect a fairly large aquarium (4000l).

Zayn Home:

Zayns first high-powered advanced reef aquarium. This system, still regarded by many reef hobbyists in Cape Town, to have been the benchmark in marine aquarium displays. On this system Zayn became familiar with advanced reactors and life support systems.

TO COME

Zayn Shop (Ras Mohammed):

Show tank at Zayns first hobbyist store was setup in 1999. This 27m-squared store was to become the humble beginnings of Phuture Lab, Palau Lab and Power Lab.


21 13:09


21 13:09


21:53


21:52

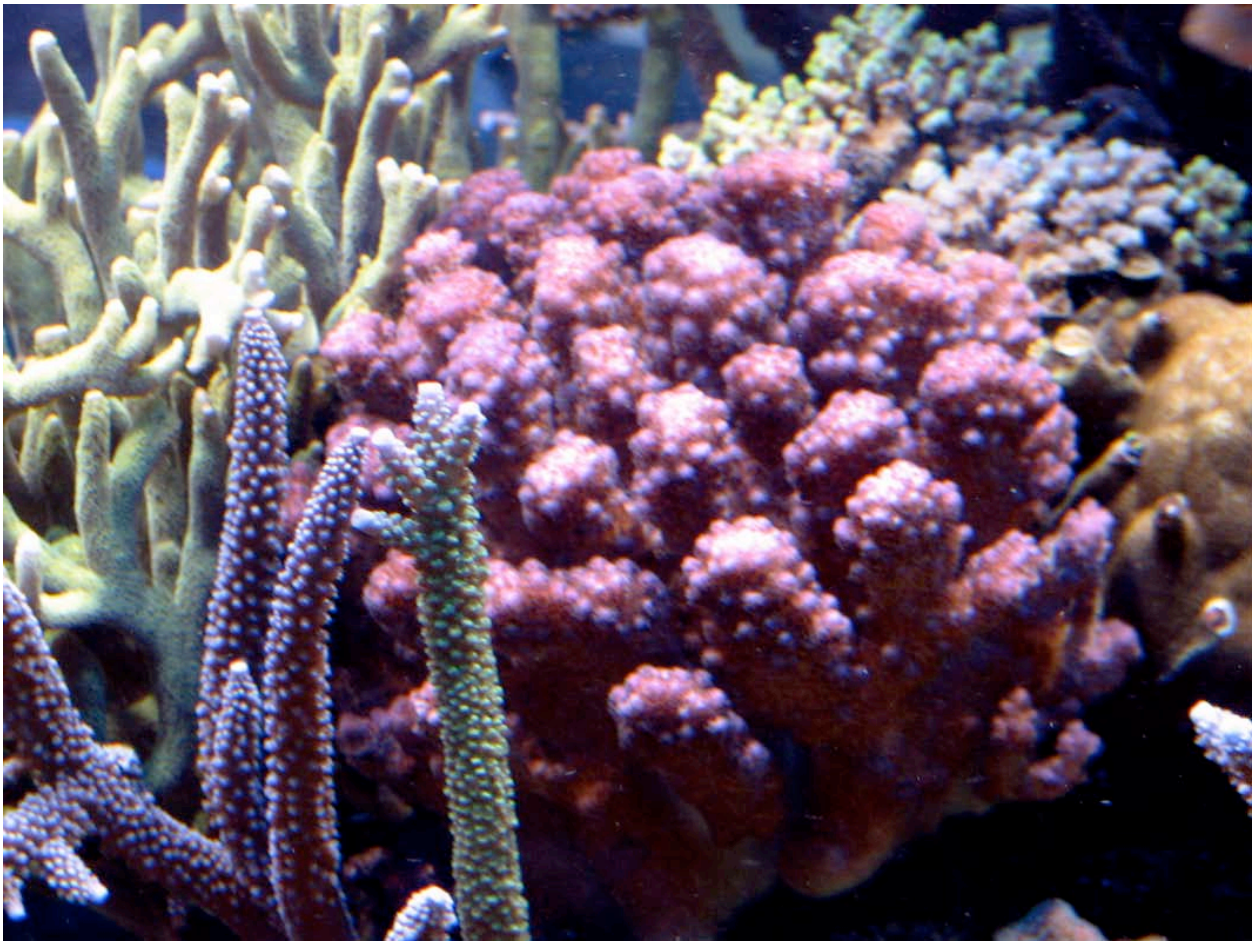

4 21:50

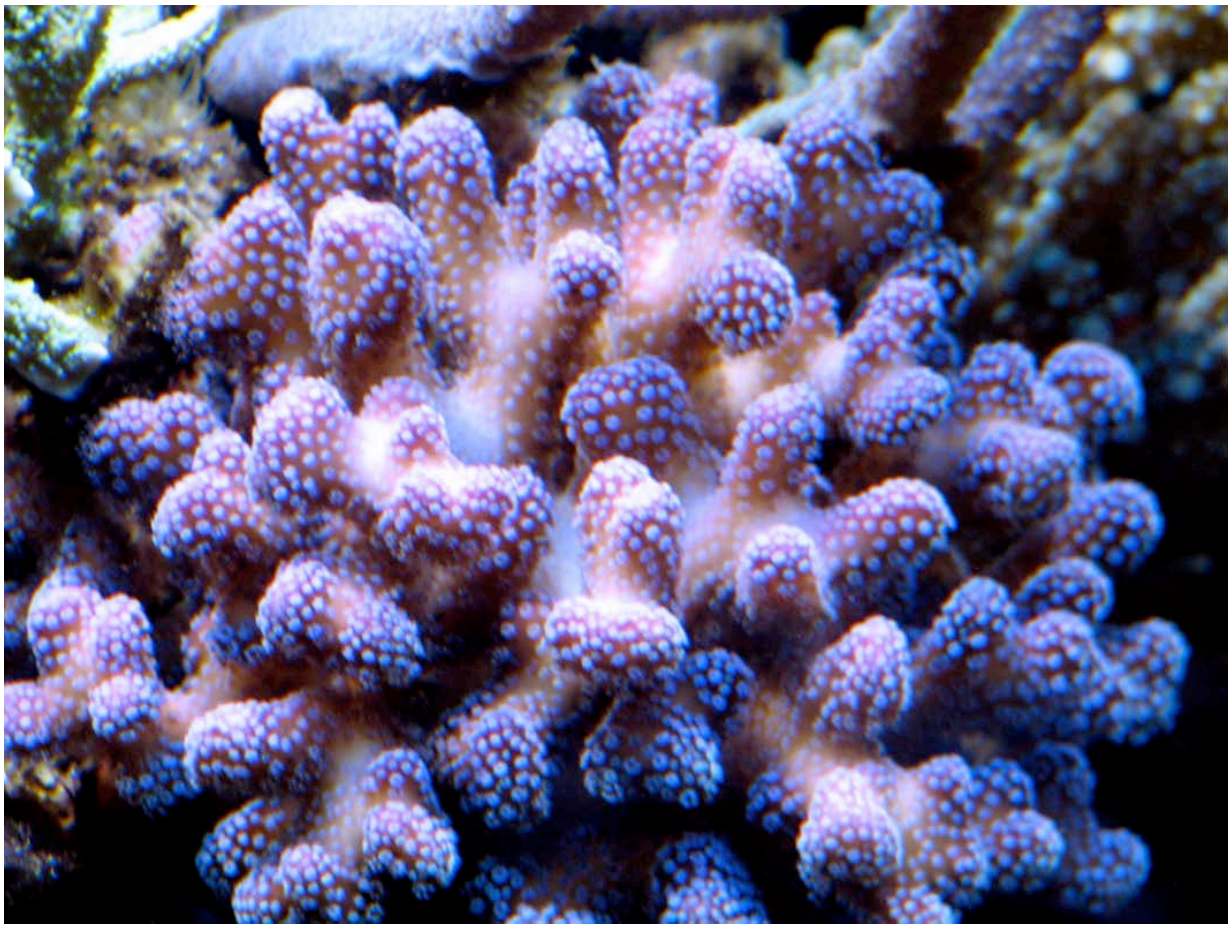

21:53

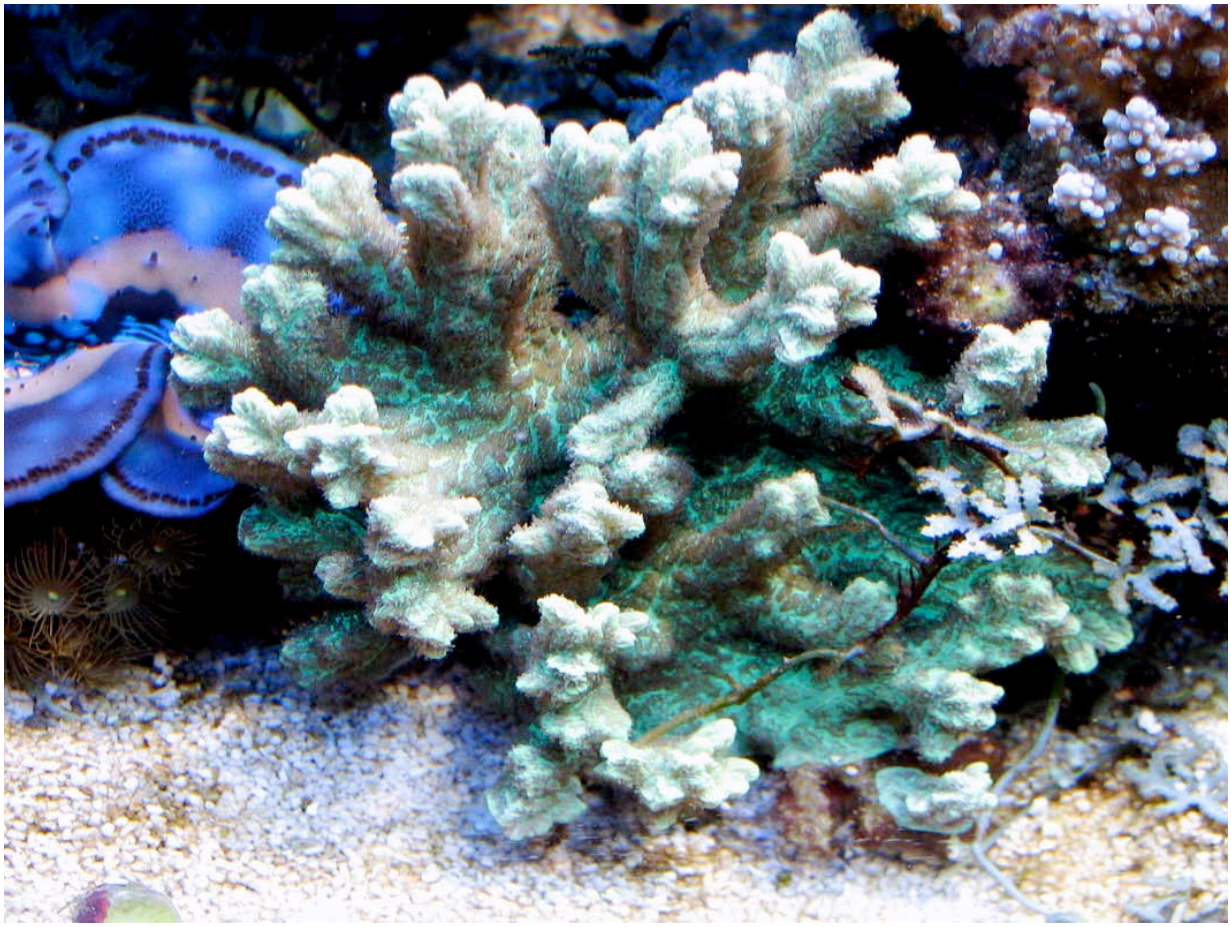

21 13:09

Zayns Tanks at Phuture Lab (Tank 3 and 4)

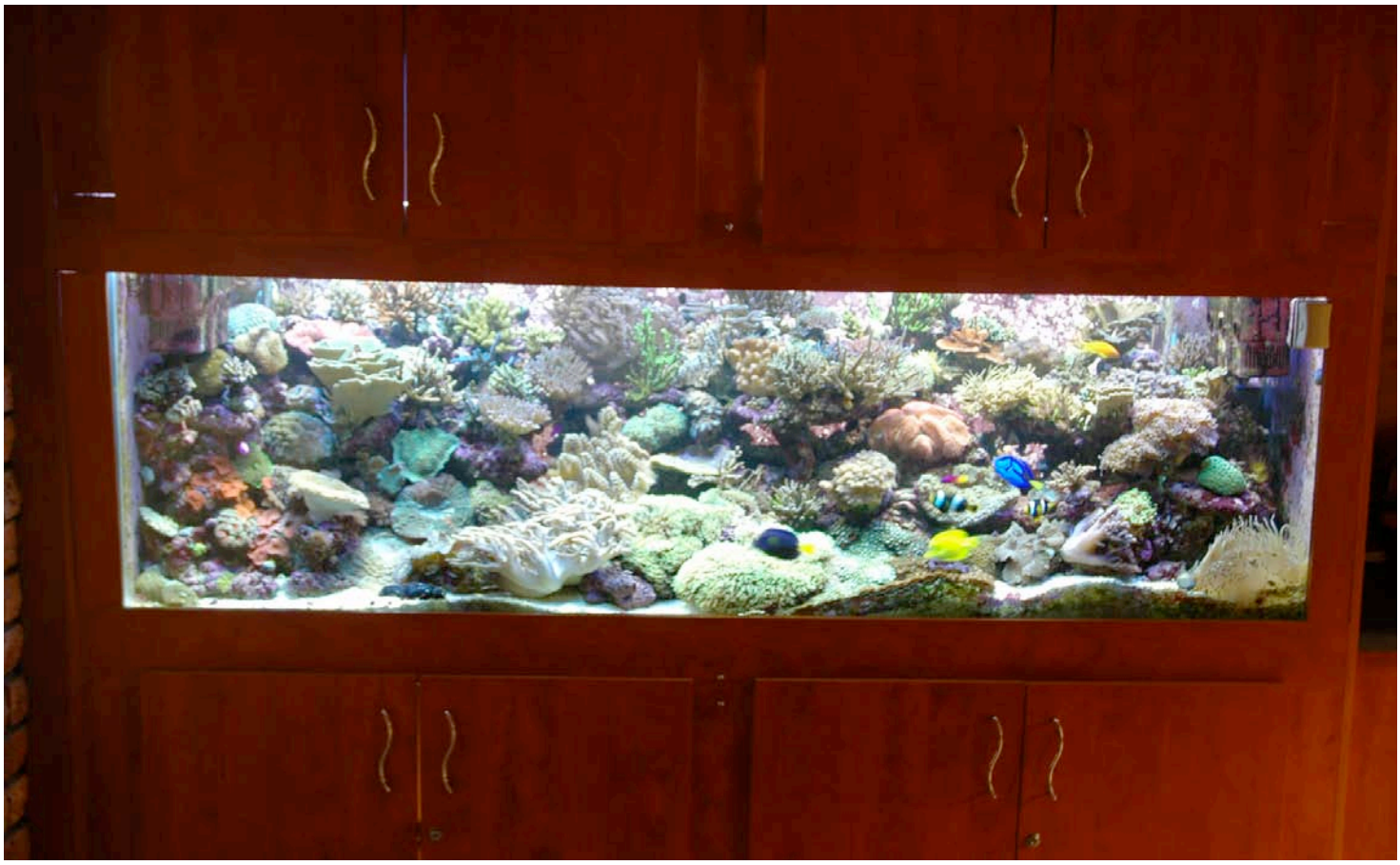
Zayns first full-blown SPS aquarium with high fish load, bacteria plankton and advanced supplements and coral foods. This system was one of the first to show rapid stone coral growth and intense coloration. The four years of research resulting from the display created the foundation of the M-Process.



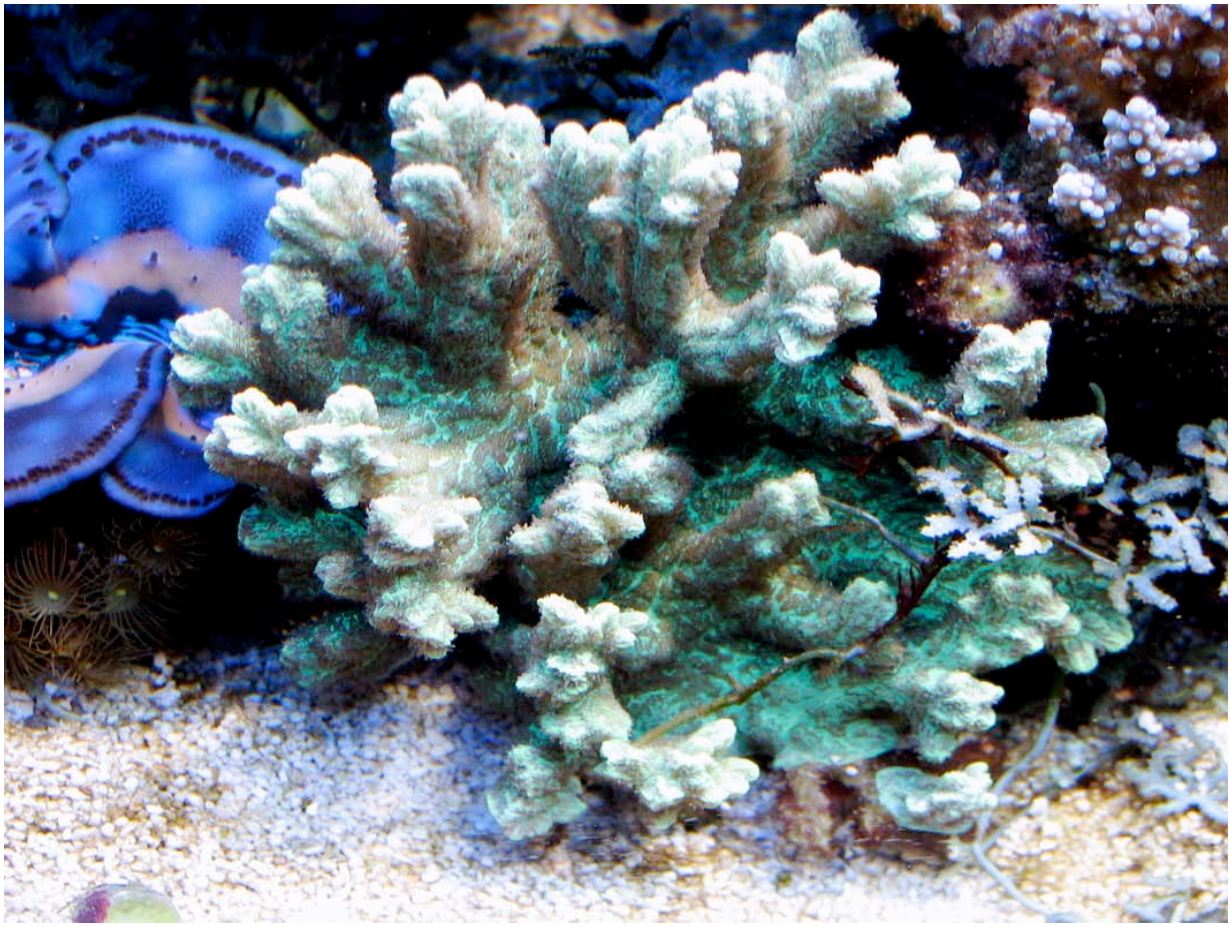




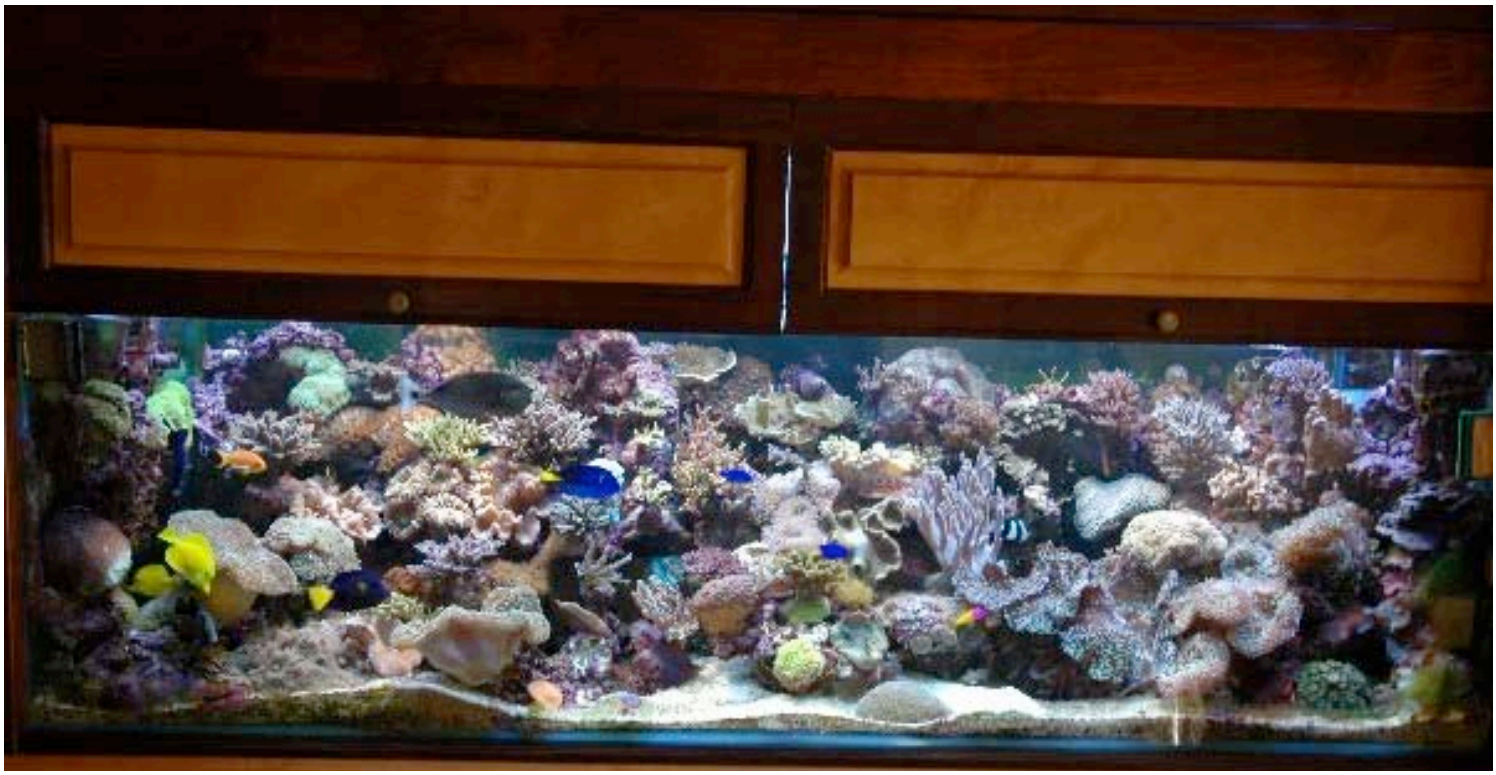
Allan Ross Reef Tank:



Beautiful aquarium of Allan Ross established by Zayn Sibda many many years ago. Alan was one of the first clients that allowed Zayn to construct a high-energy turn over system that in turn led to the development of the M-Process.



Mr Parker Reef Tank:



This aquarium owned by Anwaar Parker who has been one of the longest reef aquarists in South Africa has set the bench mark for

Lighting:

1. T5 fluorescents:
T5 lights are used in both white and blue color
They are the most efficient light source available
They should run for 14 hours daily and ideally be linked to an auto timer

2. Metal Halides:
Still considered to be the closest match to sunlight
They allow high input of wattage and are relatively compact
They do however produce high heat emissions
Introduce very natural glitter lines

Circulation:

1. Power Heads:
Produces an efficient form of water movement attempting to mimic wave action

2. Wave Computers:
Once added to power heads more specific water motion types can be created to more closely match natural flow energy types.
E.g. laminar (calm), turbulent (random) and surge (harsh)

3. Stream pumps:
These create gentle, slow moving water that mimic tides traveling on and off the reef.
E.g. incoming and outgoing tides.

4. Wave Boxes:
Used in combination with above, wave boxes recreate back and forth swaying action of water for near natural flow effect.

5. Close Loop Pumps:
These work the same as power heads but are externally housed pumps for a more aesthetic look, that produce high flow rates.

Fresh water purifiers:

Removes contaminants in tap water

Temperature control:

1. Heater:
Warms water to correct level

2. Chillers:
Cools water to correct level

Filtration:

1. Protein Skimmers:
They form the backbone of the artificial filtration system. By mixing aquarium water with fine bubbles, they are capable of extracting raw waste from the water.

2. Carbon Reactors:
They absorb compounds from the water that are non-skimmable and help maintain sparkling water clarity.

3. Phosphate Reactors:
They work in a similar manner to carbon reactors but remove phosphate only.
Phosphate is a dynamic compound that will always build up in an aquarium unless it is constantly filtered out.

4. Nitrate Reactors:
Same as above but specific to nitrate.

5. Ozone Generators:
Increase skimmer efficiency, helps maintain clean water and helps destroy parasites.

6. U.V Sterilizers:
Helps maintain clean water and destroy parasites.

Chemistry management:

1. Auto Top Up Units:
Automatically replace fresh water that leaves the system due to evaporation.

2. Kalk Stirrers:
Enrich fresh (R.O) water with calcium and other ions that create stability in water chemistry.

3 Calcium Reactors:
Enrich aquarium water with calcium and other ions that create stability in water chemistry.

Nutrition:

1. Auto Feeders:
Automatically dispense pellet and flake foods.

2. Plankton Reactors:
Inject live plankton cultures into aqu

Maintenance schedule

Water chemistry target values

Parameter	Min	Max	Ideal	Corrected with
Temperature	23	27.5	26	heater / chiller
Specific gravity (salt level)	1020	1028	1026	Pure water or salt mix
KH	6	13	11	KH buffer / *
Ph	7.8	8.6	8.4	Automatically / *
Calcium	380	500	450	Calcium buffer / *
Phosphate	0.001	0.005	0.003	See phosphate manual
Nitrate	0	1	0	See nitrate manual

Ammonia	0	0	0	Ammonia detoxify
Nitrite	0	0	0	Ammonia detoxify
Magnesium	1020	1350	1250	Magnesium buffer / *
			*	See calcium reactor manual

Maintenance schedule

Daily:
Insure:

- Water at correct level
- Temperature within normal range
- All equipment functioning correctly
- All livestock behaving normally
- Feed fish

Weekly:

- Wash protein skimmer cup
- Clean glass panels
- Test water and record levels
- Add supplements and additives
- Wipe down salt spray
- Feed level three coral and anemones

Monthly:

- Perform 10% water change
- Replace carbon and phosphate medias
- Replace mechanical filter pads
- Remove stain marks from viewing panels
- Replace kalk powder
- Flush air inlet to skimmer
- Replace air stones

Every three months

- Perform 25% water change
- Replace calcium reactor media
- Top up sand bed
- Top up media in nitrate reactor if required
- Remove debris from inline/sump

Every six months

- Strip and clean all pumps and power heads
- Strip and clean protein skimmer
- Replace all reactor tubing
- Replace diaphragms on air pumps

Every nine months

- Replace light bulbs
- Replace up lift plumbing sections
- Replace heaters
- Service chillers

Performing a water change:

Step one:
Prepare water by adding supplied salt (+- 900grams) to 25l R.O water in container.
Shake drum well until all salt is dissolved.

Step two:
Switch off up-lift pump in sump or drive pump in inline sump. Often protein skimmers can bubble over when the sump level risers. Monitor and switch off if necessary. Switch off auto top up systems. Make sure heaters remain submerged.

Step three:
Use siphon pipe (clean up kit) and fill second 25l container with water from aquarium. Discard this water.
Then siphon new water into sump and restart up-lift pump.
For inline sump models pour water back into system in the inline sump and then restart drive pump.

Step four:
If skimmer has been turned off restart. Switch auto top up back on.
Check that all equipment is running correctly. Monitor all reactors carefully and insure they are at the correct drip rates.

Test kits

Product	intervals	required from
Thermometer	1 weekly	start up
Hydrometer	1 weekly	start up
Ph	1 weekly	start up
KH / alk	1 weekly	start up
Calcium	1 weekly	start up
Ammonia	1 weekly	start up
Nitrite	1 weekly	start up
Nitrate	1 weekly	60 days
Phosphate	1 weekly	60 days
Magnesium	monthly / optional	60 days

Note: the continuous testing of water parameters is essential to monitor values and their response to additives, water changes, feeding, chemical medias and the seasons change as the system grows and ages.

Fish food

Product	Interval	Required from
Flakes	Morning	Start up
And	I.e. Day 1	
Frozen	Evening	Start up
Sea weeds	Morning	Start up
And	I.e. . . . Day 2	
Pellets	Evening	Start up
Pellets or flakes	Morning	60 days
And	I.e. Day 3	
Frozens	Evening	60 days
Or	I.e. Day 3	
Specialty	Evening	60 days

Note:
Feed fish very small amounts daily, one flake or pellet at a time.
The food must not blow into rock structures.
As the food falls from your fingers the fish must catch it.
If food floats hold it between your fingers under water until it becomes soaked and less buoyant.

Fish feeding and its influence on coral development:

The correct feeding of a reef aquariums fish population can be directly linked to its success. Over-feeding and or incorrect food application however can result in severe damage to the system so always feed slowly and carefully and follow instructions.

Food requirements vary from species to species and therefore the instructions above call for a varied diet input. The unique feeding likes or dislikes of each specimen needs to be taken into

account and adjustments can be made accordingly. With correct feeding applications fish can be maintained in good health allowing them to remain colorful, grow and in some species reproduce. The feeding of the aquariums fish population also producers other important effects on the system. It makes available to the eco system on a whole a food source, which indirectly maintains food chains in the system. This drives the eco system from a micro biological level through to the coral fauna. Fish food benefits the coral fauna in the following ways.

Solid food particles:
Some fleshy hard coral and mushrooms are able to trap large food particles and consume them directly. Corals with smaller polyps (e.g. zooanthids, stony coral and filter feeders) trap or filter out smaller particles and fine food material dispersed into the water column as fish bite on larger particles or tug at meaty chunks.

Some debate exists regarding the direct feeding (by hand) of large fleshy coral also referred to as target feeding. In our opinion it is best left for these coral to trap or capture food from the water column themselves. Our concern would be the over loading of nutrient input by target feeding. However it is not a clear instruction to follow. Often target feeding newly imported specimens helps them recover from transport damage and can help them settle in a new environment. Some species like Sun Cup Coral and Anemones will not survive unless they are fed directly.

Fish waste material:
As fish pass out waste material, coral can capture them as described above. This waste material quickly brakes into tiny particles forming a 'nutrient dust ' that the coral can filter out. These particles feed micro and macroscopic organisms that collectively add to the ecology of the system. This dynamic food web by means of its functions both purify the water and in turn produces spores, gametes and organisms themselves that re-feed the fish and coral.

Availability of micro nutrients:
The feeding of the fish population and the reactions associated with this process also makes available to the coral fauna a dynamic range of micro nutrients. This includes trace elements, vitamins, fatty acids, lipids and amino acids. Some aquarists believe that due to this, no additional supplements need to be added to a reef system. We do not agree with this and feel dynamic feeding in relation to a rigid supplement routine is required. For further reading see supplements manual.

Nutrient through flow:
While the benefits of correct feeding is in no way debatable it is imperative to realize that this module holds true only if the nitrate and phosphate levels remain at the correct values. Our current understanding is that a reef aquarium, like a natural coral reef, needs to be exposed to constant through flow of nutrients. This is only possible when a comprehensive life support system is in place. Inputs of fish and coral foods need to be fed on and then rapidly extracted through skimming, carbon and phosphate reaction and nitrate reduction under the influence of kalkwasser.

Supplements and additives

Product	dosing intervals	required from
KH / alk. Booster	1 weekly up to 3 per week	day 14
Calcium booster	1 weekly up to 3 per week	day 14
Bacterial cultures	1 weekly up to 3 per week	day 1
Bacteria food / detox	1 weekly up to 3 per week	day 1
Iodine	1 weekly	day 30
Trace	1 weekly	day 30
Strontium	1 weekly	day 30
Magnesium	1 weekly	day 30
Vitamins	1 weekly up to 3 per week	day 60
Amino acids	1 weekly up to 3 per week	day 60
Liquid coral foods	1 weekly up to 3 per week	day 60

Note:
Supplements and additives are important for the development of your reef ecosystem. They replenish important minerals that are consumed.

Service kits

Note: smaller packages available for M40, M60, M90

1. Clean-Up Kit (start up)
2. Acclimatization Kit (start up)
3. Chemical Module One (start up)
4. Fish Food Kit Module One (start up)
5. Test Kit Module One (start up)
6. Chemical Module Two additives (30 days)
7. Fish Food Kit Module Two (60 days)

Note: M120 up

Test kit module two (60 days)
Chemical module three additives (60 days)
Note: half package available for M40 M60 M90
Emergency kit recommended

M-Range

The M-range was developed to produce a turnkey solution for the establishment of a reef aquarium, a demonstration of Phuture Labs commitment to holistic reef systems.

Tank

Tanks are built using clear float glass and finished in black silicone. The design uses floating bases in the M150 and M150S. The M120S, M150 and M150S are crafted using base and euro braces, for additional structural support. The standard overflow utilizes a bulkhead system to drain water to the sump tank. To achieve this 42mm or 50 mm holes are drilled.

Stand

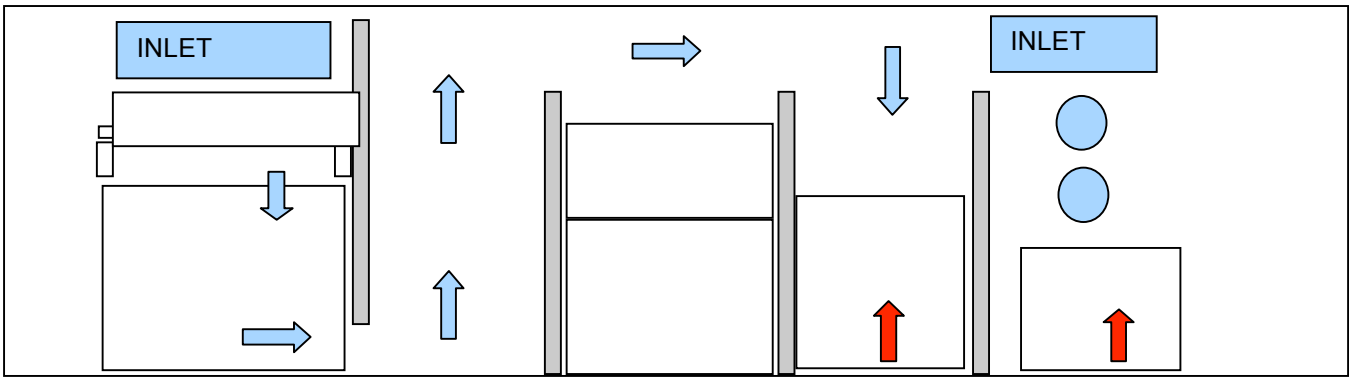
25 mm x 25 mm and 50 mm x 50 mm tubular steel is used to create an under construction on which the aquarium sits. The steel is sprayed black for additional protection. Between the tank base and stand 20mm high-density foam is placed for added protection to the base.

Sump tanks

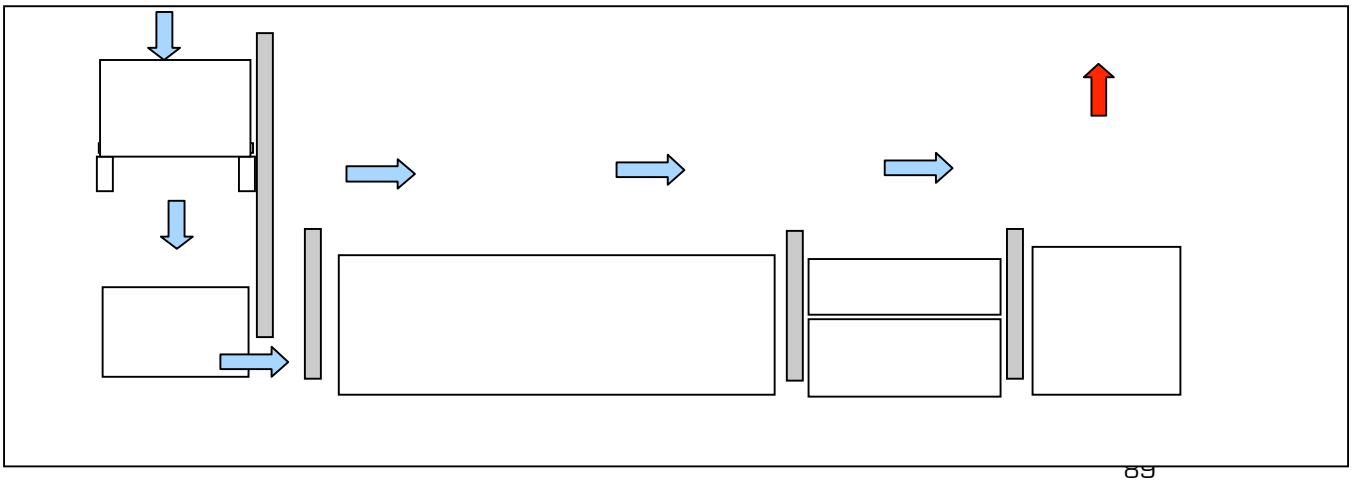
Inline sump: (M40, M40S, M60, M60S, M90)

These create compact in-tank filtration housings. The user-friendly layout reduces the need for complex plumbing and decreases noise emissions, without any loss of performance. A common misconception is that they are less powerful to under-tank sumps. This argument has no merit, as the function of the sump is to hold equipment and accommodate the drain-back of water when the main pump is switched off. Inline sumps perform all these tasks. As with the larger units in the series (Racer S and Racing Sump) they come standard including: (See list after images).

IN LINE SUMP



RACER AND RACER S



1. Baffle chamber for bubble and noise reduction and mechanical filtration for removing larger waste particles.
Mechanical filtration pads (mech pads) must be replaced regularly, see maintenance schedule for further details.

2. Technical chamber for housing hardware components.

3. Refugium chamber for cultivating a living / natural filter.
Refugiums must be setup using a deep layer of sand and chips of live rock to spike life in the refugium. Here in the absence of predatory action by fish a multitude of macro and microorganisms can develop that both consume waste material and produce live plankton.
Every six months it is recommended to add new rock material and top up the sand to spike up the life forms and their diversity.

4. Pick-Up chamber is the final stage of the sump and houses the return / up lift pumps, which pump water back to the main display aquarium. This chambers water level will drop as evaporation sets in. So the water level lines must be monitored daily and additional water must be added as required back into this chamber so as not to disturb the refugium.
Note: during evaporation only fresh water leaves the system, so only pure fresh water (reverse osmosis) must be used. R.O. water can be purchased at any Phuturelab Shuttle Store or an R.O. unit can be purchased for easier maintenance. To refill sump from the R.O. drum a bucket and jug is included our clean up kit. An M Auto Top Up can be installed here for automatic refilling of evaporated water. (See M Auto Top Up Manual)

Undertank sumps:
Racer S: (M120 and M120S)
Racing sump: (M150 and M150S).
The Racer S is an identical downscaled version of the Racing Sump. They have the exact layout design as the inline series. The few differences are the extended back and side panels for splash reduction.
Note: see Pick-Up chamber above for water level maintenance.

Joinery:
M-Range cabinets and canopies are built using 16mm melamine boards in light and dark wood colours. We find this is a balanced mediam between cost and function. With the correct care and maintenance the wood holds against continues exposure to the salt water. Due to moisture buildup in the sump, annual replacement of the door hinges might be required. The dual flap design of the canopy allows for additional T5 lighting upgrades and also creates an opening for heat exchange and ventilation of moisture. As an additional upgrade a Metal Halide can be suspended above.

Plumbing:
The uplift and down-flow systems are built using quality picked high-pressure fittings and pipes. These form the main arteries connecting the main display to the life support systems.

Electrical:
The integrated electrical system is based on Powerbar Duct System, which neatly accommodates all electrical wires and connections. The individually controllable plugs allow for quick switching off of any component. In case of an emergency the entire system can be shutdown by the main supply plug (red plug in main socket). The Powerbar system is modular and can be extended as new products are added.

Water and salt:
The initial filling of the tank can be performed using tap water, depending on water quality. If there is any concern the use of R.O. water is adviced. All M Range tanks are shipped with sufficient salt

for establishing a recommended salt level (s.g) of 1.026. From here on the salt level will remain constant, as salt does not evaporate.
Note: please ensure you have read notes on Auto Top Up Chamber and have consulted skimmer maintenance for instructions on s.g balance.

Sand:
The type of sand (aragonite) sent with an M-range tank is availability dependant. For self-installations ensure aragonite is correctly rinsed. Some dust will still cloud the water but will soon settle in the mech pad.
Note: in new aquariums it is normal for the sand to move. Once bacteria and microorganisms start to develop they will bind the sand.
We do not recommend that at any stage the sand be vacuumed, as often is the practice in freshwater aquariums. After a while microorganisms from the live rock will spread into the initial sterile sand, and result in the development of a dynamic sand ecosystem called the benthoic environment. All the debris and sediments that the live rock, coral and fish extrude that settles in the sand will be consumed by the benthos ecosystem. Ultimately the waste material settling in the sand will be broken down into a non-toxic form (inert constituents). The Benthos environment creates a dynamic component of the biological functioning of the system as a whole. This relies on the sand bed not being disturbed, as any movement through the sand would rupture and kill the fragile ecosystem. Having said this, we do however recommended that a pair of sand sifting gobies (Valencia and Sand Glider) be used, as they only disturb the top sand section, keeping it pure and white and resulting in more reflection from the light occurring on the sand bed.

Heater:
A standard heater is supplied and preset to 26 deg Celsius. It is recommended that they be replaced every 18 months.
Note: if you're tank is overheating i.e. exceeding 27.5 deg. it could be the room temperature. We therefore do not recommend turning down of the control dial on the heater. To ensure the heater has not malfunctioned check that the red pilot light is off if the thermometer has a reading higher than 27 deg.

Power heads:
The power head is used to recreate wave action, which all life forms in the aquarium require to remain healthy, by washing away de-oxygenated water and replacing it with treated water from the main return pump. For servicing, the pumps must be completely disassembled and washed. Please check that all parts of been replaced in the correct order.
Note: the shaft in the centre of the impellor has rubber buns and washers that must be seated correctly during reassembly.
If calcium build up is noticed on the impeller soak in vinegar in the supplied maintenance kit.

Flow up grades:
In our opinion a reef aquarium can be started with a recirculation of 6 times per hour. This can be increased to a maximum of 45 times per hour. More important is the quality of flow, wave control and format types. Our preferred flow source remains power heads, both in-jet and streamer types, which run by switching controllers.

Lighting:
Lighting in a reef aquarium has to perform an esthetic and biological function. Corals and algae require light to photosynthesize. During photosynthesis corals manufacture carbohydrates, which is used as energy.

The standard supplied T5 light source is a high performance system. They are the most efficient light source available. The blue tube generates u.v light and the white tube mimics the higher spectrum of natural sunlight. Tubes should be kept free of salt spray and dust build-up. Wipe bulbs using a damp cloth once they have been switched off and allowed to cool. If chronic salt spray build-up occurs, consider that either the power heads or uplift pipe is situated too close to

the main aquariums water level. They should therefore be adjusted accordingly. T5 tubes should be replaced every nine months.

Light up grades:
In our opinion a reef aquarium can be started with as little as 0.3 watts of light per litre of water. This can be increased to a maximum of 1.2 watts per litre. More important is the quality of bulb, reflector and drive gear. Our preferred light source remains T5, 150w and 250w Metal Halides. Coral require time to adapt to a brighter light source so never replace all light bulbs simultaneously or perform a massive light upgrade on all of the lights. Burn in new light bulbs / upgrade units slowly. Start at 2 hours and increase an hour a day. Monitor coral and stop increasing duration if coral show any signs of stress. Although the new light / additional light will benefit the animals they need time to adapt to the influence it has on them and the symbiotic algae within their tissue.

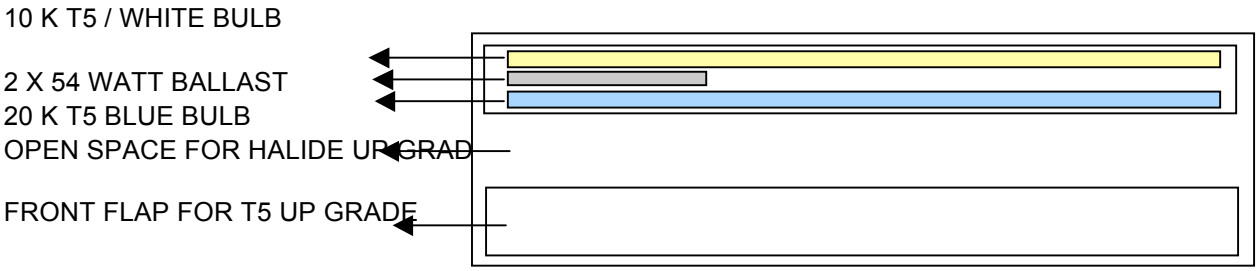
Note: M40, M40S, M60 and M60S receive clip-on lights that are of a different format.

Skimmer:
See skimmer manual

Delivery package (where applicable):
Delivery package includes the delivery and start-up of the system. Its intention is to fill the aquarium, having insured it has been placed level and that all components have been reconnected. If a timer unit has been purchased, the dial will be set to real time. Once all components are checked and running the doors are to be set.
Note: it does not qualify the client to maintenance expectations or callouts for trouble shooting.

From here on the client is expected to follow the M-guide. For further recommendations and clarification on warranties, liabilities and expectations see: contract.

Top view: canopy and lighting system



FRONT VIEW: STANDARD M-RANGE LAYOUT

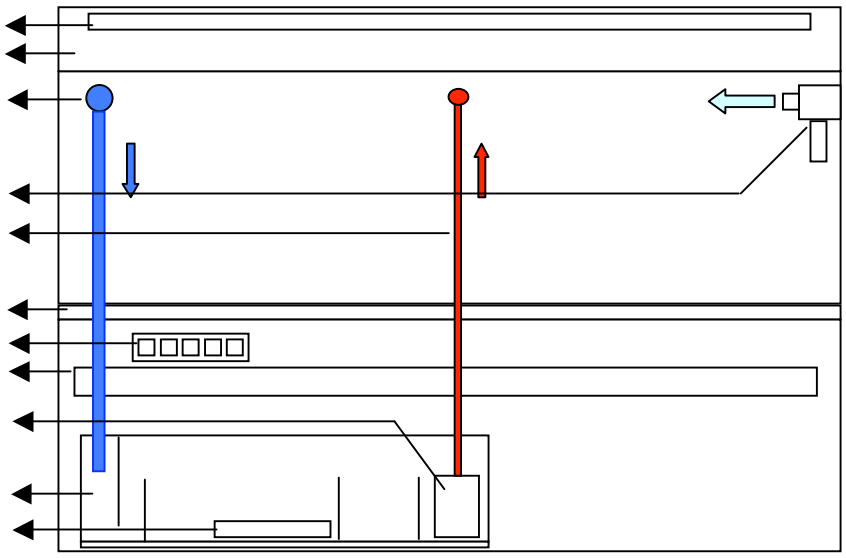
T5 LIGHTS
CANOPY
DOWNFLOW

POWER HEAD
UPLIFT PIPE

POLY BOARD
MULTI ADAPTOR
POWER BAR

UPLIFT PUMP

SUMP
HEATER



The M-manual

M - Drive
Product description
M - Drive protein skimmer
Physical description
Note: study diagrams first.

The M - Drive series is a range of fine, handcrafted protein skimmers that are assembled using high quality acrylics and pressure fittings. The removable cup is joined to the main body via the riser neck. Here an accurate conc. machining process is used to allow for smooth discharge of super bubbles up the riser neck. Inferior protein skimmers utilize union valves to create similar connections, allowing the cup to be removed, but they negatively affect the upwelling of rising bubbles. Union valves both create friction and interrupt upward bubble drift. The large collection cup allows for large carrying capacity of dirty water (skimmate). The cups lid slides on easily although seals tightly, preventing skimmate leak, as often seen on other skimmers. The attention paid to design detail and panel fitment on the top shoulder of the main body has resulted in the non-interruption of bubble formation in this area. This insures wet bubbles do not tear and burst, and therefore allows them to rise into dry super bubbles.

Main body, including inlet and outlet:
The complexity of the main body is enshrouded in its simplicity. Through much calculation the inlet height and diameter allow for optimal discharge of incoming aspirated water. The inflow via its cast deflector bend sets up a semi-cyclone effect between the bubbles and water. This is ultimately achieved in relation to a downward current created by the out-flowing water through the cast 40mm diameter exit. In principle the semi-cyclone effect is a natural drag between the bubbles and water, based on the intrinsic bouency of the bubbles. As a result large contact time

is created between water/ bubble interface. This results in a high degree of bombardment, which is the potential for two bubbles to collide more than once. This allows for super bubbles to be created later, at the top of the riser neck.

Drive pump
Tpbd impeller:
The run-dry pump has been tuned to create a formidable aspirator. Multiple modifications have been performed to produce a tremendous amount of small, uniform bubbles, without loosing head pressure and flow rates. The impeller has been worked and is based on a disk-like sieve that sits on the front and rear of the impeller. The impellers blades have been supported for weight reduction and have received micro-upright secondary blades for further grinding action.
The new tri-phase impellers with its bi-discs essentially create a vacuum under which the fine bubbles are created. The bubble emmition is therefore unsurpassed in its pump category.

Intake injector:
An equal amount of energy has been spent on the intake injector. Dual intake vents within the injector link the atmosphere to the traveling water.
This allows for more passive transmission of air to the tri-phase impeller.
The resulting effect is aggressive protein skimming without the need for high energy-consuming pool pumps, complex body design and function.

Importance of protein skimming:
Protein skimmers are the very backbone of the filtration system in captive reef aquariums. They can remove up to 70% of the total wastes created. These include not only proteins, but enzymes, stinging cells (nematocysts), particulate matter etc. With continuous, aggressive protein skimming, clean water can be maintained. This retards the development and buildup of phosphates and nitrates and creates a stable environment in which fish, coral and other invertebrates can thrive.

Note: As with all areas of reef aquaristics, much debate exists, regarding purchasing the correct size skimmer, our ratings are based on estimates modeled around a moderately stocked aquarium. For high fish and coral loads additional skimming is required. No harm can be introduced and we do not find that over-skimming is possible. If nutrient load is suspected of being too low, this would be an opportunity to add more fish and coral. For further reading refer to "modern reef syndrome" published by Phuture lab.

Installation:
The unit comes fully geared for in-sump mounting. For hang-on or external sump installations, additional plumbing will be required. 32mm and 25mm PVC fittings are recommended. Before gluing parts first dry-fit all components.

Running in your skimmer:
All new skimmers need a fatty lining to coat themselves internally to allow for a smooth rising of the bubbles. Therefore new skimmers do not build dry foam. In our experience new skimmers can take up to three weeks to run-in and start performing optimally.

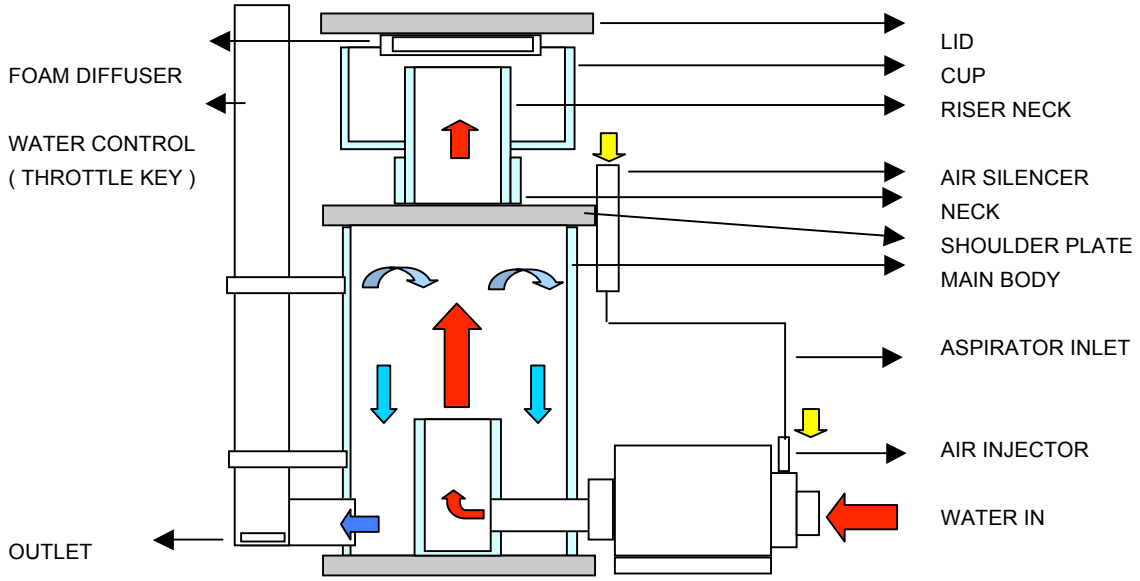
Fine-tuning:
Using the throttle key a back pressure can be created in the main body. This increases the water level height in the riser neck. This allows for wetter skimming. Some aquarists prefer to run small effluent discharge that will be dark, sluggy concentrated wastes, whilst others recommend "wet skimming." Whether wet or dry skimming is employed, should depend on the nutrient content of the system. I.e." wet skimming for higher nutrient levels and higher stock loads. Nb: wet skimming removes more salt water from the main system; therefore it is imperative to monitor s.g (salt content).

Maintenance:

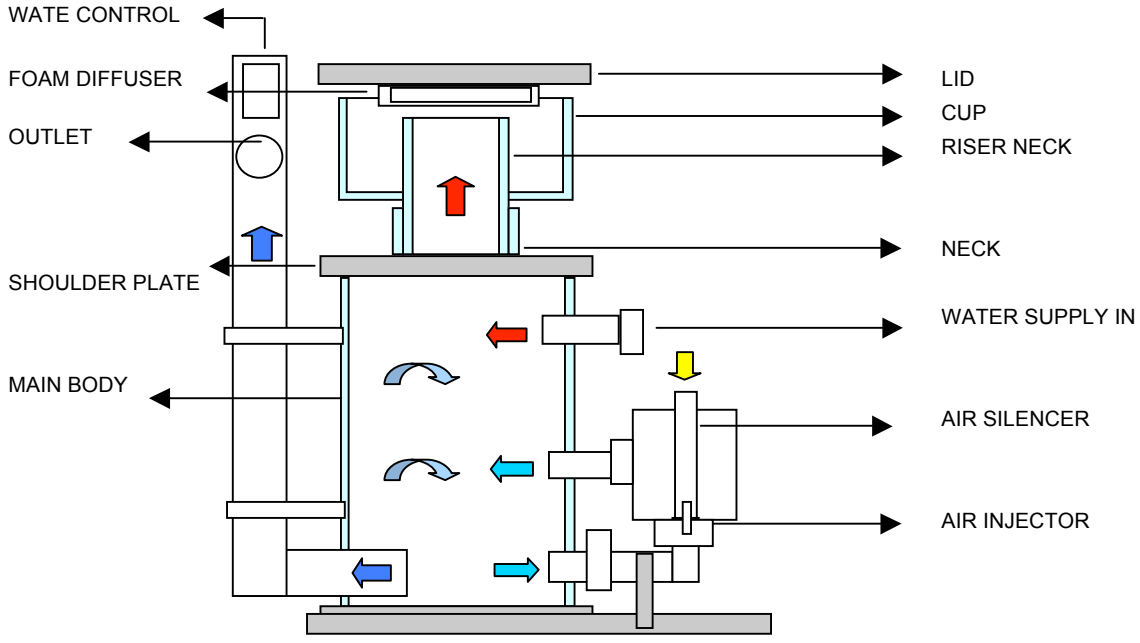
A clean skimmer largely performs far better then a dirty one. We recommend that the cup and riser-neck be washed every second day, with once weekly as a minimum. Every month warm water (250ml) can be used to flush out the aspirator inlet tube, by simply placing the tube into the water vessel during operation. This will flush out any dust that might have collected inside the tube. We further recommend that the skimmer be stripped and cleaned completely every three months and that the aspirator tube is replaced.

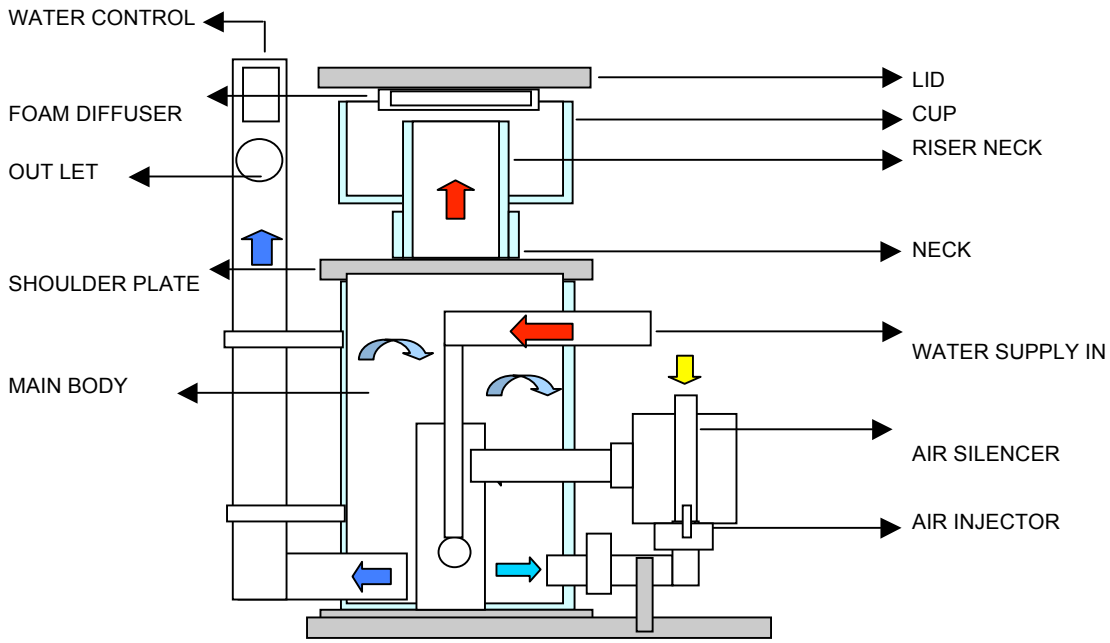
Note: Algae build-up inside the skimmer can reduce performance; therefore they should be installed preferably in a dark or semi-lit area.

M-Skimmer 500 and 1000 in sump



MSKIMMER 500 AND 1000





The M-manual:

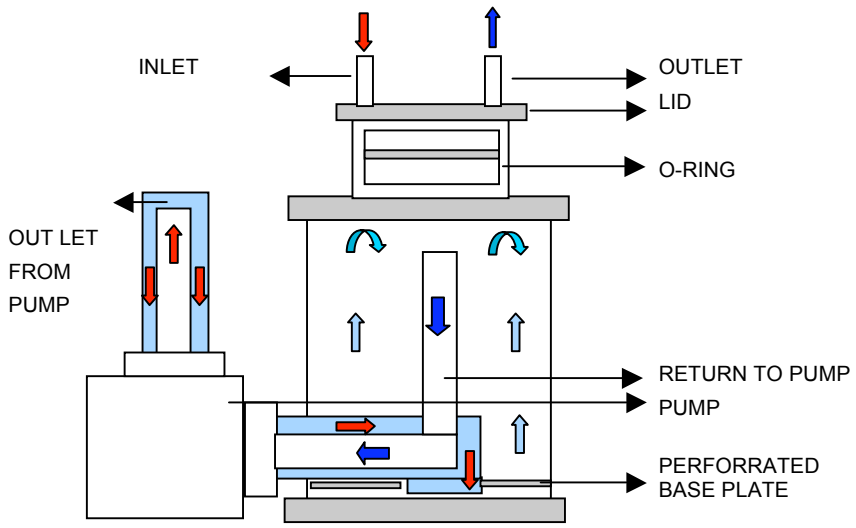
M-Carb
1. Product description
2. Carbon reactor
3. Physical description:

- Pure acrylic
- Hand assembled
- High pressure tolerance
- Screw on / off lid including high pressure o-ring.
- Push-in fittings for inlet / outlet
- Perforated base plate, including reverse flow reaction body, ensures thorough media / water interface.
- Express on / off run dry pump for easy maintenance, including low heat and noise immitions.

Importance of continues carbon filtration:
Note: reactor-based chemical applications are far more efficient than relying on nylon bags to hold medias. Mesh bags do not allow thorough mixing of aquarium water with the chemical medias. Mesh bags grow close with bacterial films and result in the water channeling, and therefore only allowing a small water / chemical interface.
Carbon is a cheap and highly effective media for removing many forms of pollutants. These include dissolved, particulate, organic and inorganic material. Bearing in mind that not all wastes are skimmeable the requirement for carbon filtration is crucial. By removing yellowing substances, including galvins, enzymes and uric acid associated with ageing aquariums, crystal-clear can be maintained. The benefit of polished water can often be noticed on an m.v controller when the carbon is replaced, by a rising redox potential. Clear water also increases the efficiency of light penetration through the water. Therefore it is not advised to replace carbon in the same month as replacing light bulbs or adding a new light source. Unfortunately some aquarists are of the opinion that carbon depletes the system of trace elements (iodine etc) that are added weekly and therefore should not be used. The development of these supplements came into existence to

offset the consumption of valuable trace elements by skimming and carbon etc. So to add trace elements and not run carbon and use protein skimmer would result in artificially high trace element concentrations.

Dosing instructions:
Various opinions exist on the matter but most aquarists seem to use 1ml per liter of water. E.g.: 500 ml for 500 l aquariums. Carbon should be replaced monthly. It is not necessary to rinse or shake the media in the course of the month unless a build up of sediments are noticed in the material. In this case additional mechanical filtration should be used to pre-treat the water.
A flow rate of one drop per second up to a running speed is adequate. In larger aquariums a maximum flow of 2000 lph should not be exceeded.



M-Phos
1. Product description
2. Phosphate reactor
3. Physical description:

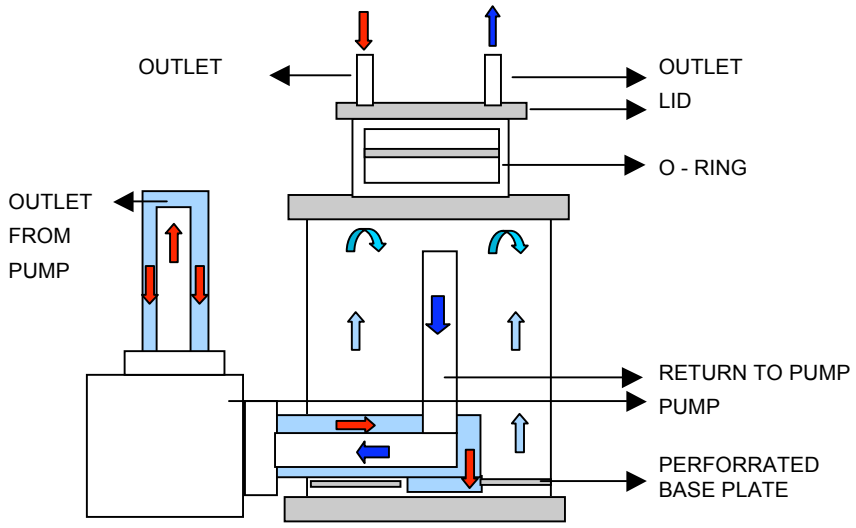
- Pure acrylic
- Hand assembled
- High pressure tolerance
- Screw on / off lid including high pressure o-ring.
- Push-in fittings for inlet / outlet
- Perforated base plate, including reverse flow reaction body, ensures thorough media / water interface.
- Express on / off run dry pump for easy maintenance, including low heat and noise imitations.

Importance of continuous phosphate filtration:
Note: reactor-based chemical applications are far more efficient than relying on nylon bags to hold medias. Mesh bags do not allow thorough mixing of aquarium water with the chemical medias. Mesh bags grow close with bacterial films and result in the water channeling and therefore only allowing a small water / chemical interface.

All living organisms require phosphate to build genetic material (RNA and DNA). Although phosphate is vital to reef ecosystems, they exist at very low levels between 0.001 and 0.003. At levels higher than this they can cause a multitude of damage, including the development of problematic algae. The only way then to assure they are kept at appropriate levels is the use of phosphate removers. Some aquarists feel that if the system contains no problematic algae, phosphate-removing materials are not necessary, however this is unwise. Slightly elevated levels of phosphate are also damaging to corals in other ways even when lower than what is required to foster slime and hairy algae. Phosphate at these levels can retard coral growth by inhibiting the ability of the coral to bind calcium from the water. Also the symbiotic algae within the coral develop beyond what is required by the coral. This results in a browning of the coral but has major effects on its energy expenditure as the coral will continuously try to reduce these populations. This then can affect growth rates and presumably growth formations and reproduction.

Dosing instructions:
Ultimately the amount of material used is relative to the phosphate level. On noticing an increase it is safe to assume that the media is exhausted. Phosphate medias used are either aluminum oxide (white pearls) or ferric hydroxide (brown granules / resembles instant coffee) and have distinct quantity applications. Therefore it is imperative to read instructions. If chronically high phosphate levels exist one should consider that the total phosphate input is higher than normal. This could be as a result of
1. Poor quality fresh and salt water.
2. Over feeding and or incorrect application of coral foods.
3. Defective or insufficient protein skimming.
4. Insufficient water changes.

Note: Many aquarists are still advised to use material in the sump. These include bio balls, ceramic noodles and crushed coral, through which the water is allowed to pass. This can have a damaging effect on the water quality. These filtrates will eventually become clogged with debris and sediments that can result in the development of nutrient sinks. It is then crucial to completely remove these materials if they are in use. Sufficient natural biological filtration occurs in the rock and sand to support the nitrogen cycle. With reef aquariums “more is not always better". However recent research has discovered the importance of continual dosing with water born bacteria. These help assimilate nitrogen containing compounds, and in doing so reduce ammonia, nitrite, nitrate and even phosphate.

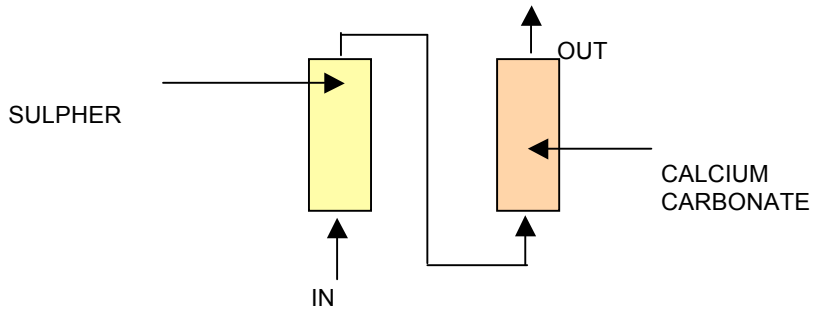


M-Nitro
1. Product description
2. Nitrate reactor
3. Physical description:

- Pure acrylic
- Hand assembled
- High pressure tolerance
- Screw on / off lid including high pressure o-ring.
- Push-in fittings for water inlet / outlet
- Feeder port for bacteria food
- Perforated base plate, including reverse flow reaction body, ensures thorough media / water interface.
- Express on / off run dry pump for easy maintenance, including low heat and noise imitations.
- Probe card for connecting m.v controllers

Importance of continuous nitrate filtration:
Note: reactor-based chemical applications are far more efficient than relying on nylon bags to hold medias. Mesh bags do not allow thorough mixing of aquarium water with the chemical medias. Mesh bags grow close with bacterial films and result in the water channeling and therefore only allowing a small water / chemical interface. Nitrate filters must run without exposure to air and must therefore be airtight under low flow rates between 1 and 10 drops per second.
Nitrate exists at very low levels between 0.001 and 0.003. on the reef and is created during the metabolism of waste products by bacteria. At levels higher then this they can cause a multitude of damage, including the development of problematic algae. The only way then to assure they are kept at appropriate levels is the use of nitrate reactors. Some aquarists feel that if the system contains no problematic algae, nitrate reactors are not necessary, however this is unwise.
Slightly elevated levels of nitrate are also damaging to corals in other ways even when lower than what is required to foster slime and hairy algae. Symbiotic algae within the coral develop beyond what is required by the coral. This results in a browning of the coral but has major effects on its energy expenditure as the coral will continuously try to reduce these populations. This then can affect growth rates and presumably growth formations and reproduction.
Currently two forms of nitrate reactors are in popular use:

1. Sulpher and Calcium Carbonate systems:
This system uses the above medias in two distinct reaction chambers where water is slowly dripped through the system. Bacteria use the sulpher as a food source.
A byproduct of this reaction is sulphuric acid, which is then neutralized, in the second calcium carbonate stage. These systems are relatively cheap, easy to install and safe. The only drawback is its capacity and therefore large reactors are required for large aquariums. E.g. 2l of media is required to treat a 400l aquarium, which is lightly stocked.



2. Bio Bed Nitrate Reactors:
Bio Bed Nitrate Reactors use a more traditional media to grow bacteria (Power Lab - bio balls), and the bacteria are fed carbon sources (Power Juice Nitro). By allowing the water to drip in slowly the oxygen values start to drop within the reactor. In this deoxygenated environment de-nitrifying bacteria can flourish. To foster their growth and therefore increase the rate of denitrification the bacteria are fed.

As these bacterial colonies establish themselves in the reactor the oxygen values can start to drop lower then what is required, so the de-oxygenated water is now called anoxic. At this stage hydrogen sulphid can be produced. In our experience at anoxic values de-nitrification still occurs and hydrogen formation cannot harm the inhabitants of the system, provided the water is being dripped out of the reactor. Therefore you should never flush out the reactor into the main system (tank or sump). If the reactor has been off for a long while and you want to restart, drain out all the water and discard this water down a drain and refill the reactor with aquarium water. Then rinse the media in R.O. water. A relationship exists between oxygen values and redox potential and to get maximum performance from a bio bed nitrate reactor that is fed, it is important to understand this relationship. (Note the following explanation is dramatically over simplified).
Firstly redox potential is used to describe the rate of oxidation vs. reduction and measures the rate of electron transfer in mili volts (m.v's) and is referred to as the o.r.p value. It does not matter if this is not yet understood, as long as you understand the following:
Healthy aquariums have an m.v, which would range between 300 and 450 m.v.
At this m.v value the water contains a high amount of oxygen. At 0 m.v the water will contain little oxygen and at -250 m.v the water would be deoxygenated and at minus 450 it would be anoxic. Therefore the nitrate rector will start to take effect at 0 m.v and be most efficient at -250 m.v and lose efficiency at 350 m.v.
Note: main tank m.v's must be between 300 m.v to 450 m.v and nitrate reactor between -200 and -275 m.v. (For raising tank m.v see ozone).

Application: a new nitrate reactor is fed aquarium water at one drip per second. This water will therefore have an m.v reading of between 250 m.v and 450 m.v. Bacteria start to grow in the reactor and utilize the oxygen. As this occurs the m.v's in the reactor start to fall. Once the m.v s reach 0 denitryfication occurs. As more bacteria grow the m.v's fall and will continue to do so. To counteract this, the flow rate to the reactor must be increased. Remember the tank m.v's are high and positive. This will then mean that more aquarium water is being treated. In this lies the super efficiency of these reactors. Denitrifying bacteria need a food source though. So as flow rates are increased, so too must the bacteria food be increased. To jumpstart new nitrate reactors that have been installed on existing systems that contain high nitrate values, the reactors can be 'force-fed' by feeding the reactor twice to thrice a day. The bacteria in the reactor will establish themselves quicker. Waterborne bacteria can also be added directly to a new reactor to inoculate the reactor using Power Bacteria.

Based on this you must realize that the harder the nitrate reactor works the more actively it will attempt to lower the m.v s of the main aquarium as the water it returns to the main system has a minus m.v. When a nitrate reactor is connected to an established aquarium and force-fed both food and bacteria it can result in a rapid fall in the main aquariums m.v levels and this we have found can result in an outbreak of red slime algae (cynobacteria). With the use of ozone gas and an ozone reactor this effect can be counteracted, as ozone raises the main aquariums m.v. If an ozone generator is not employed then best to allow the reactor to mature at a slower pace.

M.v controllers and Nitrate reactors:
By connecting the supply pump driving water to the reactor to an m.v controller the reactor can be fed water at a high flow rate (>200 l / h). Once the m.v s in the reactor are forced too high the controller will switch off the pump and therefore a stable m.v within the reactor can be established

that is not too high or too low. Then food doses can be matched to maintain a stable m.v at high flow rates.
Dosing systems and nitrate reactors:
A dosing system can be used to automatically feed a nitrate reactor. This reduces maintenance time.
Tank m.v increases due to: (target values 300 - 450 m.v)

- Strong waterflow and surface movement
- Powerful protein skimming
- Clean mechanical filters (mech pads)
- Frequent carbon replacement
- Frequent phosphate remover replacement
- Lack of sediment / detritus build up
- Use of ozone
- Zero phosphate / nitrate readings

Nitrate reactors m.v fall due to: (target - 200 to -275 m.v)

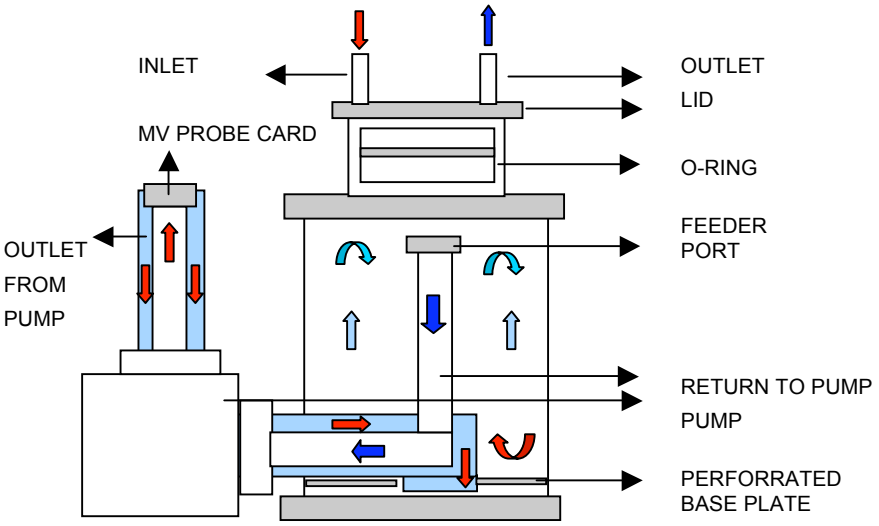
- Drop in oxygen (when used by bacteria)
- Hence: water is dripped in slowly to reduce o2 inputs
- Bacteria food, as more bacteria will develop
- Hence: more oxygen is absorbed
- Water supply to reactor is cut off completely (if the water supply gets clogged etc.)
- Hence: all oxygen is consumed in reactor

Quick start-up sulpher reactors:
Ultimately the amount of material used is relative to the nitrate level. Sulphur nitrate reactors must always run through a calcium carbonate final stage as the chemical reactions in the first stage releases sulphuric acid. Provided this is so, it is impossible to damage the aquarium inhabitants. The sulphur can be topped up as required and 50 % can be changed per annum. The same would apply for the calcium carbonate. If chronically high nitrate levels exist one should consider that the total nitrate input is higher than normal.

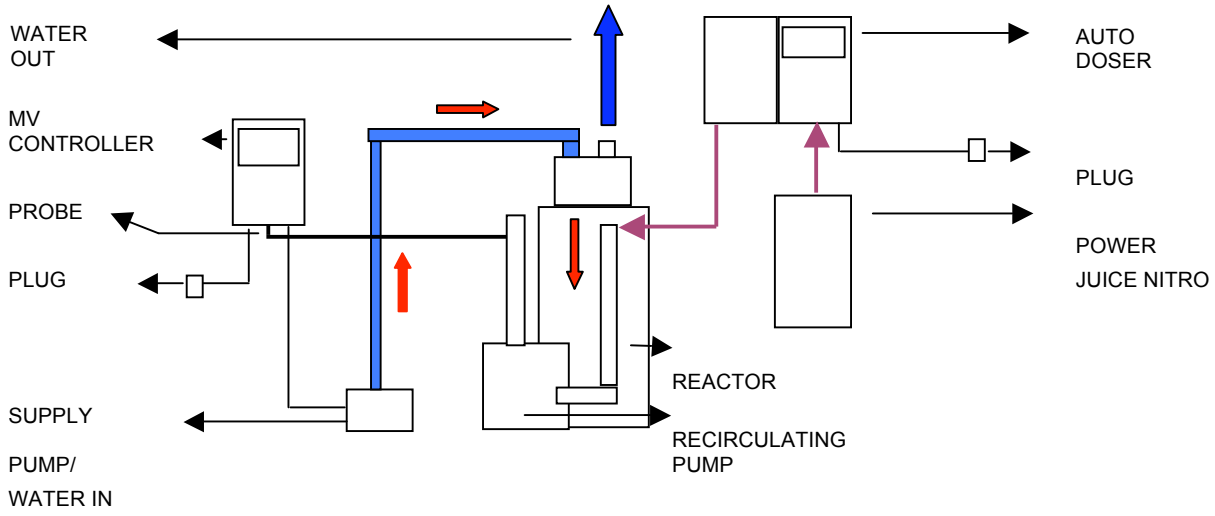
This could be as a result of:

- Poor quality fresh and salt water
- Overfeeding and or incorrect application of coral foods
- Defective or insufficient protein skimming
- Insufficient water changes
- Buildup of sediments and debris in the sand and or sump / inline sump

Note: Many aquarists are still advised to use material in the sump. These include bio balls, ceramic noodles and crushed coral, through which the water is allowed to pass. This can have a damaging effect on the water quality. These filtrates will eventually become clogged with debris and sediments that can result in the development of nutrient sinks. It is then crucial to remove completely these materials if they are in use. Sufficient natural biological filtration occurs in the rock and sand to support the nitrogen cycle. With reef aquariums “more is not always better”. However recent research has discovered the importance of continuous dosing with waterborne bacteria. For further reading see bacteria plankton in supplement manual.



INSTALLATION DETAIL:



M-Auto Top Up
1. Product description
2. Auto top up
3. Physical description:

The unit is made up of a high quality float sensor that is relayed to a pump housed in a bucket. The bucket is then filled with pure fresh water (Reverse Osmosis water)

To regulate the readministration of evaporated water, an auto top up can be used. The system will on demand replace pure fresh water (Reverse Osmosis) to the sump or inline sump tank. This then reduces the need for manually having to add freshwater to the system. This serves as a protection to the pumps from running dry and prevents fluctuations in the salt value of the system.

With the use of the auto top up a kalk stirrer can be used.

M-Kalk
1. Product description
2. Kalkwasser stirrer
3. Physical description:

- Pure acrylic
- Hand assembled
- High pressure tolerance
- Screw on / off lid including high pressure o-ring.
- Push-in fitting for water inlet.
- Low watt motor
- Stable paddle assembly
- Passive flow reaction body ensures thorough media / water interface.
- Express on / off lid for easy maintenance
- Low heat and noise immitions.

Importance of continuous kalkwasser application:
Note: reactor based chemical applications are far more efficient than relying on bottled solutions. Kalkwasser solutions must run without exposure to air and must therefore be air tight under low flow rates between 10 and 50 drops per second.

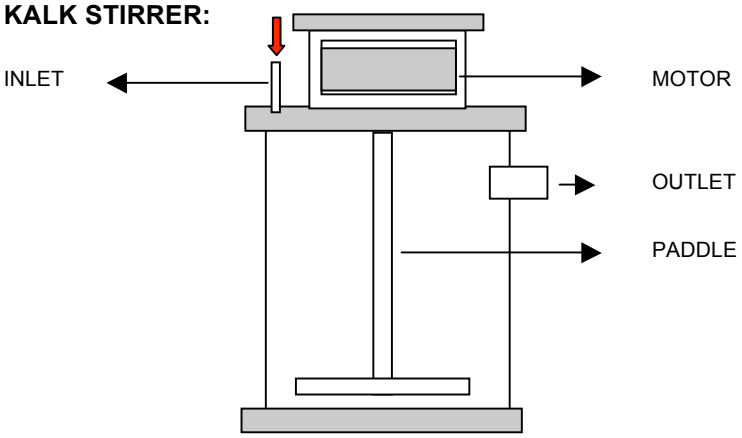
Kalkwasser (calcium hydroxide) solutions have the following benefits to the reef aquarium:

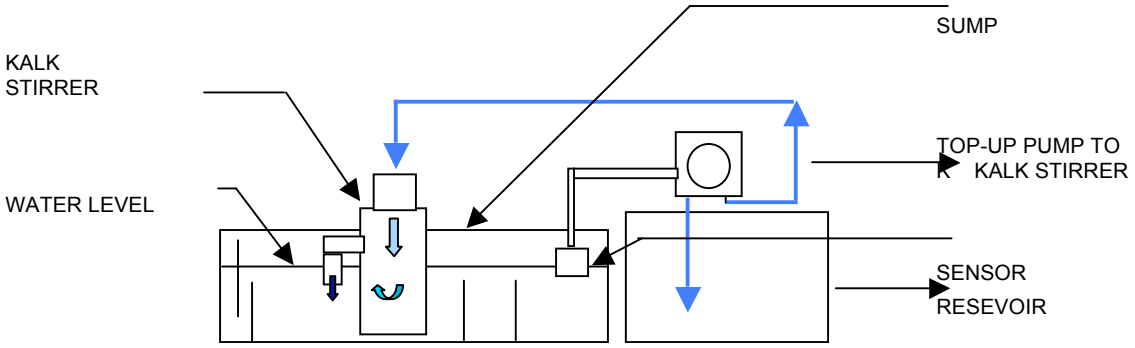
- Stabilizes the ph
- Increases the protein skimmers performance
- Makes certain non-skimmable material capable of clinging to the bubbles within the protein skimmer.
- Helps reduce phosphate from the water
- Positively increases calcium content, reducing need to add calcium supplements
- Prevents the depletion of Kh or alkalinity

Dosing instructions:
Ultimately the amount of material used is relative to the calcium level.
Kalkwasser chemical reactions release high ph values. Provided it is dripped in slowly it is impossible to damage the aquarium inhabitants. Calcium hydroxide can be topped up as required per week or all the powder can be changed per month.

If chronically high calcium levels exist one should consider that the total calcium input is higher than required. This could be adjusted accordingly.

KALK STIRRER:





M-Calcium
1. Product description
2. Calcium reactor
3. Physical description:

- Pure acrylic
- Hand assembled
- High pressure tolerance
- Screw on / off lid including high-pressure o-ring.
- Push in fitting for co2 inlet.
- Aspirated co2 injection
- Perforated base plate, including reverse flow reaction body, ensures thorough media / water interface.
- Express on / off run dry pump for easy maintenance, including low heat and noise imitations.
- Probe card for connecting ph controllers
- Control valve for fluid bed height regulation

Power Lab calcium reactors are fully integrated including self-priming bubble counter, drop counter tube and a durable internal circulatory pump allowing for thorough mixing of carbon dioxide (c02). For self-installations either a supply pump or Power Drive (push-in fitting) can be purchased to supply unit with aquarium water. In addition a co2 cylinder and regulator is required. A series of up grades are available to further enhance performance. These include ph controllers that can be used to regulate the internal ph value of the reactor, via a solenoid valve, and operate the water supply pump allowing for accurate minimum ph value of the main aquarium.

The unit comes standard with calcium carbonate media (Power Calcium).
Power Magnesium is a magnesium-based media that can be mixed with Power Calcium reducing need for manual magnesium dosing.

Calcium and carbonates on the reef:
All calcium-containing organisms on the reef use these to create their skeletons and support structures. These include corals, clams and coco worms. Its importance could be described as being the pulse to reef aquariums. If their levels remain too low or unstable it is unlikely that the system will thrive.

Importance of calcium reactor application:

Note: reactor based chemical applications are for more efficient than relying on bottled solutions. With its application the need for manual supplementation or buffering of the system is no longer required. Manual additions create spikes in calcium / alkalinity/Kh levels. These stress corals and fish and do not allow for natural growth rates, color and growth formations. Unlike manual dosing calcium reactors allow for per second injection of calcium and carbonates. Another problem associated with bottled solution dosing is an ever constant see-sawing effect between calcium and alkalinity buffers. Calcium reactors release calcium and carbonates in complete chemical balance and allow for the simultaneous build up of both.

Calcium reactors have the following benefits to the reef aquarium.

- Stabilizes the ph
- Positively increases Kh / alkalinity
- Positively increases calcium content, reducing the need to add calcium supplements.

Dosing instructions:
Ultimately the amount of material used is relative to the calcium level.
Calcium reactions release low ph values. Provided it is dripped in slowly it is impossible to damage the aquarium inhabitants. Calcium reactors can be topped up as required per month or all the media can be changed every three to six months. If chronically high calcium levels exist one should consider that the total calcium input is higher than required. This should be adjusted accordingly.

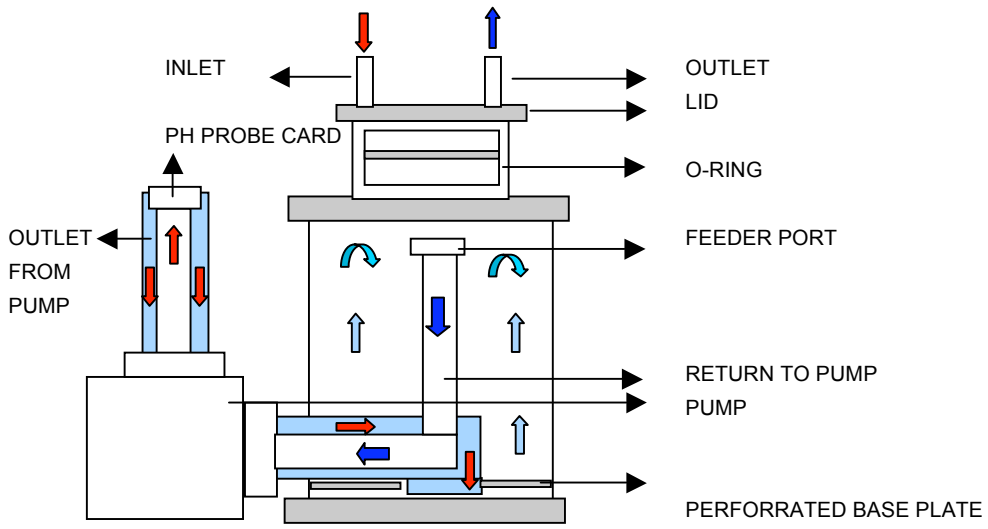
Setting water flow:
Note: examine diagrams first and ensure components are correctly installed.
The basic mode of operation is to allow the reactor to fill with aquarium water via the supply pump or Power Drive fitting. Once the reactor has filled it will discharge water back to the sump/ inline sump via the exit line. At this stage the water flow control tap must be used to set a water flow rate of 1 drop per second. Now turn on the internal circulatory pump.
Always insure main control tap is closed prior to switching on internal circulatory pump. Slowly open tap and adjust media to operating fluid level.

Setting co2 flow:
Note: examine diagrams first and ensure components are correctly installed.
Start by ensuring the second stage control on the regulator is completely closed. Then open the first stage, which is a tap, valve or pushdown fitting on the head of the co2 cylinder. Now open second stage control slowly until the bubble counter shows an injection rate of 1 bubble per second. Within a short while the co2 will start to acidify the water within the reactor and the media will start to dissolve and thus the water returning from the reactor will contain a high calcium and alkalinity value. Depending on the actual tank values, it will take just a few days for the system to reach the required target values. (Ca 450 Kh 11)

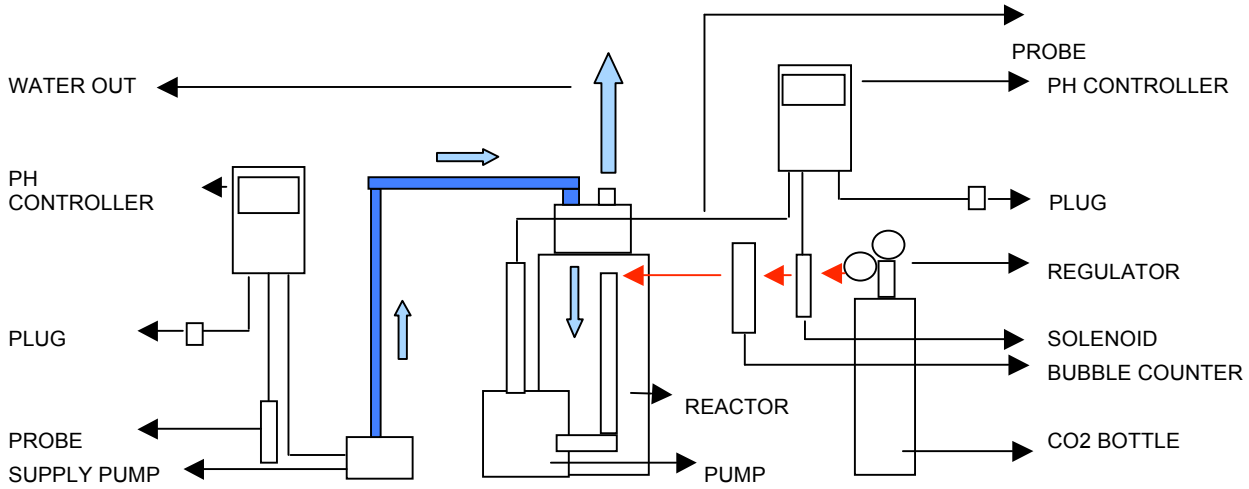
Fine-tuning:
By measuring the exiting waters (effluent) ph value, it is possible to access if the reactor is working properly. Also the calcium and alkalinity can be measured to give an indication of the strength of the effluent. Under the standard configuration of 1 drop, 1 bubble a ph of 6.5 should be reached and the effluent should contain a very high Kh / calcium value. If after a few days the main displays Kh/calcium content is too high and exceeds the target value reduce the water flow and bubble rate slightly.
If after a week the value in the main display has not risen to a suitable level, increase drip rate, the co2 rate (bubble) rate should also then be increased. If there is concern that too much or little co2 is being added check the ph value of the effluent water and ensure a reading of between 6.5 and 6.3 ph. If the ph value has fallen below 6.3 ph reduce bubble rate.
We have found on most reactors that 1 bubble per second should be sufficient up to 10 drops of water per second. Always increase water flow first when trying to increase main display values and calculate that each 10 drops will require 1 bubble of co2.

Once the systems settings have been fine-tuned regular servicing of the material and co2 refilling is all that will be required. Do not be fanatical about exact drip rates. The main displays value is what should most importantly be monitored.
Note: with the use of ph controllers the internal ph value can be set automatically. This ensures optimal ph values both within the aquarium and reactor.
Due to the acidic nature of the effluent, a lowering of the main displays ph value will be noticed. However provided the drip rates are monitored and set according to guidelines set above, it will fall within a safe band; a minimum of 7.9 ph for the main aquarium display is acceptable. When the target Kh / alkalinity value is reached the ph will stabilize.

Front view: calcium reactor



Installation detail:



Power supplements
Introduction

Power Lab's momentum in reef aquarium engineering has moved on into the development of sophisticated supplements. By manufacturing our own range of pharmaceutics we have greater control over quality and can insure that only the very best chemicals make their way into our aquarium ecosystems. Our products are therefore engineered using what we call Pure Grade Active Ingredients (P.G.A.I). With P.G.A.I as the foundation to our entire supplement's range, we can largely overcome concerns with toxic chemical byproduct build-up. In our formulations, residual discharge is mainly salts that are harmless and unable to counter act with other important elements in the water column. According to our research as little as 10 % water changes even if only performed once within a 12-month cycle will adequately be able to reinstate ionic balance.
Note: even though this will reinstate balance frequent water changes are still required.

To introduce novice aquarist to our range, supplements are arranged in the following groups:

1. Hardness Control:

Calcium and carbonates are used to deposit calcium carbonate (Cac03) by all calcium-containing organisms. The stability of these values are linked to the magnesium level and similarly to the ph value. Their maintenance at natural seawater levels is therefore crucial for coral, fish and invertebrate development. In order to maintain correct water hardness the following targets are to be reached:

TEMP	26 DEG CELSIUS
SALINITY	1026 SG
ALKALINITY (KH)	11 KH
CALCIUM	450 PPM
MAGNESIUM	1275 PPM

Power Lab's hardness control packages are not to be seen as substitutes for calcium reactors and kalk stirrers, but are designed rather to be used in combination with reactors for lifting low levels, although reactors and stirrers are still the most efficient and cost effective method for long-term maintenance. All our hardness control products use Multi Platform Buffering Systems. M.p.b.s technology allows our hardness control products to remain more stable, this translates into alkalinity, calcium and magnesium levels that do not suddenly fall after buffing. M.p.b.s technology has allowed us to largely counter effect the influence of precipitation and co-precipitation. This will be noted as a dramatically reduced seesaw effect on target values while buffing. (Adding of chemicals)

To allow for stabilization and maintenance of the calcium, alkalinity and magnesium the following products will be used.
Power Alkalinity: use to raise and maintain alkalinity (Kh)
Power Calcium Up: use to raise calcium
Power Calcium: use to maintain calcium
Power Magnesium: use to raise and maintain magnesium

Dosages and application:
For Power Calcium, Power Calcium Up and Power Alkalinity use:
One level teaspoon per 100l of estimated aquarium water. Do not forget to include water in sump tank or tanks.

E.g. use 3 tsp for a 275 l aquarium. Mix each tsp to 250ml R.O. water and stir.
E.g. use 3 tsp in 750ml R.O. water.

Rather do one product at a time, with at least an hour between each.
E.g. to buff a 275l aquarium for alkalinity, calcium, and magnesium:

Step one:
Stir 3 tsp Power Calcium in 750 ml R.O.
Once settled, pour slowly into sump or filter chamber. We recommend dripping in solution at a rate of few drops per second using a Power Drip Line.
Wait at least one hour then...

Step two:
Stir 3 tsp Power Alkalinity in 750 ml R.O.
Once settled, pour slowly into sump or filter chamber. We recommend dripping in solution at a rate of few drops per second using a Power Drip Line.
Wait at least one hour then...

Step three:
For Power Magnesium use 5ml per 100l aquarium water. This can be added directly to the sump or filter chamber.

To raise alkalinity: 1 tsp will raise 100l by 1.5 dkh
To raise calcium: 1 tsp will raise 100l by 15 ppm
To raise magnesium: 5ml will raise 100l by 5 ppm

Raise levels slowly at a max of 10% per 24 hrs.

2. Trace Elements:

Power Iodide:
Important to all marine life and is used in many bio chemical reactions, including the production of enzymes. Iodide must be replenished, as it is not only removed biologically from the system but also through protein skimming and carbon use.

Power Strontium:
Strontium is often mentioned for its role in calcification in coral growth but is required for many other bio chemical reactions.

Power Trace:
Power Trace replenishes aquarium water with an array of minor and exotic elements that are absorbed by the ecosystem and lost due to filtration.

Power Vitamins:
Power Vitamins replenish aquarium water with an array of vitamin elements that are absorbed by the ecosystem and lost due to filtration.
Multi vitamins should be added to fish food and allowed to be absorbed.
In this manner the fish will be able to ingest and assimilate the vitamins.
Waste material and small uneaten food particles that then make their way into the water column are in turn filtered and translocated by the coral fauna.

All Power Trace elements are organic and concentrated.
Dosage: 1ml per 100l once weekly, can be added directly to tank or sump filter in high flow area.

3. Nutrition:

An important component to the modern reef aquarium is the application of coral foods in various formats. This has been a dramatic change in thinking from former systems. The predatory role of coral and anemones have been known for some while, but coral feeding was generally avoided in captive displays due to concerns regarding the buildup of harmful waste material including debris (detritus), nitrates and phosphates. Today with the efficiency of protein skimmers and with the aid of carbon, phosphate and nitrate reactors these are no longer a potential hazard. Correct feeding of the aquariums fish load too, makes available to the coral fauna an important mix of food and nutrients. (This discussion will be found under Power Labs fish food products.)
Corals have several feeding strategies; they can capture small invertebrates (similar to a Venus fly trap). These small items could be macroscopic shrimp, baby fish etc and are termed zooplankton. Coral can also capture or filter from the water column algae cells, termed phyto plankton. Lastly coral can absorb directly from the water beneficial nutrients via a process called translocation.

Power Growth:
Power Growth is a highly concentrated specific amino acid solution and assists in the deposition of live tissue within the skeleton matrix. Corals and anemones can both capture the smaller particles as well as translocation the liquid contents.

Power Health:
Power Health is a broad-base amino acid and is translocated and utilized by clams, coral, and anemones. Its constitutes are used for growth and repair in damaged areas. It results in healthy coral that display brighter colors and better polyp extension.

Power A.R.T:
Power A.R.T is a plankton substitute that contains high concentrations of protein and vitamins. The effects on the system are similar to those of Power Health, but will feed micro and macro organisms too.

Power Phyto Plankton:
Power Phyto Plankton is a strain of greenwater, which is farmed under sterile conditions. It is a natural coral food, and also feeds micro- and macroscopic life forms in the tank. It is rich in various forms of vitamins and nutrients.

4. Bacteria Plankton:

The recent discovery of the importance of waterborne bacteria has resulted in the development of cultured bacteria. These bacteria are not present to the same extent within captive reef aquariums as they are found in natural reefs.
This is due to protein skimming and direct feeding by coral.
Waterborne bacteria perform the following functions:
They consume nitrates and phosphates as they are protein based, which results in cleaner water. These protein-based bacteria then become a food source to coral, micro and macro organisms. When they are skimmed out of the system it acts as a form of nutrient export, again resulting in cleaner water. The growing of this bacteria plankton is therefore crucial in the development of a successful reef aquarium.
In order to grow and culture these highly beneficial bacteria in reef aquariums the following products will be used:

Power Bacteria:
This freeze-dried bacterial culture is farmed under strict conditions and therefore contains no harmful species and has a stable shelf life.

Dosages and application:

1ml per 100l weekly. However in high stock displays or displays with high levels of nitrate and phosphate bi weekly additions can be performed.

Power Juice:
Power Juice has been specially formulated as a food source to feed Power Bacteria. By feeding the bacteria natural sea level values of bacteria, plankton can be achieved.

Dosages and application:
In new aquariums use 1ml per 100l daily for the first two weeks.
Thereafter use 1ml per 100l weekly. If the system contains delectable nitrates and phosphates daily additions can be performed.
Overdosing is possible, but does not seem a concern provided the dosing instructions are followed. Signs of excess bacteria plankton will be white or cloudy water. The only danger with this could be a rapid depletion in oxygen levels. If this occurs stop adding bacteria and power juice. Once water clears restart products but reduce the frequency of additions.

Power Juice Nitro:
Power Juice Nitro has specifically been developed to feed our Power Nitrate bio bed reactors. For its application see reactor manual.

5. Color Enhancers

Power Green, Power Pink and Power Blue colour enhancement products encourages the reintroduction of natural colour formations in coral and clams. Provided the aquarium is correctly equipped, stocked and fed, weekly dosing with these elements can restore vibrant colours in most coral including metallic highlights. These products were initially developed with stony coral (s.p.s) in mind. Since undergoing the research to develop them, our understanding of how the total system will benefit from their additions has changed.
It is therefore recommended that they be used on all systems.

Dosages and applications:
For sharpening stony coral colors use 1ml per 250l biweekly. Then monitor color change and adjust regiment accordingly.
For general application use 1ml per 100l weekly.

Supplements although essential to the well being and development of reef aquariums need to be viewed as a component within a larger system, which when only collectively run can support the establishment of a successful aquarium. Often some aquarists will mention that for many years reef aquariums were run without the use of advanced equipment and aid, so why the need then to incorporate all these new elements? Since their introduction the following changes have been brought into our systems:

Reduction in maintenance cost:
With the application of calcium reactors and kalk stirrers there is a reduction in the amount of calcium and alkalinity buffers required. Reactors can often reduce the annual hardness control bill several fold.

Reduction in maintenance time:
Under the influence of carbon, phosphate and nitrate redactors the system remains more stable and requires less attention and care. Simple chores are too reduced.

Increase in live stock holding:
A far greater collection of fish, coral and invertebrates can be successfully housed within the aquarium. Today we find it quite possible to maintain near natural levels of livestock.

These systems therefore allow the production of natural seascapes truly representative of the world's tropical oceans. Under much observation and study of other methods employed the resulting effects in the non-use of high technology systems are obvious. Our systems are capable of allowing coral fauna to grow, expressing the natural, magnificent color and growth potential and growth structures. This is seen as more dramatic ecosystems sculpture.

Trouble shooting:

Up lift / return pipe blows bubbles:
Vibration noises
Water on floor
Tank over flows
Sump over flows
Sump level does not rise
Skimmer keeps filling with clean water
Skimmer does not fill with dirty water
Sulphur smell in sump

Corals:
Shut close
Release slime
Start to sting each other
Tissue start to detach from skeleton
Mushrooms / polyps jump off rock
Anemones start shrinking
Lights stay on / off

Bubble counter stops running
Reactors stop dripping
Temp, alk, ca, no3, p04 too high / low
Problematic algae start to grow
Power heads blow bubbles

Fish start fighting
Fish stops eating

Up lift pump / reactor pump does not start up
Top up does not run

Plankton reactor stops:
Bubbling
Running

Chiller does not cool water
Chiller freezes up

Water becomes milky / cloudy

We expect clients to stay in contact with us especially if they are experiencing problems with their aquariums.