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A WaterZoo introduction to…

Marine aquariums

Many years ago, marine fish, and corals were once considered very challenging, and only for the most expert hobbyist with a deep pocket. Luckily, in the last decade things have improved dramatically, and keeping a successful marine aquarium is no longer the preserve of a dedicated few.
Marine fish & corals are still sensitive to poor conditions, but the technology available, and knowledge has improved beyond recognition, while the costs have dropped. This makes setting up, and maintaining a thriving marine aquarium within the reach of any hobbyist that is prepared to get the right equipment, and devote a short while every week maintaining it.

Marine aquariums can be divided into two basic categories, reef and fish only. A fish only aquarium, as its name suggests contains just fish, and is sparsely decorated by comparison, however, the stocking density is greater, with fewer restrictions on the species that can be mixed. The large aquarium at the entrance to the livestock area is an example of a fish only aquarium on a massive scale.
A reef aquarium contains fish as well as corals, anemones, shrimps etc, and replicates the natural environment. This can subdivided into soft and hard corals. Both requires stronger lighting and a higher standard of water quality than fish only aquariums, but provide a stunning display. The Reefer 250 and Trigon 190 near the entrance are good examples of aquariums containing hard or soft corals.

Firstly, you will need a suitable position to place your aquarium, ideally this should be away from direct sunlight, and close to a power source. The WaterZoo guide to positioning your aquarium gives more details.
Once you have a suitable location, you should decide if you wish to keep just fish or the more natural reef, and the size of aquarium you would like.
There is a huge choice of aquariums & cabinets, not all of which are suitable for installing the equipment required for keeping marines. Increasingly, there are now some very good reef ready systems, these are aimed primarily at marine hobbyists. The Red Sea Reefer, & Kent BioReef, are good examples of ready-made systems that we normally have on display. These can be a good choice for the beginner as they have excellent instructions detailing not only setting up, but also long term care. While there are marine aquariums available as small as 15 litres, we would suggest something at least twice this size for the beginner. Small aquariums can suffer from temperature fluctuations and the number and type of inhabitants is very restricted, as marine stocking levels can be as low as 2.5cm per 27 litres. Some freshwater aquariums e.g. Juwel can be adapted successfully, or sump-based system, with the equipment housed in the cabinet maybe the answer, if your budget runs to four figures. We have examples of these types of system running in store.

Filtration is a complex subject for the marine aquarium, as there are so many possibilities. Due to increasing use of live rock, which can virtually replace conventional filtration, there has been a move away from many traditional filtering methods. While large filters are still recommended for fish only systems, they are now considered far less important for reef aquariums, where large quantities of live rock are used. Live rock is a naturally occurring coral rock, its huge surface area harbours bacteria, which perform the filtration process. There is also man made alternatives like Real Reef Rock, that are just as good. To perform the filtration process, aim to fill at least half the aquarium with live rock, or as a rough guide 1kg per 10 litres of water.
Even aquariums with live rock can benefit from some additional filtration, this may consist of a

fluidised reactor, to house chemical media, e.g. carbon or phosphate remover. Some type of mechanical filter, to reduce the accumulation of detritus can also be useful. An efficient protein skimmer, is in our opinion is a beneficial component in a well-stocked marine aquarium and must if you wish to keep hard corals. These consist of a vigorously aerated column with a collection cup on top. Pollutants stick to the air bubbles, which then climb up in to the collection cup, where they collapse into a dark liquid. This liquid consists of waste products, which could contribute to deteriorating water quality. Protein skimmers come in a wide range of shapes and sizes, the motorised ones being the most efficient, these start at around £80.
Filtration not only traps particles, and pushes water through chemical media, but also helps increase water movement. This is crucial to the health of most sessile invertebrates, it brings them oxygen rich water and nutrients, while taking away waste products. Filtration on its own is unlikely to provide sufficient water movement, and additional pumps will be required. This extra movement can be achieved by the addition of 'stream' type pumps these have been designed specifically for circulation purposes. Whatever method used, aim to circulate the entire volume in a reef aquarium, at least ten times per hour, preferably twenty. Fish only aquariums require the water to be filtered at least three times per hour, but will also benefit from additional water movement by stream pumps.

Any aquarium benefits from illumination, it brings it to life, and shows the vibrant colours of the inhabitants. For the marine aquarium containing corals, the lighting is vital, not just to illuminate them, but to provide a source of energy. Within the tissues of most corals live symbiotic algae called Zooxanthellae, that produce food for their host, for this partnership to work they require high intensity lighting. There are many ways to produce suitable light, several high output T5 (½" Ø) fluorescent lamps provide sufficient light for most of the commonly kept corals, in shallow aquariums. These run hot, and can contribute to overheating of the aquarium, especially when enclosed.
LED's are rapid becoming 'the' light of choice for marine aquariums, although initial cost appears high this is more than offset by lower running costs and long life. Crucially they run cool so will not contribute to overheating of the aquariums water. There is a huge range of LED's available, the better ones are controllable enabling natural light conditions like sunset and sunrise to be emulated.

Virtually all marine organisms offered for sale originate from shallow tropical waters. To prevent the water from becoming too cold, a thermostatic heater is required, set at between 23ºC and 27ºC. Overheating, and keeping a stable temperature, can be a real problem in aquariums with lots of equipment, and poor ventilation. If the water temperature frequently exceeds 29ºC then a chiller, or some other method of cooling the water may be required.
The WaterZoo guide to preventing overheating of aquariums gives more details.

The essential element for any aquarium is water. For freshwater species tap water is normally ok, if not ideal. For marine aquariums only purified water should be used due to significant levels of nitrate and phosphate present in tap water. These levels may harm the inhabitants, and will cause algae problems. The easiest, and most cost-effective way to produce water low in contaminants is reverse osmosis (R.O), these use mains water pressure to force water through a special type of filter. R.O. units start at around £90, but produce water quite slowly, alternately we can fill your own container, for a small charge.
A fundamental difference between marine and freshwater, is the addition of synthetic marine salt, this should be a type specifically developed for use with R.O. water. Initially, this can be added directly to the aquarium, but once livestock is added, it must always be dissolved in a separate container first. The salt level can easily be checked, with a hydrometer, or a more accurate refractometer. When water evaporates, the salt is left behind, so the salinity can increase, if left unchecked. Natural seawater has a specific gravity of around 1.026, but aquariums are often kept at the slightly lower level. Stability of this parameter is far more important than the exact level, provided extremes are avoided.
Even with the use of R.O. water and a good quality marine salt, a close eye needs to be kept on

water conditions. The seven most important water quality parameters to monitor are Ammonia, Nitrite, Nitrate, pH, KH, phosphate and salinity.
Ammonia is extremely toxic to marine organisms; it is produced primarily by the metabolic processes of fish. It is easily mineralised by naturally occurring bacteria in an established aquarium. Ammonia should be zero at all times.
Nitrite is produced when another type of bacteria mineralise ammonia. Luckily nitrite is less toxic to marines than freshwater species, even so the level should ideally be kept at zero.
Nitrate is normally the end product of waste after all the other types of bacteria have mineralised it. In a reef aquarium it is broken down further by a special type of bacteria that live within the live rock. It is far less harmful than ammonia or nitrite, but still the closer to zero the better for the inhabitants. In heavily stocked systems, frequent water changes, or other methods will be required to prevent nitrate levels climbing too high. The WaterZoo guide to nitrate gives more details.
pH, this should remain above 8.0, ideally 8.3. This is relatively easy to achieve by good water movement & oxygenation. Products to maintain pH level, known as buffers are also available, and are often necessary in established systems.
KH (Carbonate Hardness) should be between 8 and 12 degrees, keeping this parameter correct helps stabilise pH, can reduce some algae problems, and helps coral grow.
Phosphate is introduced into the water through feeding or untreated tap water, and is not removed by filtration or live rock. While not toxic to fish, even tiny levels can slow coral growth and cause major algae problems. Water changes alone are rarely enough to control its accumulation, and the use of a phosphate remover is almost always necessary.
Calcium and Magnesium needs monitoring where many corals are present, when growing these key elements become depleted. Low long-term levels may slow growth; this is easily rectified by the use of the appropriate additives e.g. Red Sea Reef Foundation elements

As mentioned, sufficient live rock can perform a filtration role, but it also is excellent for decoration purposes too. No two pieces are the same, it is relatively light and has lot of interesting shapes. It is readily colonised by colourful coralline algae, and once added to the aquarium many sessile invertebrates will appear. It should be positioned in a way that is pleasing to they eye and stable, but still allowing for good water circulation as well as leaving space for the corals that will be added later.
Ocean rock can be useful, either as decoration in fish only system, or as a base rock in those where lots of live rock is to be used. It is a heavy white calcareous rock, which is soon colonised, additionally it may help stabilise the pH.
In recent years many realistic replica corals have been developed, while these don't aid filtration, they do provide an attractive form of aquascaping, especially for fish only aquariums.
Coral sand, or coral gravel makes an ideal substrate that provides a habitat for some fish and invertebrates, a layer of several centimetres, is all that is required. Live sand is also available and can be added directly to the aquarium, shortly before the first livestock is introduced, this is great for establishing the water quickly, as it is already colonised by beneficial bacteria.

Even the most well-equipped aquarium requires maintenance, contrary to popular belief, marines do not take significantly longer to maintain than freshwater ones. On average 15-20 minutes a week, is all that is required, on the average sized system. This may take many forms, it could be just checking water quality, cleaning the glass, or carrying out a partial water change. The primary difference is that the water needs preparing before adding to the main aquarium. The water to be added should match closely the salinity, and temperature to that already present. At The WaterZoo we sell ready mixed salt water that is ready to add, so this can save a lot of effort.

While most corals derive as much as 90% of their energy requirements from high intensity lighting, some supplemental feeding is recommended. Some form of liquid food e.g. Red Sea Reef Energy several times a week, is probably the easiest method and satisfies the dietary requirements of most corals. Aquariums with many corals may also need the addition of various

trace elements that they require for growth and well-being. E.g. Red Sea Reef Foundation elements.
Most being wild caught, marine fish are little more finicky than freshwater species, at least until well established. They will take one of the many types of frozen food, Brineshrimp or Mysis being the most readily accepted and forms a good staple diet. A dried food is worth feeding as weight for weight, it has more nutrients than frozen and produces less waste. On the reef, fish graze almost constantly, therefore in the aquariums they should be fed small amounts at least twice a day, unless they are kept in a lightly stocked reef aquarium where they can graze.

A successful marine aquarium consists basically of an aquarium, good quality saltwater, intense lighting, effective filtration, be it natural or artificial, and a reliable heater. But as soon as you start to do any research, you will find a whole host of other equipment, much of which is useful, especially on large aquariums. Below is an overview of some of the items you may come across.
The use of an ultraviolet steriliser (U/V) reduces the chances of disease outbreaks and prevents any disease spreading. Filtered water is pumped over an ultraviolet light, this in turn kills many disease organisms, the cleansed water is then returned to the aquarium. Especially useful in fish only systems, but can be used on any aquarium. Although not essential a wise investment, we use these extensively in the shop to ensure our fish are disease free.
A top up system consists of a float switch connected to small pump, when the water drops below a predetermined level it triggers a pump, to add freshwater from a reservoir. This helps maintain a constant salinity. This is very useful in aquariums without covers.
Calcium reactor, uses carbon dioxide gas to dissolve a media high in calcium carbonate, in our experience, this is only required for highly stocked reef aquariums with many stony corals.
Nitrate reactor, this removes nitrate from the water by creating a low oxygen environment in a chamber filled with sulphur media. Not normally required in reef aquariums where live rock is used, useful on fish only systems, but it can negatively affect pH.
Fluidised bed filter, consists of a tall chamber, filled with sand, or chemical media. When filtered water is pumped through it, the media is suspended in the chamber, maximising the surface area. These are the ideal way to maximise effectiveness of phosphate removing filter media
Trickle filters are rarely used now, but a many years ago were very popular. These filters are highly efficient, as the bacteria that colonise the media utilise oxygen from the atmosphere, rather than from the water. This provides high levels of dissolved oxygen.
Ozonizers, produce ozone gas, which must be added via a protein skimmer, as it is a powerful oxidising agent and can harm livestock. It must be used with caution, but it can give unparalleled water clarity, that is low in dissolved organics.
Computers are even creeping into aquariums, these can monitor and control many aspects of aquariums management. While they have some useful features such as data logging, which helps spot trends, e.g. Seneye.

Further information
Interpet Mini Encyclopaedia to marine aquariums
The new marine aquarium (M. Paletta)

This guide is provided as a brief introduction to marine aquariums, it does not cover every aspect, and we suggest researching the subject thoroughly, to assess all the options before starting.
It is especially important to find out about the requirements of each species before purchasing.

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Jason Scott, a regular contributor to Practical Fishkeeping magazine, who has over 30 years' experience in the hobby, wrote this WaterZoo guide and others in the series.