Basic Saltwater Aquarium Equipment

Choosing the right equipment for starting a saltwater aquarium.

By John Tullock

This is not going to be one of those "Choose a sturdy support for the tank, water is heavy..." basic equipment articles. I shall take the liberty of assuming that you have some knowledge of aquariums, although you may never have kept one before.

To successfully maintain marine organisms in the home for any reasonable length of time, you will need an aquarium of some kind. This should be a rectangular tank of any size larger than, say, 10 gallons (38 liters), although the bigger the better. It will need a sturdy support near electricity, and a source of water should be convenient.

The tank should be made entirely of glass or acrylic. You will need a cover for the tank, and a heater of sufficient wattage to keep the aquarium at a constant 75 degrees Fahrenheit (24 degrees Celsius). About 3 watts per gallon is usually satisfactory.

You will need an assortment of accessories for maintenance chores: a couple of 5-gallon (20-liter) buckets, a larger plastic container of about 30 gallons (115 liters), some flexible hose, nets...in short, the same sort of stuff you need for a freshwater tank. You will also need both a filtration system and a lighting system, the selection of which you should give considerable thought to.

When you think about equipment for a new marine aquarium, think about nutrients. That's right, nutrients — of which there are not very many in the waters around coral reefs. The novice saltwater enthusiast should always remember that the life forms destined to inhabit his or her marine aquarium come from the waters around coral reefs. For reasons explained below, most of what you will be doing when caring for your marine aquarium will be involved with removing nutrients from the water in the tank.

So let's think about nutrients for a moment. Nutrients are, of course, essential for the survival of most living organisms. However, one of the special features of the coral reef environment is the paucity of nutrients in the water. Reef organisms have developed marvelously efficient ways of capturing and, in many cases, recycling most of the available nutrients. The result is that the bulk of the nitrogen, phosphorus and organic carbon present in the reef habitat is found in the biomass, not dissolved in the water.

In the aquarium, which is a closed system and an ecologically incomplete environment even under the best of circumstances, excess nutrients begin to accumulate from the moment living organisms are added. This accumulation results in a decline in the water quality of the system. If nothing is done to reverse this process, water conditions will soon deteriorate to a point outside the range of tolerance of the life forms. They, in turn, will fare poorly.

Filtration is therefore necessary to prevent, or at least retard, this gradual worsening of water conditions. Filtration, properly chosen and combined with water changes and the judicious application of tank additives, enables the aquarist to maintain aquarium water in good condition almost indefinitely.

Sunlight plays an important role in the nutrient recycling process that occurs naturally on coral reefs. This fact has important implications in the selection of aquarium lighting.

Choosing suitable filtration and lighting is only one aspect of setting up a successful saltwater aquarium, but it is a very important aspect, for two reasons. First, a significant portion of the total cost of the aquarium will be spent for the filtration and lighting systems. Second, there is a trade-off between the initial investment in equipment and the amount of effort you will expend later in keeping the tank in the appropriate condition. Such effort may not only involve maintenance chores but, alas, may also be associated with medicating sick fish, replacing filter media and light bulbs, coping with prolific algae growth and repairing worn or faulty equipment. The time to be choosy and critical is now, when you are first setting up the tank, not six months from now when that bargain-priced pump fails while you are away for the weekend.

There is such a bewildering array of options available for filtering a marine tank. Which one is best? The correct answer, of course, is that no one filtration system is suitable for all applications, and that the choice for your particular aquarium should be determined by what you intend to keep in the tank. There are probably as many filtration theories as there are

aquarists, but for simplicity's sake, I will discuss only three approaches to marine tank filtration. I shall refer to these as "high-tech," "natural" and "traditional" setups.

Thoroughly dedicated marine hobbyists, by the way, can actually forgo filtration altogether, provided they are willing to carry out frequent, large water changes. The ultimate purpose of any filtration system is to extend the useful life of the water in the tank. And no filtration system, no matter how sophisticated, can eliminate the need for partial water changes. All filtration methods are applied with the intent of preventing changes in the chemistry of the aquarium water that would render it unsuitable (i.e., stress-producing) for the inhabitants of the tank.

High-tech filtration systems seek to automate, insofar as possible, maintenance of the appropriate water quality. The goal is stability of the water chemistry with minimal labor for the aquarist. The redox controller (to be discussed later in this series) receives my vote for the centerpiece of such a system, although only a couple of years ago any tank fitted with a wet-dry filter was high-tech. If you are comfortable with or like to use computers, fax machines and so on, you may be a candidate for a high-tech aquarium system. To do it right, you will need a roomy budget.

Natural filtration systems rely primarily on the good judgement of the aquarist, a protein skimmer and an ample quantity of live rock. This is my personal choice, but not one I can, in good conscience, recommend to the novice. Developing good judgement about marine aquarium husbandry requires some hands-on experience. For the beginner, it is wiser to employ some equipment that will provide a margin for errors in judgement.

Traditional systems are, in my view, defined by the use of the undergravel filter. This somewhat less-than-satisfactory device has the decided advantage of being both cheap and almost foolproof. Its primary disadvantage is that proper cleaning is difficult to accomplish.

In the last few years, wet/dry filtration systems have received much attention, largely with regard to their application in maintaining so-called reef tanks. Any marine aquarium, however, whether reef or fish-only, will fare better and be easier to maintain if a wet-dry filter is installed instead of using an undergravel filter. Because traditionalists will be horrified at this allegation, and the novice aquarist may be horrified at the cost of a wet/dry filter, let me explain why I believe there is a decided advantage to this method of filtration over the more commonplace, and certainly cheaper, undergravel filter.

At minimum, we require a filter to process toxic ammonia into less toxic nitrate via the process known as biological filtration. If you do not clearly understand what is meant by biological filtration as it applies to aquarium maintenance, stop right here and do some reading on the subject. Complete descriptions of this process, which is achieved by beneficial bacteria, are found in virtually any decent book on aquariums, whether freshwater or saltwater. Excellent articles that deal with biological filtration in detail regularly appear in this and other magazines.

In a nutshell, your saltwater aquarium filtration system must be able to detoxify the ammonia (a form of nitrogen — a nutrient) that will be produced by the inhabitants of the tank, or they will die rather promptly. Both undergravel filters and wet/dry filters easily accomplish biological filtration.

Wet/dry filters, however, excel in two ways. They trap detritus in such a manner that it can be removed with much less effort than is required for an undergravel filter, and they are far easier to maintain, with little physical disruption of the tank.

A wet/dry filter is essentially a watertight box (sump) with a smaller box (biological chamber) sitting on top. Water flows from the aquarium by gravity, trickles through the biological chamber, collects in the sump and is pumped back into the aquarium. The biological chamber is filled with pieces of plastic that become colonized by the beneficial bacteria that detoxify ammonia. The sump often houses additional filter media, or other equipment, and thus serves as a convenient place to hide this extra hardware underneath the tank, out of sight.

The trickling of water through the biological chamber permits maximum contact with the air, allowing essential oxygen to be dissolved in the water and harmful carbon dioxide to escape. Detritus, which consists mostly of dead bacteria, is trapped in a simple sheet of polyester fiber pad placed at the top of the biological chamber through which water from the tank must flow. Good filters have a nifty drawer in this position in order to facilitate periodic cleaning of this pad. Additional detritus accumulates in the sump, beneath the biological chamber, from which it may be siphoned with minimal disturbance to the tank itself. Maintenance chores are therefore more easily accomplished and, consequently, more regularly performed.

With an undergravel filter, in contrast, all of this stuff — filter media (substrate), powerheads, airstones, wires, hoses and so on — is in the tank. This not only spoils the appearance of the tank, but makes proper cleaning almost impossible without severe imposition upon the peace of mind of the tank's inhabitants.

I have mentioned detritus several times. Why is detritus such a problem? It acts as a storage depot for nutrients, and, as I mentioned above, most of what you want a filter to do is eliminate excess nutrients from the aquarium. Phosphorus compounds, of which detritus is a rich storehouse, will promote thick, obscuring growths of algae if allowed to accumulate. Organic carbon compounds, dissolved in the water but also found abundantly in detritus, will provide food for undesirable and possibly disease-producing bacteria. The water in the tank will be analogous in purity to the air over the Los Angeles freeways and your fish will not thrive.

If you cannot justify the purchase of a wet/dry filter and must settle for an undergravel system, bear in mind the limitations of the latter. Resolve to spend more time maintaining the tank and resist the temptation to stock a large number of fish. I will present some important facts about choosing a wet/dry filter system in the next installment of this article.

Lighting plays a key role in the marine aquarium, but is a critical consideration only if you plan to keep invertebrates, such as anemones or corals. An aquarium that will not be home to such organisms should nevertheless be brightly illuminated. Reef fish are accustomed to high light levels in their natural habitat, and bright light will promote the growth of beneficial green algae. As you will come to understand, algae can be both a bane and a blessing in a marine aquarium.

If you plan on keeping anemones, which require bright light, you should consider fixtures that permit you to place several fluorescent lamps over the tank, or perhaps a metal halide system. I will discuss both types of lighting in a subsequent installment of this series.

Most beginners opt for a tank containing fish and perhaps a few invertebrates, such as starfish or shrimps, that have no special light requirements. For these organisms, the standard fluorescent strip light that comes with most aquarium tanks is satisfactory. Such fixtures will accommodate a single fluorescent tube. Select a hood for the tank that will accommodate a tube of the maximum length that will fit across the top of the tank. The longer the tube, the brighter it will be.

The particular type of fluorescent tube is important, since all tubes are not created equal in terms of their light output or the aesthetic appeal of the color of the illumination. Some of the best are the Ultralume 5000K and Advantage X lamps manufactured by the Philips corporation. Some of the worst are cool white (the lamp usually supplied in hardware store fluorescent fixtures) and the various brands of lamps typified by the Sylvania Gro-Lux, which are designed for growing and displaying terrestrial plants. Gro-Lux type lamps are marketed widely under a variety of names for aquarium lighting. In my view, they are less than satisfactory.