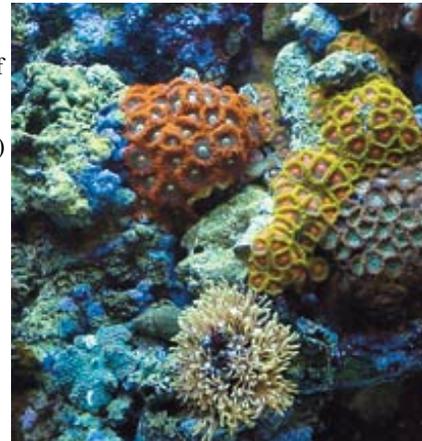


Placement of Corals in the Reef Tank

Drs. Foster & Smith Educational Staff

Up until the last few years, if you asked under what conditions a coral would do best, 80% of the time the reply would be "good light with moderate current," 10% of the time, the reply would be "toward the bottom with little current," and 10% of the time, the reply would be "take your best shot." Fortunately, for the most part, these answers were correct in that most tanks used fluorescent lights of some type and the only types of corals being kept were soft corals, large polyped stony (LPS) corals, and mushroom anemones. The only precautions that we had to take in terms of coral aggression was to keep the soft corals far enough away from Hammer (*Euphyllia ancora*), and Elegance (*Catalyphyllia jardinei*) corals to keep them from being stung. Otherwise, not much thought was actually given to coral placement and its long-term effect on the animal's well being.



With the dramatic improvement and widespread use of metal halide lighting, and the increasing availability of new coral species, particularly the small polyped stony (SPS) corals, these stereotyped answers to coral placement questions are no longer valid. The three main factors to consider in placing corals are aggression, lighting, and water movement.

Aggression

Today, more attention needs to be given to reducing aggression, since many of the newer species of corals that we are now keeping are much more aggressive. This aggression has also become more of a problem as a result of our being more successful at keeping corals in general. That is, as we have become more skilled at actually growing coral colonies, our corals are growing to larger sizes. As the size of these corals increases, so too does their proximity to each other, and as a result, more of their aggressive nature manifests itself. Thus, while their aggressiveness was hardly observable and not a problem when they were a small, three inch colony, their effect on neighboring corals becomes dramatically noticeable when they are twelve inches across.

Types of coral aggression

Corals have developed several specialized mechanisms for protection and competition with other corals. These include sweeper tentacles, mesenterial filaments, and terpenoid compounds (Ates, 1989).

Sweeper Tentacles: Sweeper tentacles are the most common defense mechanisms in the hard corals, and also occur in some soft corals. Specialized stinging cells called 'nematocysts' are present in these tentacles and can attack a competing coral and literally "burn" it to the point of either killing it or severely damaging it. The length of these sweeper tentacles is not correlated to the length of the normal coral polyp and may, in fact, be many times longer.

Mesenterial Filaments: In addition to sweeper tentacles, several hard coral species can produce mesenterial filaments (also termed mesenteric filaments) from their stomachs. Corals of the genera *Favia*, *Favites*, *Scolymia*, *Pavona*, and *Cynarina* all have this capacity (Chadwich, 1987). These filaments can kill or devour other coral polyps through a process similar to digestion. Some corals even have the capacity to produce both sweeper tentacles and mesenterial filaments, enabling them to fight a battle on several fronts (Wallace, 1984).

Terpenoid Compounds: The soft corals generally compete with the hard corals by releasing 'terpenoid' or 'sarcophine' compounds into the water to injure or impede the growth of neighboring corals, and then overgrow these impeded individuals in a process called "allelopathy" (Delbeck and Sprung, 1994). Like their name implies, these compounds are similar to turpentine in chemical structure and in most instances, are just as toxic. By releasing these compounds, the soft coral injures these neighboring stony corals and can thus grow above them, eventually blocking out the light that they are both dependent upon and thereby killing the underlying hard coral.

Use correct spacing

While a miniature reef does not contain the great diversity of life that an actual reef does, provisions should still be made to try and minimize the aggression among corals. This can be accomplished by providing adequate spacing and reducing tip over potential. When setting up a tank, adequate space, which is invertebrate free, should be given around each coral head.

Hard Corals: For LPS corals, this zone should be at least 15 cm in all directions, as sweeper tentacles have been reported to be at least this long (Sheppard, 1982). The distance between SPS corals does not need to be as great; a distance of 5-8 cm is usually sufficient. However, it should be noted that these are the fastest growing of all corals, so extra space should be allowed for this. For this reason, I suggest that a buffer zone of 30% of the coral colony's size be used when originally placing the corals in order to allow for growth. This may seem extreme and may initially make the tank look sparsely decorated. However, in a well-designed and maintained reef tank, this space will be almost completely filled within the first year simply from growth. If growth space is not provided, there will be a constant need to prune corals lest they burn and kill one another.

Soft Corals: For the most part, the space between soft corals does not need to be as great initially, since soft corals do not burn each other to the same degree as the hard corals do. Consideration in placing soft corals needs to take into account:

- A faster growing coral will overshadow a slower growing coral and eventually starve it out for light.
- These corals should be positioned so that their mucous and terpenoids do not come into direct contact with their neighbors. That is, these corals will do the least harm to other corals if the water movement in the tank is such that after the water moves across them it flows down an overflow and into a sump where the harmful compounds can be removed with either skimming or carbon.

Minimize tip over potential

Tip over potential is the likelihood that one coral will tip over and land on another coral, and as a result, burn or be burned by the other coral. The burned area becomes infected and consequently, the whole colony dies. Tip over is particularly troublesome for SPS corals, which usually arrive unattached to anything. Therefore, when placing these corals on a live rock structure, use a dab of waterproof epoxy to hold them in place until they encrust over the area themselves. An alternative is to use rubber bands or plastic cable ties to anchor the colonies in a less permanent manner.

Light preference

When placing a coral, consideration of its lighting and current requirements should be made long before it is placed in a particular location. This is because moving a coral, even a small distance once it has adapted to conditions at one spot, causes the coral to "re-adapt" to these new conditions. It has been my experience, that it takes at least one month and closer to two for a coral to adapt to new conditions and start to grow. Therefore, placement should be planned so as to not inhibit the coral's growth by constantly moving it from place to place.

There are multiple types of lighting systems that can be used for corals.

Fluorescent lighting

Fluorescent lighting is still the method of choice for most reef enthusiasts, particularly those keeping predominantly soft and large polyped stony corals. Fortunately, even in fluorescent lighting there are now many choices. In addition to standard bulbs, high output (HO) and very high output (VHO) bulbs are also now available, as well as compact HO and the very latest T-5 (HO) lights. As their names imply, these bulbs differ by the amount of light that they produce. It is my opinion, that for the majority of tanks housing soft corals and LPS corals, fluorescent lighting will provide all the light necessary to meet the animals' needs and allow them to thrive and grow. The goal should be to get between 4-6 watts of light per gallon of water over the tank.

However, even with fluorescent lighting and more so with HO and VHO fluorescent lighting, care needs to be exercised when placing the animals under a new lighting regimen. This is because many of the lighting sources that we utilize contain more ultraviolet (UV) light than the corals are accustomed to on a reef. Because of this difference, I have found it advantageous to slowly acclimate new corals to artificial light. If the corals are not acclimated slowly, it may cause them to bleach or burn. This is particularly the case with the HO or VHO "blue" bulbs that we use, as well as with many of the metal halide lamps.

For this reason, when I obtain a new coral, I usually place it at the bottom third of the tank for at least one month. After this one-month acclimation period, I gradually move it up to its desired final location over another two-month period. This may seem extreme, however, I view my tanks and the tanks that I have helped set up as long term, five-year plus projects, so there is really no need to hurry. I use this method for SPS corals, which show the least tolerance for being shocked, owing to the thin veneer of living tissue that is actually present on the colony. It is also useful for large polyped stony corals like Brain corals (*Symphyllia*, *Favia*), Open Brain corals (*Trachyphyllia*), Elegance (*Catalyphyllia*), as well as any other corals that contain a large amount of bright green pigment in their tissues. It has been my unfortunate experience, that if I immediately place these corals high up in the tank, they bleach and die very quickly. Because of this, I now employ this system of acclimation, and as a result, I have achieved much better results when adding new corals to a tank.

Metal halide lighting

In tanks utilizing metal halide lighting, I suggest using the same system as described above, with a few addendums. First, for those corals that contain a lot of zooxanthellae (the symbiotic algae that lives in the coral's tissues), as indicated by their coloration being dark green or dark brown, in addition to starting these corals low it may also be necessary to initially place some type of screening material (eggcrate, fiberglass mesh, etc.) above them. This is necessary to prevent these corals from suffering from oxygen shock due to the overproduction of oxygen from the zooxanthellae when initially placed under bright light (Delbeek and Sprung, 1994). This screening material needs to be above the corals for two to three weeks to gradually allow the corals to acclimate. Once this is removed, the corals can continue to be acclimated as described above. This screening technique is also useful for tanks that are shallow (16 inches deep or less) where it is difficult to move a coral farther away from the light. In addition, during this time, the light cycle should be dramatically shortened to further reduce the risk of shocking the corals. Cutting the light cycle in half for the first week, and then gradually adding an hour to it each week is a good way to reduce the risk of light shock.

In terms of placing the corals once they have acclimated, the general rule is the brighter the color of the coral, the closer to the lights it should reside. Thus, bright pink Bird's Nest (*Seriatopora hystrix*) or Cactus (*Pocillopora verrucosa*) corals usually should be placed higher in the tank than their brown counterparts. The reason for this is that the brighter color indicates

pigments in the tissue have been produced to protect the coral from ultraviolet (UV) light that is present in the shallower depths (Delbeek and Sprung, 1994). Once a coral has been acclimated to this bright light and begins to grow, the growth tips will usually be of a brighter color than the original colony itself.

This same pattern also holds for soft corals. Brightly colored soft coral colonies like Yellow Tonga Leather corals (*Sarcophyton elegance*), bright green Finger Leather corals (*Simularia sp.*) and white *Xenia* colonies all seem to do better with brighter lighting than their brown or beige counterparts. If the lighting is inadequate for these brightly colored corals, these bright colors will gradually fade over time. Therefore, a good indicator of whether a coral is in the proper place and under adequate lighting is how its color compares with what it looked like when it originally arrived. If the lighting is better and the coral is acclimated properly, it is even possible to bring out the colors of a coral, so that over time, it may be more green or pink than when it was originally collected. This is the result of more UV light being present in our reef tanks than the coral was exposed to in the wild. Thus, to compensate for this, brighter pigmentation occurs.

Under metal halide lighting, many corals can remain at the bottom of the tank. Mushroom anemones (*Actinodiscus sp.*), Plate corals (*Fungia sp.*), Tongue corals (*Herpolitha sp.*), and Brain corals (*Favia*, *Favites*, *Symphyllia*, etc.) all do quite well in the lower depths of these tanks. In addition, Elegance (*Catalyphyllia*) and Bubble (*Plerogyra*) corals seem to do better under metal halide lighting when placed lower and to the far sides of my tank. In fact, in my tank, the Bubble coral resides under an overhanging Leather coral and is doing quite well.

Water movement

The last factor to be concerned with in terms of coral placement is water movement. Most corals have very little means for cleansing themselves, and rely on strong water movement around them to perform this task. That is why powerheads or some other source of water movement are so essential in a reef tank. Otherwise, detritus will settle on the corals and decay, which quickly leads to algae formation and the demise of the coral. However, not all corals require the same amount of water movement.

Strong Current Corals: Corals that do best with strong water movement usually come from areas where wave action is greatest. These corals usually have small polyps and are either bulky or encrusting in form (Veron, 1986). Corals such as *Porites*, *Turbinaria*, *Symphyllia*, *Acropora paucifera*, etc., fall into this category. These corals can take the strongest water movement in a reef tank, as they live on the outermost slopes of the reef.



Moderate Current Corals: The next group of corals requires moderate current, as they come from the lagoons and back reefs where the current is not as great, and in fact, may be limited to the changing of the tides. Nevertheless, if adequate water movement is not present, these corals will not thrive. Most of these corals have either large polyps or are fairly large polyped encrusting corals. Corals such as Star polyps (*Clavularia sp.*), Flowerpot (*Goniopora sp.*), Leather and Finger Leather (*Sarcophyton* and *Lobophyton*), and Plate (*Fungia*) corals fall into this category. The next group requires even more moderate water movement and includes Soft Finger Leather corals (*Simularia*, *Nephtea*), Colt coral (*Cladiella*), Polyp rock (*Zoanthid sp.*), and *Euphyllia* and *Elegance* corals.

Low Current Corals: The last group still requires water movement, but it is only a trickle relative to what the first groups of corals should receive. This group includes Mushroom anemones (*Actinodiscus sp.*), Elephant Ear anemones (*Rhodactis sp.*), and Bubble corals (*Plerogyra*).

In many instances, the difference between success and failure with a particular coral specimen has often been the result of moving an animal several inches in relation to the water movement. Also, when I have had an animal that was not thriving, it was generally due to inadequate water movement rather than too strong of a current.

Conclusion

Besides the three aspects of coral placement described above, there are many other factors that need to be considered. My goal, however, was to provide general guidelines and factors to be considered rather than the actual requirements for every coral species. However, I would like to point out two rules that are generally true:

1. Corals hate to be moved and require time to acclimate to new conditions.
2. If a coral is not thriving in a location after two weeks, then chances are it will die unless you move it.

Sorry for the ambiguity, but the real message of this article is that only by observing your animals and experimenting will you find the optimum location to place your charges.