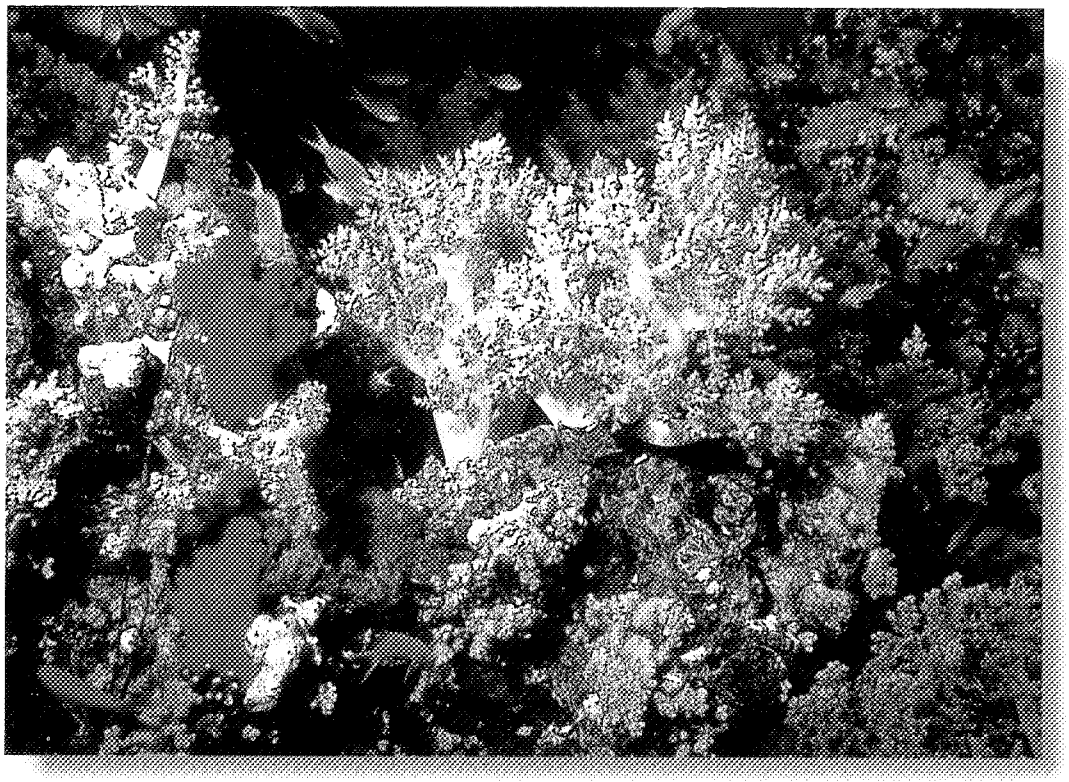
Creating the Reef Environment

SOFT CORALS

Selecting and Maintaining Soft Corals
Feeding and Algal Symbiosis
Lighting and Water Clarity



Jim Fatherree

SOFT CORALS
AND RELATED MINI-REEF ANIMALS

Jim Fatherree

As interest in the aquarium hobby continues to grow every year, more and more people are becoming involved in the husbandry of live corals and other marine invertebrates. Keeping these animals alive and well in reef aquariums can be a very interesting and rewarding pastime if done properly, but this requires that hobbyists teach themselves all aspects of the hobby from filtration techniques to lighting systems to the individual living requirements of each and every type of organism they want to keep. Failure to do so most commonly results in complete loss and leads to nothing but frustration for the not-yet-educated aquarist. So although a major aim of this publication will be to provide readers with a basic background in the biology and natural history of the various animals it covers and to color that information in light of some of the purely aquaristic concerns involved with the needs of soft corals and their relatives, how to choose and use marine aquarium equipment will not be a major part of this book. Certainly attention will be paid to such vital considerations as nitrite and nitrate buildup, pH and temperature, but there will be no in-depth discussions of currently available filtration strategies and water treatment systems and things of that nature—those are for the many good specialized marine aquarium books already on the market. Here we'll talk mostly about and show the animals known as soft corals in the aquarium hobby from the standpoint of showing where they fit taxonomically and how they differ from one another, coupled with discussions of their particular requirements as aquarium dwellers: what they have to have and what has to be avoided.

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This cluster of sun polyps may look like a group of individual polyps at first glance, but on closer inspection it can be seen that they're all joined by a common fleshy base and are therefore colonial cnidarians.

thought that all of the first cnidarians were free-living organisms and that over millions of years some of them eventually took on a life attached to the bottom. Through time many of these sedentary groups also began to form complex colonies composed of hundreds or thousands of intimately connected organisms. From these primordial groups arose all of the incredible varieties of solitary and colonial cnidarians that we strive to keep alive and well in our reef aquariums today.

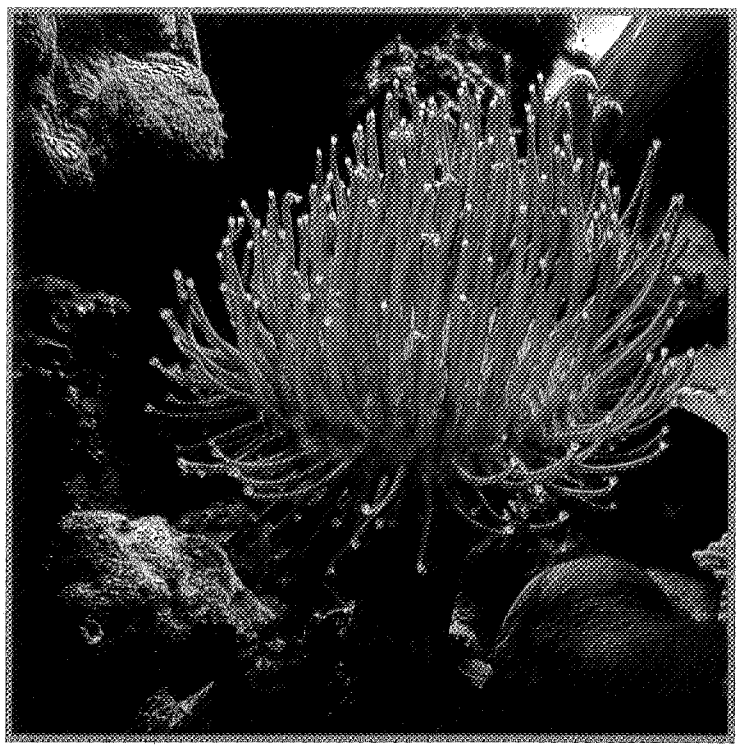
THE BASIC ANATOMY OF CNIDARIANS

Cnidarians are biologically among the simplest of the multi-cellular animals, and while their overall external appearance may vary greatly, they are all very similar in a number of ways. First, all cnidarians have the same basic body construction at the tissue level of organization. All have a body wall composed of an outer and inner layer. The outermost layer is called the ectodermis, or ectoderm, and is comparable to the animal's "skin"; the innermost layer is called the endodermis, endoderm or gastrodermis. Between these two layers is a clear jelly-like material called the mesoglea.

Typical cnidarians have a prominent mouth that opens into a large single body cavity. Cnidarians have no true digestive system or tract, but this cavity acts as the organism's stomach and is called the enteron, or gastrovascular cavity. In this area food is held and digested through the use of various enzymes. Nutrients are then absorbed by the cells of the gastrodermis and are spread throughout the organism's body by cell-to-cell transfer. Cnidarians have no excretory system either, and after food has undergone digestion wastes are simply ejected back through the mouth or are secreted through the body and out to the environment through the cells of the ectoderm.

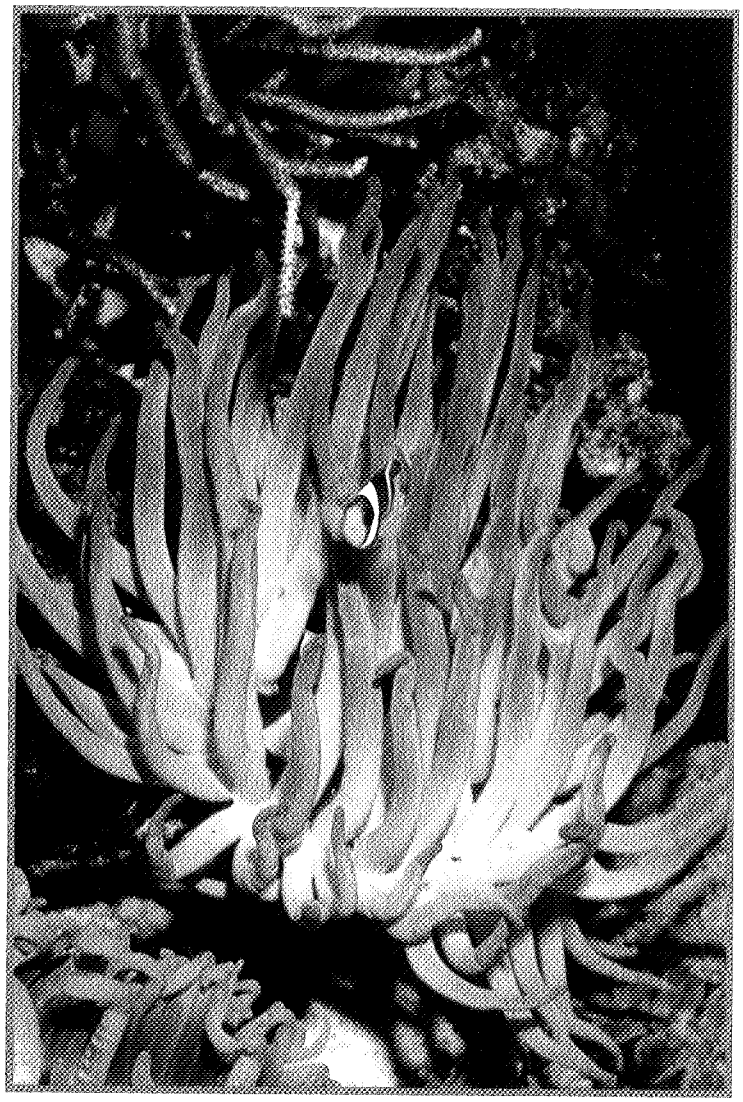
The mouth is typically surrounded by a ring of tentacles of varying size. The primary function of these tentacles is to help the organism capture and ingest food. To aid in this task any ten-

***Sarcophyton,* one of the leather corals, commonly thus called because of the leathery feeling of the base from which the individual polyps emerge.**



cnidarians, broken down class by class within the phylum. Cnidarian taxonomy is based on several characters, from overall structure to different life cycles to the number of tentacles each polyp of a particular group has, and in some instances species are so hard to tell apart that a microscope is required to look for the tiny differences in their structures. It can be quite difficult and for the most part should be left to the experts. There have also been nomenclatural changes over the years, resulting from the restructuring of various groups. So it is common to see different names for the same taxonomic group in aquarium literature. The entire phylum Cnidaria, for instance, was called the phylum Coelenterata not too long ago, and of course individuals within the class were called coelenterates instead of cnidarians. The phylum contains four different classes: Hydrozoa (which comprises seven orders and includes such dangerous animals as the Portuguese man o' war and the fire corals); Scyphozoa (the jellyfishes); Cubozoa (the sea wasps); and the Anthozoa, wherein we find the animals that are the subject of this publication.

An anemone of the order Actiniaria, commonly designated as the true anemones, with a guest anemonefish (*Amphiprion).* A gorgonian can be seen in the background.



The soft-bodied cnidarians that are commonly found in reef aquariums and are our primary subjects of discussion all belong to the class Anthozoa (the most "important" members of which are the hard corals and the anemones), but they are spread over two different subclasses within the Anthozoa. The subclass Alcyonaria (also known as Octocorallia) contains the leather corals (order Alcyonacea), the gorgonians, sea fans and sea whips (order Gorgonacea) and the organ pipe corals and star polyps (order Stolonifera). The subclass Zoantharia contains the colonial anemones (order Zoanthidea), the mushroom anemones (order Corallimorpharia) and the true anemones (order Actiniaria). Both subclasses also contain other orders, but we're not concerned with those orders here, since we're dealing only with the cnidarians generally regarded as "soft corals." (The "hard corals, " incidentally, are within the order Scleractinia, subclass Zoantharia.) Each of the pertinent groups will be discussed in detail in the sections that follow.

about 6,500°K to 6,800°K.

This can be done in two basic ways. The first and easiest way is to simply buy bulbs that emit light at 6,500°K to 6,800°K. There are currently metal halide bulbs on the market that emit light at exactly 6,500°K, and there are also several brands of fluorescent bulbs that are a mixture of both white and blue light and are appropriately called 50/50 or daylight bulbs. The overall color of these bulbs is usually just a little bluer than daylight and is thus ideal for reef aquariums. The other approach is to use a combination of bulbs of various colors that have an overall emission similar to daylight. This is commonly done by using metal halide bulbs that are 5,500°K with fluorescent bulbs that are 7,100°K. While it is not necessary, many hobbyists also prefer their lighting to actually be even bluer. This is also easily done by combining fluorescent bulbs that are 7,100°K or metal halide bulbs that are 10,000°K with fluorescent bulbs that are 6,500°K.

The other basic consideration is intensity. The right spectrum means little if the intensity is too low. Regular wattage fluorescent bulbs come in a variety of colors from white to actinic-white (50/50) to actinic. However, these bulbs do not have a very high output at all compared with high output (HO) and very high output (VHO) bulbs—but they are much more inexpensive. While some cnidarians can survive with a few of these bulbs over the aquarium, many will require more intense lighting in order to grow and reproduce. High output and very high output bulbs in these colors are a big step up. While a normal wattage 4-foot fluorescent bulb has an output of 40 watts, a 4-foot HO bulb puts out around 85 watts, and a 4-foot VHO bulb puts out around 110 watts. Compact fluorescents, relatively new to the market, are another type of fluorescent lighting. These bulbs also have a much higher output than regular wattage bulbs, and they are actually a bit brighter than HO and VHO bulbs. Metal halides are by a long shot the most intense lights available for aquarium applications. They are large bulbs that look just like streetlight bulbs. They also come in a variety of spectrums, from 4,500°K up to 20,000°K. However, the 5,500°K and 6500°K varieties seem to be not only the most reliable but also the cheapest, and as discussed when used in combination with actinic fluorescent bulbs they provide a very desirable spectrum.

Experimentation often is needed to find out the best placement for a soft coral within the tank to obtain the proper amount of illumination. This 65-gallon reef aquarium obviously offers different strata of light intensity.

Unfortunately, the brighter a particular type of bulb is, the more it usually costs and the more the fixtures and ballasts cost as well. Most manufacturers and hobbyists suggest replacing bulbs every 9 to 18 months depending on the type, so keep in mind the cost of replacing all of your bulbs when deciding on a lighting system. Many of the more intense lighting systems will also get so hot that special cooling fans must be mounted in the canopy or fixture to keep the temperature down.

When it comes to how much your aquarium needs, keep in mind that many soft corals and anemones need at least moderate (HO/VHO/power compact) and will truly thrive only under intense (metal halide) lighting. For the most part you should try to have the greatest number of bulbs that you can mount over your aquarium without overheating the water (and without breaking you). It's practically impossible to overdo it. Also keep in mind that the deeper your tank is, the less light reaches the organisms nearer the bottom; in general the deeper the tank, the more lighting you'll need.

This specimen of a *Litophyton* leather coral is a cutting from a larger individual. It has taken hold of a piece of shell and has been moved from a breeder box into the aquarium—and it's doing very well.

offered to you, when shopping for new livestock you should always be on the lookout for and avoid:

1. *Specimens that have obvious tissue damage*

Tissue damage or decay is usually seen as areas of the specimen's fleshy body that have a moldy or rotten look to them; such a condition is often called tissue necrosis. Dead or damaged flesh is often covered by a nasty brown jelly-like material, while in other cases it is evident only as obvious missing areas of flesh. This condition usually worsens over a short period of time and can lead to the death of an individual or sometimes a whole colony. An exception is in cases where a specimen has a lesion in a location that can be carefully pruned. If this is the case, the damaged or dead portions can sometimes be carefully broken away or cut off without any damage to the rest of the animal.

2. *Specimens that have bleached*

A bleached specimen in effect has lost most or all of its zooxanthellae. This is a common side effect of the organism's getting too hot during shipping, but it can be caused also by other factors such as exposure to excessive UV radiation or from a lack of intense light. In the wild, affected corals are sometimes repopulated by zooxanthellae relatively quickly and survive, but they typically do not recover in aquariums.

3. *Specimens that are not expanded*

Specimens that are normally covered with polyps may retract somewhat at night, but if they fail to expand or "polyp out" over a few days' time they are more than likely irritated or unhealthy. Many soft corals will be shrunken and retracted if this is the case. Likewise, anemones commonly close up at night but should reopen soon after the lights are turned on. If an anemone fails to do so it also is probably irritated or unhealthy. It is unwise to purchase any such specimen that fails to open fully.

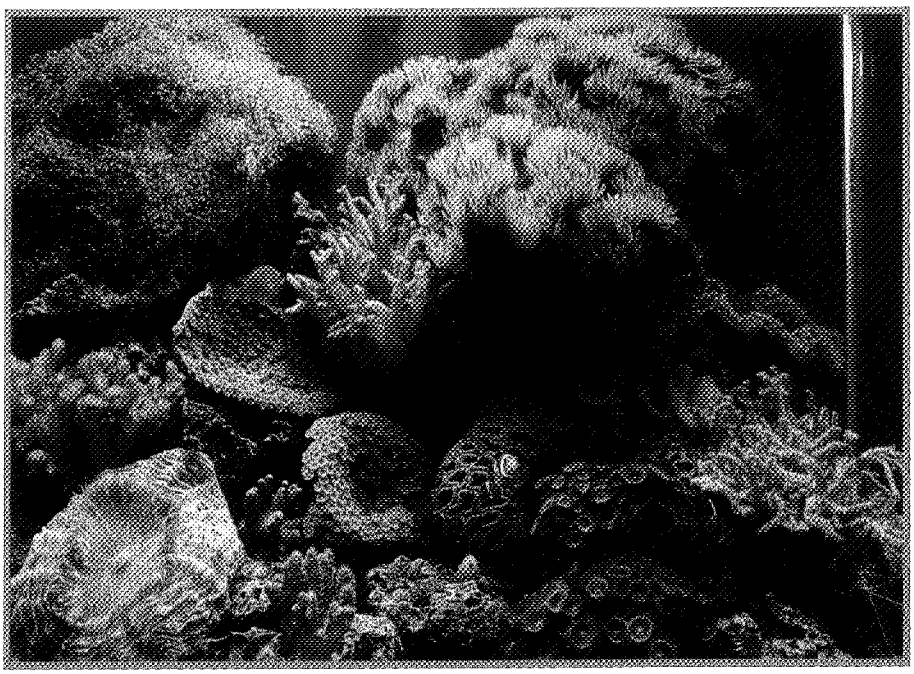
THE INDIVIDUAL GROUPS

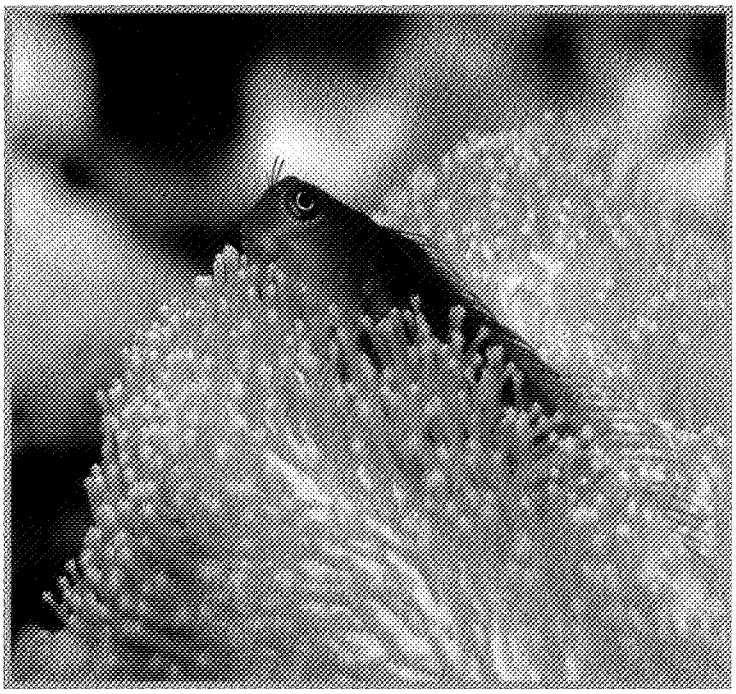
The following sections are intended to provide you with specific information about many of the soft corals and anemones commonly seen for sale in aquarium stores. While in the past it seemed that wholesalers and retailers had made up their own names for each individual cnidarian group, today almost all have one somewhat universal common name. In the pages that follow, various soft corals, anemones, and other related cnidarians are referred to by these individual common names. For many the generic name (the capitalized first name of the two names in today's binomial system of nomenclature) is provided as well, but the specific name (the uncapitalized second half of a scientific name) is usually not provided, because when dealing with soft corals it is almost never used due to the great difficulty involved in proper identification. Also keep in mind that many soft corals that are very similar in appearance may share a common name but are actually members of more than one genus or can be different species of the same genus.

For each group of organisms some basic information is given to explain a little about them and to help you choose which ones to stock your aquarium with. When it is needed, other more specific information is also provided. General lighting requirements and overall hardiness and aggressiveness levels are given where applicable. However, you should keep in mind that these are general guidelines and are greatly dependent on the water quality in your aquarium and the dealer's aquariums, how various specimens tolerate shipping at different times of the year, how and where they are collected from and other pertinent factors.

Where lighting is discussed, remember that various lighting systems are considered to be low output, moderate output, or intense output. For general purposes several regular wattage fluorescent bulbs (4 to 6) over aquariums from 18 to 24 inches deep (most aquariums from 55 to 150 gallons) is considered low output, even if actinic bulbs are included. Moderate lighting output over the same aquariums requires the use of several VHO fluorescent bulbs or compact-type bulbs. To achieve intense lighting over the same aquariums requires the use of metal halide systems, usually with a combination of fluorescent bulbs. Of course you must keep in mind that a system that is considered to be moderate over an aquarium that is 20 inches deep would be considered intense over an aquarium

Leather corals, zoanthids, corallimorphs and other cnidarians are represented in this 60-gallon reef tank.



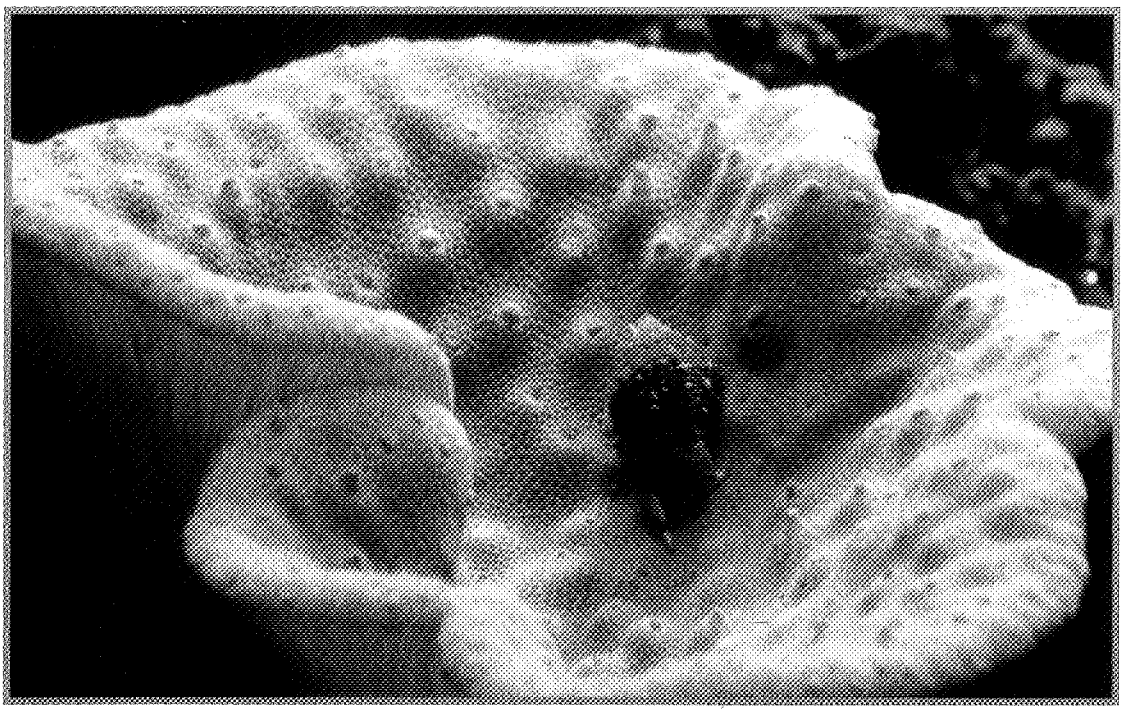


reef-building corals semantically through use of a word shared by both common names.

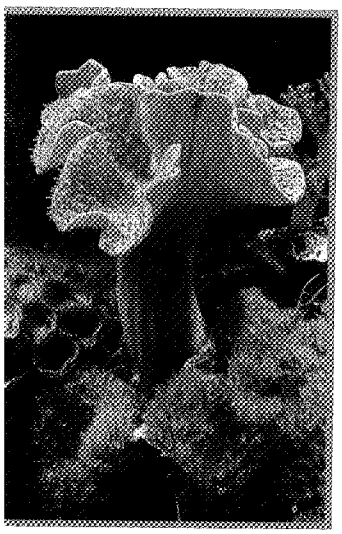
The problem, though, is that where common names truly serve the purpose of identifying particular animals and groups of animals because the names are actually used by people who deal with the animals (as opposed to so-called "common" or "popular" names that are simply coined for the purpose of creating a non-scientific name because the scientifc name is assumed to be too hard to learn) we're pretty much stuck with them.

And that's why the general term "soft corals" is used to apply to not only the members

Fishes, crabs, shrimp and other dwellers of the reef may occasionally it on or crawl across a leather coral, and individual corals react differently to such intrusions. The small blue-leg hermit crab shown in the photo below has obviously irritated the toadstool leather coral on which it's perched, because the coral has retracted all of its polyps. Conversely, in the photo above a large bicolor blenny has decided to use the top of the toadstool leather coral as a perch with no reaction at all from the coral. The fish shown often sits atop the coral in the photo, so the coral may have become acclimated to the contact.



of the order Alcyonacea within the subclass Octocorallia of the class Anthozoa but also to such disparate groups as the gorgonians (order Gorgonacea), the star polyps (order Stolonifera, which happens also to be the order that contains the organ pipe "corals," another group with "coral" in its name even though it's not in even the same subclass as the reef-building corals), the zoanthids (order Zoanthidea), the corallimorphs (order Corallimorpharia) and the "true" anemones (order Actiniaria). The last-named



A leather coral of the genus *Sarcophyton*, showing the mushroom-shaped body that has given rise to the common name of "toadstool" corals; they are also sometimes called "umbrella leathers."

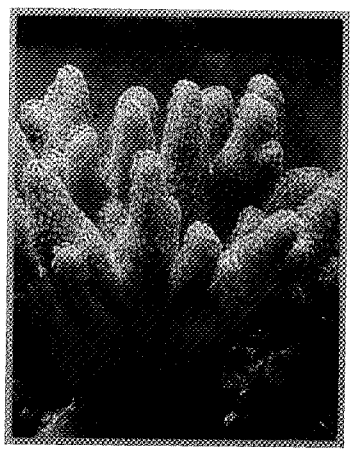
three orders at least are in the same subclass as the reef-building corals, so they are considerably different taxonomically from the other animals being lumped together here as "soft corals." The designation certainly isn't very scientifically precise and isn't very descriptive, but it's very commonly used in the aquarium trade and hobby.

Even using the term "reef-building" in reference to the "true" corals—members of the Order Scleractinia in the subclass Hexacorallia—does not provide enough contradistinction between groups, because some other cnidarians (the blue "coral" *Heliopora*, which isn't even in the same subclass as the scleractinians, is an example) build structures that could easily be considered to be small reefs; additionally, there also are some "true corals" that don't build reefs, so the term is misleading on both exclusionary and inclusionary counts.

Even marine biologists have trouble identifying many alcyonaceans at the species

The thickly branched shape of these (*Sinularia* species) corals' bodies makes it easy to see why they are often called "finger leathers."

A *Sinularia* species with the "fingers" tightly clumped.



level, and most simply don't try. Many of these animals are so similar in appearance and structure that they can be identified only at the generic level—and in many cases not even then. The most reliable method of identification is to collect skeletal fragments in the form of sclerites and spicules from a specimen. These fragments, while being very small, are usually unique enough in structure to aid in classification. But obviously it is not an option for most hobbyists (or collectors, or dealers), so most of the leather corals are sorted and sold by common name only.

Alcyonaceans have fleshy stems that are reinforced structurally by tiny carbonate sclerites. These are small spiny structures (usually only a millimeter or two in length) that are made of the same material that stony corals use to form their skeletons. The sclerites are meshed together within the coral's tissues like puzzle pieces to form a sort of pseudo-skeleton that can be somewhat rigid to very flexible. Different types of corals

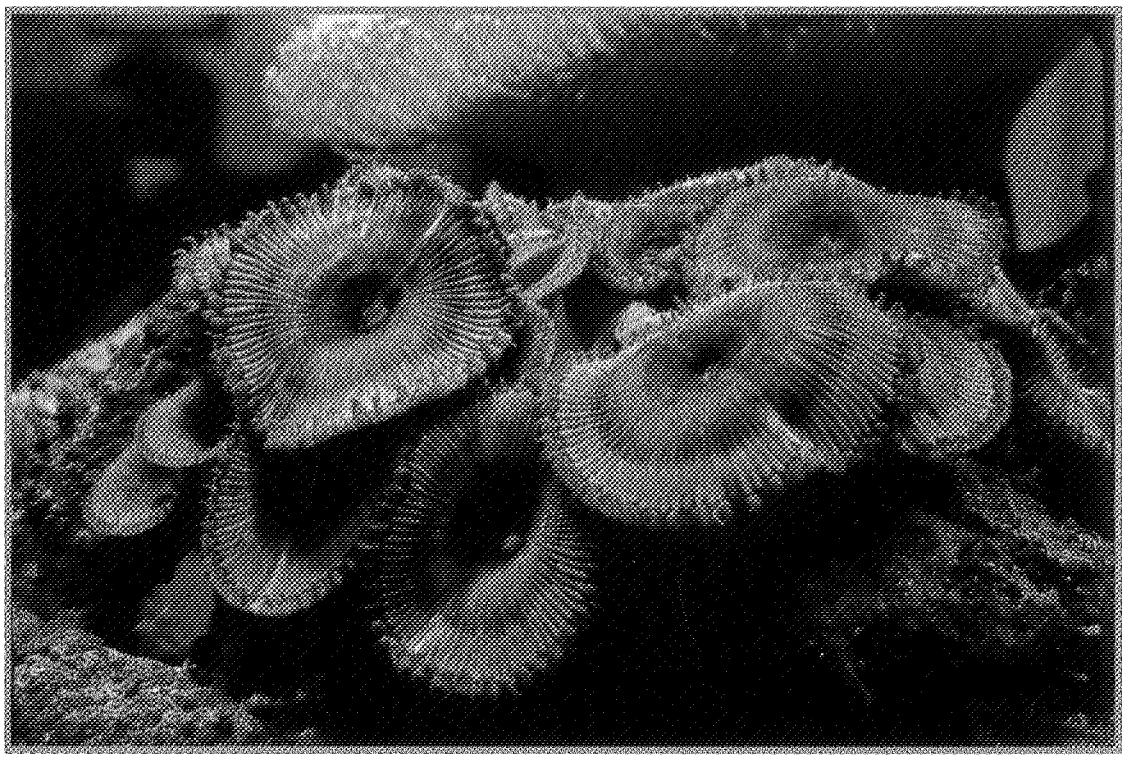
ORDER ZOANTHIDEA: THE COLONIAL ANEMONES

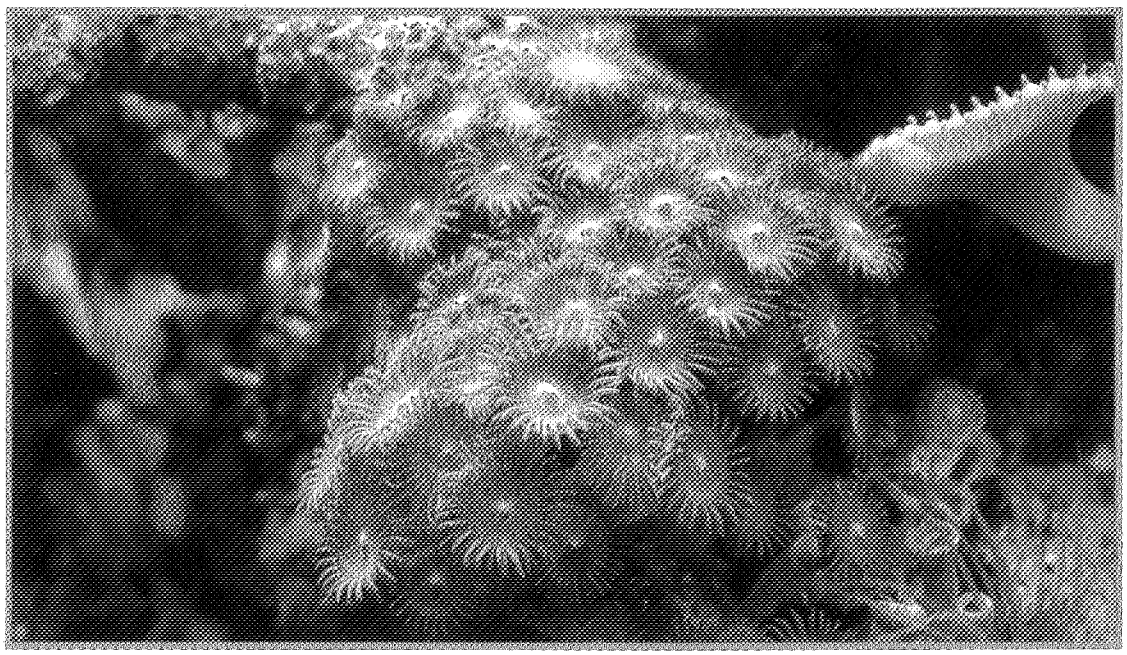
The order Zoanthidea is composed of two major groups of hexacorallians, the button polyps and sea mats, all of which are commonly called colonial "anemones." As opposed to many of the other types of soft-bodied cnidarians, the largest of the zoanthids reach a length of only a few inches and typically form large encrusting colonies that overgrow rocks and other hard surfaces on the reef.

The button polyps and sea mats are very common in reef aquariums and are some of the hardiest cnidarians available to hobbyists. Each individual polyp is similar to a stalked anemone and has a single centrally located mouth encircled by a ring of small tentacles. The polyps are usually only a quarter of an inch to one inch in size and are secured firmly to the bottom by a fleshy base. While at times some of the various species have polyps that live as solitary animals, many types can also be found in small clusters that are attached together by a common base or by thin strands of flesh. All reproduce by forming smaller clones on the fringes of a colony. In some cases the newer polyps break away from each other and very slowly move to a nearby new location.

All of the button polyps and sea mats have symbiotic zooxanthellae and will grow and reproduce under moderate to intense lighting. Many (but not all) will also take in small food particles and can be fed by using an eyedropper filled with water and prepared foods such as brine shrimp, blood worms, bits of clam

Sun polyps of the genus *Palythoa.* These colonial anemones are usually much larger than any of the other button polyps, sometimes growing to one and a half inches in diameter and three inches in height. They can be fed prepared foods and will grow and multiply quickly in the aquarium under good conditions.





Colonial anemones of the genera *Palythoa* (above) and *Zoanthus* (below), referred to variously as button polyps and sea mats. The distinction between the two depends on whether the individual polyps are connected or unconnected in the colony. While this is usually very difficult to determine without close inspection, the sea mats typically form a tough, fibrous encrusting base from which the polyps grow, whereas in many cases the button polyps can be free-living but closely spaced individual polyps. In the aquarium trade both names seem to be somewhat interchangeable—probably because of the difficulty in telling the two types apart—and members of each group often are sold as the other. The sea mats and button polyps belong to either *Palythoa* or *Zoanthus; Palythoa* species are somewhat larger and have larger tentacles and mouths, and most of them will take prepared foods. *Zoanthus* species tend to be smaller and have a less defined mouth, which typically appears to be nothing more than a small centrally situated bump; they do not take prepared foods.

meat, etc. The feeding process is interesting to watch, and the foods help the polyps to grow at a faster rate and reproduce. A good iodine supplement should also be used to encourage growth and reproduction.

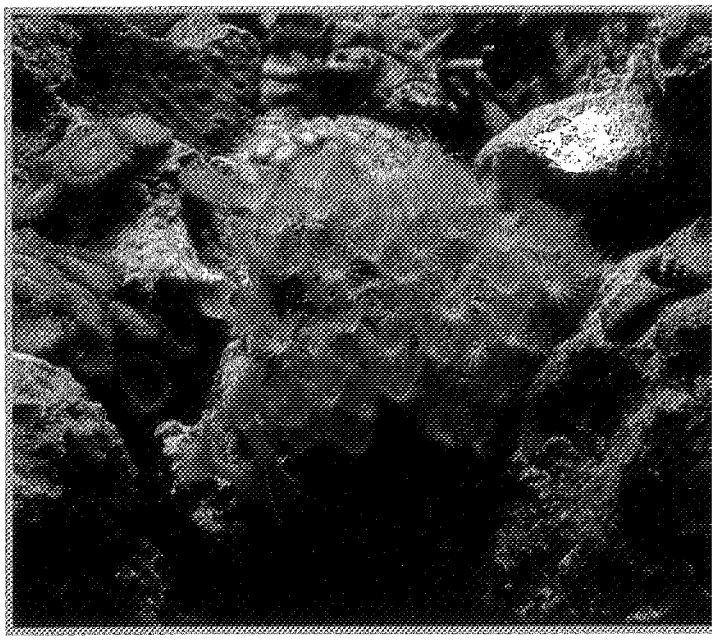
Button polyps and sea mats are not aggressive towards their neighbors. They have short tentacles but do not seem to have any ability to sting. The tentacles are more for entrapment of food particles. They will spread over live rock in the reef aquarium and can grow in direct contact with most other cnidarians..

Under favorable conditions and moderate to intense lighting, zoanthids can grow very quickly and live for years in the aquarium. In fact, they commonly have to be pruned back or scraped off rocks to keep them from overtaking the entire tank and overrunning other animals in the process. However, if conditions are not satisfactor they are prone to experience "crash." This occurs when many of them, or all of them in the whole aquarium, die within a very short time span This die-off can actually occu over a period of just a few hours and can cause serious problems for the hobbyist if a quick cleanup and water change are not performed. It is mandatory to provide adequate iodine additions to the aquarium to ensure tha no crash occurs.

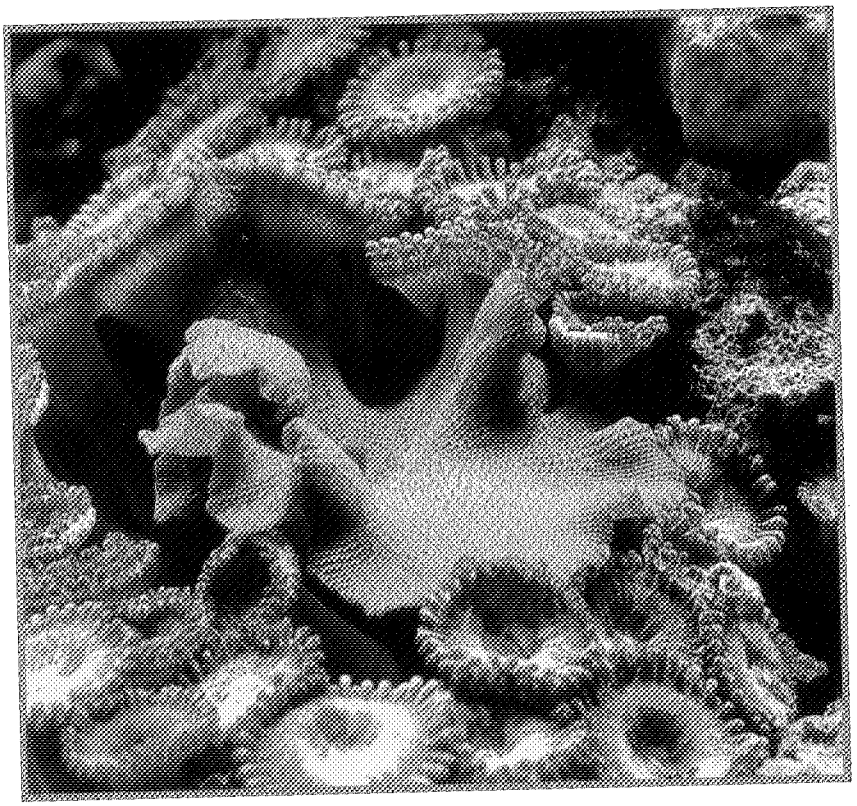
Propagation of zoanthids is easily done with a little patience. To spread new colonies around the aquarium or into another aquarium, place small piece of live rock or seashell in direct contact with an estab lished colony. Within a few weeks the colony should start to grow over the smaller piece of substrate, which can be pulled away from the colony and moved to a new location.

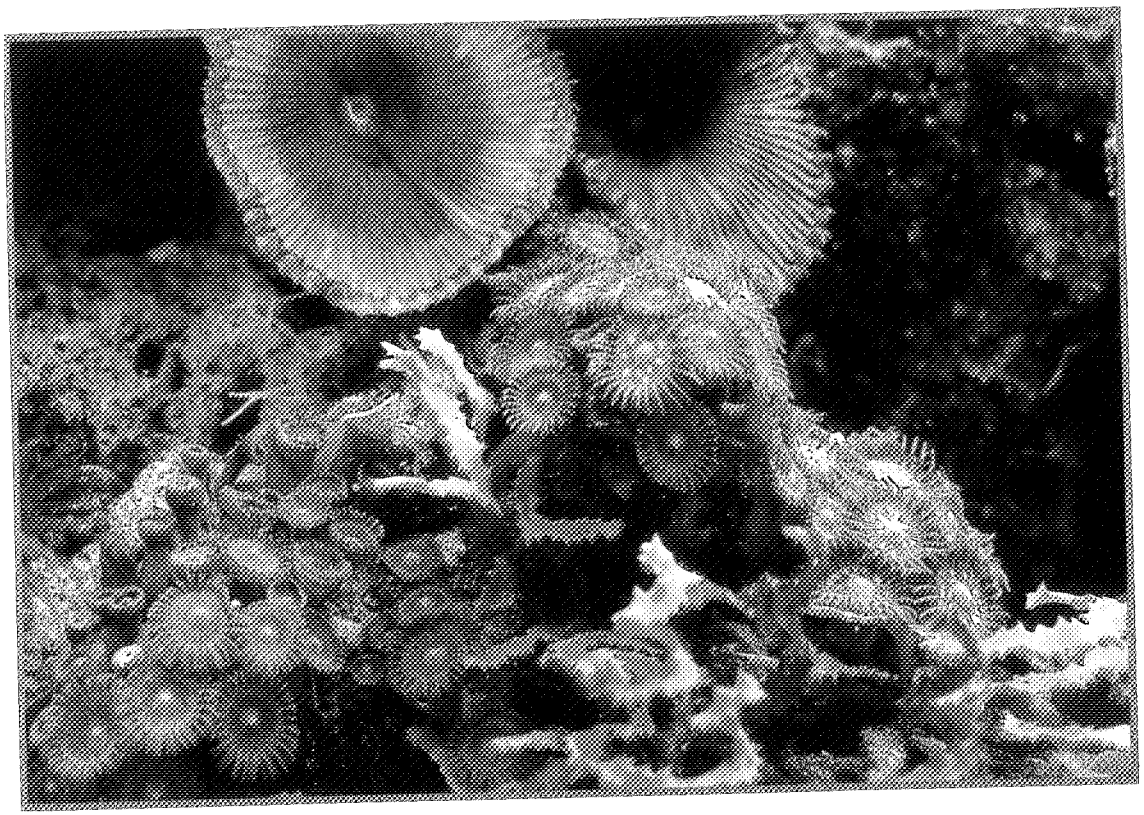
Above: A colony of *Palythoa* that almost entirely covers the rock to which it is attached.

Below: A colony of *Parazoanthus,* commonly called yellow polyps. These polyps readily take prepared foods, which they can grab with their long tentacles.



Right and below: both of these photos demonstrate the general lack of any aggression between the various colonial anemones shown. At right a large mushroom anemone is completely surrounded by polyps with no obvious ill effects. In the photo below, *Palythoa* and *Zoanthus* polyps are in direct contact with each other, with no damage to either.





Creating the Reef Environment

SOFT CORALS

Even more varied in their natural history, biology, color, and form than their reef-building relatives the hard corals, the soft corals share with the reef-builders the capacity for fascinating anyone able to view them in their environment, whether that environment be within the ocean or within a marine aquarist's home. That fascination has been the basis for the explosive growth in popularity of saltwater aquariums in general and mini-reef aquariums in particular. The excellent presentation in this book of a lively and valuably informative text coupled with full-color photos that portray soft corals at their wondrous best will help spur their popularity even further.

Defining soft corals in the broadest sense, to include even the true anemones, author Jim Fatherree has provided an essential guide to soft coral selection and care.

Cover photo by Raphael Mesa

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