Feeding Corals

The role of aquarium scavengers in feeding corals.

by Ron Shimek

One of the continuing problems of marine reef aquarium husbandry is how to deal with feeding. Initially in this hobby, the need of animals such as corals for food was essentially ignored. The prevailing opinion, based on no evidence whatsoever, was that corals did not need to feed, as they had their own internal food-producing organisms in the form of endosymbiotic algae called zooxanthellae. Probably as result of this starvation philosophy a large number of really very hardy animals were labeled hard to keep and condemned to a slow death by starvation.

Over the last several years, most hobbyists have awakened to the need to feed their animals. Examination of the pertinent literature of coral reef scientists indicates that an absolutely prodigious amount of food flows onto and over a coral reef in a day. Most of this food is intercepted and eaten by the reef animals, not least of which are the corals themselves. Small-polyped corals, in particular, appear to be adapted for an essentially continuous bath of small particulate planktonic food. In a reef aquarium with a decent sand bed containing a good sand bed fauna, a sizeable component of those needs may be met by production of bacterial aggregates, larvae and other microplankton generated by the bed.

However, to generate those small planktonic items, the sand bed needs to obtain nutrition. Additionally, this sand bed planktonic production is only one source of food for most of the animals in the aquarium. The other source would be, of course, food added by the aquarist. Generally, the volume of this added food may be relatively significant, as many hobbyists now feed relatively well, particularly as it has become apparent just how much food is necessary for good health of the animals.

This food is often particulate in nature and rapidly disperses throughout the aquarium. Not all of it can or will be eaten immediately. The excess settles out of the water column to the bottom. The uneaten food that drops to the bottom is rich in nutrients and if it simply stays there, it will release a significant amount of nutrient into the water as it decomposes. This dissolved nutrient will fuel algal and cyanobacterial blooms, as well as adversely effect the metabolism of many animals, including corals and soft corals.

Ideally, this food is rapidly attacked by some sort of scavenger that eats it, incorporates part of it into its own tissues, excretes part of it as dissolved gas and waste, and passes the rest down a food chain as feces and detritus. At each succeeding level in the food chain, there is less and less useable material until all the excess food has either been incorporated into organisms or excreted.

Many of the smaller scavenger organisms, such as harpacticoid copepods, gammarid amphipods, nematodes and bacteria are common in reef aquaria with a well-developed sand bed. However, the initial scavengers, the ones that can handle large food items, are often lacking or, like hermit crabs, dangerous to the other reef inhabitants. Until this first scavenger group is added, the captive reef system will neither adequately nor efficiently process the debris and detritus.

Small hermit crabs have become common additions to virtually all marine reef aquaria. They are introduced into systems on the belief that they are primarily herbivorous and will only eat algae. This assumption of herbivory stems from observations of the crabs picking at and eating materials in and around algal clumps. From these observations, the erroneous assumption has been made that these animals are primarily herbivorous.

Unfortunately, this assumption is not true. Most hermit crabs are truly omnivorous, eating almost anything they can get into their mouths. In fact, the crabs are what biologists term as “generalized microphagous feeders.” In other words, they will eat any food item as long as it is small.

Hermit crabs like other crustaceans are unable to open their mouths to accept a large food item. Their mouths are openings in a non-deformable exoskeleton that doesn’t allow the mouth to expand to eat large things. Because of this restriction in the variation in mouth size — and concurrently, on the size of prey eaten — most hermit crabs feed by finding an acceptable size food item and picking at it, shredding it into tinier fragments.

Many free-living crustaceans eat in much the same way and, compared with other animal groups, there really is little specialization in the way of specific foods. As a consequence of this generalized feeding method and of generalized gut morphology, hermit crabs will be good scavengers, but relatively poor herbivores. The hermit crabs often seen “picking” at

rocks, may be seen actually eating algae, but far more commonly they may be seen “picking,” and the material that they are picking at is unclear. Instead of algae, in most cases, they are finding detritus and small animals.

The most common hermit crab introduced into marine tanks are undoubtedly the small blue-legged hermits (Clibarius tricolor). These crabs are often added in relatively high densities — often 70 to 100 or more being added to a tank with a volume of 50 to 100 gallons. Other hermit crabs are also added from a variety of sources, primarily as “herbivores,” but also occasionally as scavengers.

The feeding of hermit crabs on detritus and debris partially explains their success as herbivores; they simply facilitate the utilization of nutrient materials as crab biomass rather than as algal biomass. In effect, they are not herbivores but scavengers (Britton and Morton 1993) and their “herbivorous” aspects are due to their consumption of materials that would otherwise go to fertilize algal growth.

This sounds pretty good, but...The downside of this is that the food they are eating is often small animals, such as larvae, small polyps, small snails and smaller crustaceans. Additionally, they often attack recently fed corals, sea anemones and other animals removing their food and consuming it. In the process, they undoubtedly damage these animals.

Hermit crabs are relatively rare in natural reef situations; they simply are never found in dense numbers on coral reef rocks. The corals and anemones in these areas are adapted neither to the crab’s competition for food nor to the physical damage occurring when the crabs move over their surfaces. The pitter-patter of little pointy feet can be very destructive to delicate coral tissues.

Additionally, as many aquarists have found out, many of the hermit crab species are significant predators on grazing snails in the genera Astraea, Turbo and Trochus. These snails, unlike the crabs, really are totally herbivorous and are often easy pickings for a herd of hermits. Hermit crabs are seldom found with the snails in nature and the snails have no natural defenses against them.

In the confined environment of a coral reef aquarium, these abnormally high concentrations of hermit crabs present a severe threat to small animals, not terribly unlike an overpopulation of small insects in a terrestrial ecosystem. Like locusts, they are capable of removing many organisms, both by eating them or by physically damaging them.

There is an alternativeIdeal scavengers for a marine aquarium should have a number of defined attributes. First, they have to consume left-over food, other debris and detritus. Second, they should not consume living animal tissue. Third, they should not be so attracted to the byproducts of reef animals, such as the mucus produced by corals, that they forage on those animals for those materials. Fourth, they have to be relatively inexpensive. Finally, they should not be unattractive or repulsive. Additionally, it would be nice if they had some other beneficial attributes.

Surprisingly, there are a large number of marine animals that fit most of these criteria. Unfortunately, most of them are worms of one sort or another. While I personally think most worms are attractive and interesting, most aquarists, lacking my refined good taste, do not. Nonetheless, many of our tanks soon develop large populations of scavenging polychaete worms, otherwise often known as “bristle worms.” There are numerous species in this group of beneficial organisms, and they really constitute a vitally important component of the successful coral reef aquarium. However they are unlikely, by themselves, to constitute the complete scavenging guild; they are often limited to very small pieces of food, and are often limited in the types of foods they are able to eat. Also, being pragmatic, I doubt many aquarists would plunk down their hard-earned cash for the proverbial “can of worms,” no matter how beneficial they might be.