The importance of phytoplankton for feeding corals

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Pocillopora damicornis

The whole of tropical coral species usually marketed and kept in aquarium (Phylum: *Cnidaria* Class: *Anthozoa*), are taxonomically concentrated in a small number of orders (Subclass *Hexacorallia,* orders: *Scleractinia, Actiniaria, Zoantharia, Antiphatаria*). Subclass *Octocorallia,* orders: *Stolonifera, Alcyonacea, Gorgonaria, Corallimorfaria*) . Among aquarists, in popular language, are called "soft corals" those species that support individual polyps colony by a flexibility connective tissue (as is the case in *Alcyonacea*) or by corneal tissue such as gorgonians. Similarly, are referred under the term "hard/stony corals" species whose skeletogenesis includes the formation of a hard structure (formed by aragonite at 90% and the remaining 10% by calcite and magnesium and strontium salts). Covering this hard skeleton emerges soft connective tissue that houses both individual polyps as different specialized cells belonging to the colony. Hard corals, as is well known, considering the size of their polyps are popularly known as "small polyp corals " (SPS) and "large polyp coral " (LPS).

Among soft corals and hard corals also, we can find species that host in their tissues the famous zooxanthellae algae. These endosymbionts algae (belonging in most cases to the genus *Symbiodinium,* a dinoflagellate algae) shares with its host coral the organic compounds result of its processes of photosynthesis (mainly glucose). Additionally, some of these corals also provide certain essential amino acids to the algae that are living with (N Satoh, 2011). In contrast, many other species of soft and hard corals completely lacking zooxanthellae in their tissues. These latter depend solely on its ability to capture planktonic organisms to survive.

In a classic and simplified scheme, we would say that for corals kept in aquarium, there are three basic models of feeding: a) species that feed solely through their symbiotic algae (I refuse to use the term “photosynthetic feeding” or “photosynthetic corals”, b) species with mixed feeding strategy: organic compounds provided by the zooxanthellae algae supplemented with planktonic organisms captured and c) species that feed exclusively on pelagic organisms that capture.

Plankton capture by corals in categories “b” and “c” is considered based almost exclusively on zooplankton organisms. The various species of corals, depending mainly on the size of their polyps, trap a wide range of prey (copepods, copepod nauplii, rotifers and even bacteria). In this vision about coral's diet, phytoplankton have a secondary role, since it would not be a direct source of food for coral , but it would serve to feed several potential zooplanktonic prey and would be responsible for the nutritional profile of these latter. However some studies question this vision about phytoplankton as a secondary role for feeding corals

A good example is the study of Yahel G. (G. Yahel et al., 1998) with an extensive fieldwork conducted in the Gulf of Aqaba (Red Sea) on the distribution and consumption of phytoplankton in various coral reefs. In general terms the study shows a significant reduction (between 20 and 60%) of the mass of phytoplankton (in particular the sub-spectrum of species below 8 microns, "ultra-phytoplankton") in the waters that flow through a narrow reef channel five meters in length dominated by soft corals herbivores (*Dendronephthya hemprichi and*

Cladiella sp.

Scleronephthya corymbosa) respect to concentrations of these same phytoplankton organisms in open water nearby (seven-point sampling to five meters deep). The study's authors attribute the decrease of phytoplankton to the capture of it by soft corals already mentioned, as well as predation by other organisms belonging to different benthic taxa (bivalves, sponges, polychaete annelids).

The authors are not surprised of the fact that in the reef channel the dominant alcyonacea (*Dendronephthya* and *Scleronephthya*) are feeding on the surrounding phytoplankton, since they are corals without zooxanthellae and usually feed on phytoplankton. However, they considered a surprising result, the fact that in the reef slope with absence of the soft coral species mentioned above and dominant presence of hermatypic corals (reef-building stony corals), also was measured in this area a significant decrease in the concentration of phytoplankton. The authors attribute this fact to the intake of phytoplankton due to these hematypic corals, despite being species with zooxanthellae in their tissues and are not known as species that feed on phytoplankton.

Based on the reading of this study and other similar works two conclusions seem to be able to extract:

- Within the complex trophic network of the reef, several species of corals could be consuming phytoplankton in a proportion with respect to the consumption of zooplankton significantly greater than it was thought.
- The hermatypic corals could also be potential consumers of phytoplankton, despite the contribution of organic carbon that perceive from their symbiotic algae.

Reef aquariums, have more controllable conditions of experimentation than the natural environment and therefore offer an ideal environment to experiment with the use of phytoplankton as part of the diet. These experiences can help to assess more precisely the importance of phytoplankton in the diet of many species of coral kept in aquarium.

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