



E-AQUALEX Aquatic Sciences e-learning Toolset

Section 2 Week 9

The Living Element

3. Microbes

Usually when talking about microbes we think of their pathogenic impact. It is true that in the marine environment there are pathogenic microbes which affect not only marine organisms but human beings as well. The latter category will be dealt with in the section concerning aspects of pollution.

However, apart from these pathogenic microbes, which are in any event particular types of microorganisms, there is a whole vast area of organisms of this kind without which marine ecosystems (and terrestrial ones as well) simply could not function.

These are the decomposing bacteria, i.e. microorganisms which acquire the energy they need through the oxidation of organic material. Without these bacteria the marine environment would be full of carcasses and excretions from marine animals, not to mention excretions of terrestrial origin discharged into the sea (usually known as domestic sewage) and the day to day oil pollution.. Without these organisms there would be only chemical oxidation to act upon the organic material and this of course would mean that the process would be very slow.

Most of these bacteria are aerobic, i.e., they need oxygen for the oxidation process, while a few are anaerobic, that is, they are capable of living without oxygen.

Different decomposing bacteria are involved in different parts of the chemical element cycles in the marine environment. For instance the bacterial species *Nitrosomonas* oxidizes ammonia into nitrites and then *Nitrobacter*, another bacterium, oxidizes nitrites into nitrates, oxidizes H_2S in elemental sulphur while *Thiobacillus* transforms elemental sulphur in sulphates.

Mineralization is an important aspect of bacterial activity in the marine environment. Various essential elements are bound in organic compounds contained in "dead material". Bacterial activity transforms organic compounds into inorganic nutrients (nitrates, phosphates etc.) necessary for the development of phytoplankton.

Many marine organisms feed on the bacterial biomass including their mucus, i.e., on live bacterial cells of higher nutritional quality than some forms of dead organic material.

Temperature, pressure and radiation are important factors affecting bacterial activity. At very low temperatures bacterial decomposition is slow, it accelerates with rising temperature, while at very high temperatures (higher than 40 - 50°C) a few bacterial species (thermophilic) can carry out the full cycle of their activities. High pressure is also an inhibiting factor and that is why at great depths only certain types of bacteria (barophilic) are encountered. Lastly, ultraviolet radiation has a lethal impact on bacteria, but this effect concerns only the water surface layer since as has already been mentioned, U.V. radiation is absorbed there.

Birds

Seabirds play a growing role in the investigation of marine ecosystems and food chain dynamics. Especially their interaction with marine fishes and the fishery are regarded of growing economic importance. "Seabird" is a rather loose term traditionally used to cover those birds which obtain at least part of their food from the sea by travelling some distance over or under its surface. They typically breed on offshore or coastal areas like cliffs, dunes, skerries or remote islands. Some 274 species belong to seabirds, comprising mainly penguins, albatrosses, fulmars, petrels, shearwaters, pelicans, cormorants, skuas, ducks, terns and auks. Seabirds are characterized by longevity (high adults survival rate), high age at first breeding, slow reproductive rate and intense care for the offspring.

Seabirds are highly visible wide-ranging upper trophic level consumers that can indicate marine productivity and biotic interaction. Compared with fish, marine mammals and other marine animals that live primarily or exclusively underwater, seabirds are easy to survey, census and study. They are of high public interest and play a major role in raising public attention to environmental questions.

Figure 19. Seabirds (penguins in action)

