

tool and may provide understanding of ways to increase significantly the value of an ecosystem to man. Possible manipulations include the selective reduction of competitors and predators of resource organisms, the development of artificial reefs, the modification of temperature with the cooling waters of power plants, the addition of nutrients from deeper water or other sources, and the fertilization of the environment with pollutants.

Eutrophication of natural waters is an example of man's unplanned and detrimental modification of the environment. This type of overfertilization, a serious problem in many estuaries, presents a challenge and an opportunity to marine ecologists, since lack of essential nutrients commonly limits biological productivity. Increasing the supply of nutrients by adding sewage wastes to natural waters has the potential of increasing biological productivity in ways useful to man. Generally, however, the community structure is changed, with fewer species able to survive and grow in the changed environment. The species of plants which are most likely to survive in highly polluted areas are frequently those which are least suitable as food for the higher trophic levels. Examples of this phenomenon are numerous, but biologists do not understand the causal mechanisms. Is it simply the result of the higher concentrations of the nutrients, or because of changes in the proportions of elements? Would addition of trace elements or essential organic compounds maintain the normal community at a higher level? Can biologists and physiologists achieve the understanding of eutrophication needed to increase the yield of useful organisms and reduce the yield of the undesirable ones? Planned fertilization of an ecosystem might lead to this understanding, or at least establish the limits of fertilization above which undesirable effects predominate.

Distribution and Abundance

Organisms in the sea, like those on land, are spottily distributed in space and time. Patterns of distribution and behavior vary with age. For example, species that are sessile as adults are frequently pelagic during larval stages, and mobile species that concentrate near shore during juvenile stages move into deeper water and migrate successively longer distances as they grow older. Why and how do marine species concentrate in certain places and avoid others? Finding the