

## PHYTOPLANKTON

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Phytoplankton forms the vast array of minute and microscopic plants passively drifting in the sea, mostly confined to the illuminated zone. In an ecosystem a multitude of such organisms known as phytoplankton constitutes primary producers, which forms the first link in the food chain. Phytoplankton is broadly classified as diatoms, dinoflagellates, green algae and blue green algae. Arbitrary size-wise classification are - between 2 and 200  $\mu\text{m}$  Microphytoplankton, between 2 and 20  $\mu\text{m}$  Nanoplankton and between 0.2 and 2  $\mu\text{m}$  Picoplankton

Photosynthesis is the fundamental process to sustain life in the planet which involves assimilation of carbon into plant cells and building up of mainly carbohydrates and release of oxygen. Other substances such as aminoacids, proteins, lipids and a variety of other compounds are also incorporated into the living cells.

### Trophic relationship

Phytoplankton is consumed by the herbivorous zooplankton and a host of higher animals including fish, which transform vegetable matter into mainly protein and other high energy substances. Zooplankton forms the most abundant group inhabiting every type of ecological niche and play an intermediate role between primary producers and fish. Estimations on the rate of primary and secondary productions can lead to a computation of the potential fishery of an area. Less than 1% of the marine fish catch comes from the open ocean although more than 80% of all primary production takes place there. By contrast 50% of the fish catch comes from upwelling areas although less than 1% of all the primary production occurs there. The difference is that in the open sea the yield is harvested at the 4th or 5th trophic level on an average; Whereas the harvest in the coastal upwelling waters comes from 1st & 2nd trophic levels. As a consequence the harvest from upwelling areas is much more efficient utilization of original food energy made available in photosynthesis. In the areas where phytoplankton is abundant especially in the upwelling areas population explosion of these organisms occurs - in turn these are consumed by herbivorous fishes. This is the most efficient food relationship in the sea. On the contrary carnivorous fishes are more abundant in the open sea and the yield is tapped at the 4th or 5th trophic level. This is an example of poor trophic efficiency and the reason for only 1% of fish catch from the open ocean.

The analysis of trophic relationship is probably the most important element in studies of the functioning of pelagic ecosystema. In Biological Oceanography, the study of production is the study of the whole ecosystem in terms of flow of energy through it. The fishery resource of an area is mainly

Influenced by the magnitude of primary and secondary productions which in turn are controlled by various physical, chemical and biological factors.

Ecological efficiency is defined as the ratio of yield at one trophic level to that one level below. The excess primary organic matter produced in the sea sink to the bottom and may sooner or later promote the production of rich benthic fauna, which may in turn gives rise to a substantial demersal fishery.

### Algal Blooms or Red Tides

When environmental conditions are conducive certain planktonic algae proliferate to great extent that these overshadow all other planktonic organisms by overwhelming abundance. The term Red Tide owes its name to the Red Sea - Sometimes the colour could be reddish brown, brown, orange, green or grey. Whatever may be the colour, it is popularly known as Red Tide.

Red Tides are generally formed by a group of phytoplankton organisms called dinoflagellates. However Red Tides are also formed by certain blue green algae as well as green algae. Some of the dinoflagellate Red Tides are extremely toxic and mass mortalities of fish, shellfish and other aquatic animals occur at alarming proportions. Humans eating such contaminated sea food complain paralytic symptoms. Such toxic Red Tides are very common in Japan, Florida, California Coasts and Southeast Asia. When Red Tides occur the public is warned from eating sea foods from the affected areas. Several deaths have occurred worldwide due to PSP (Paralytic Shellfish Poisoning) and DSP (diarrhetic shellfish poisoning).

The most common Red Tide - forming organism of the Indian coasts is the blue green alga Trichodesmium erythraeum. Unlike some of the toxic dinoflagellate Red Tides, this forms most harmless but massive Red Tides.

Trichodesmium Red Tides have been reported from almost all over the tropical and subtropical zones of the world. A massive Trichodesmium Red Tide in the Great Barrier Reef Region extended 1600 Km covering an area of more than 52,000 square km. On the west coast of India we have come across Trichodesmium Red Tide extending upto 600 km.

It is interesting to note that these Red Tides occur at a period when impoverished nutrient conditions prevail in the west coast. Nutrient concentrations are low during early phase of the Red Tide increasing with its progressive development. The ability of this organism to fix atmospheric nitrogen is well established. With every pulse of the Red Tide increase in ammonium was noticed. High pigment concentrations and productivity values were also

noticed.

The enrichment caused by the release of nutrient concentrations by the decaying organism prompted the growth of many planktonic organisms in succession.

In conclusion it may be stated that Trichodesmium Red Tides play a vital role in the biological economy of tropical and subtropical coastal waters. Further massive Trichodesmium Red Tides would make substantial contribution to the nutrient budget of the sea.