

BIOECOLOGY OF SUBTIDAL REGION

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Beyond the shifting sands of the low water mark, stretches a vast expanse of aquamarine accounting for almost 95% of the total sea floor area. This province broadly referred to as subtidal region, extends upto the deepest point in the world oceans.

Depending upon the gradient and the nature of substratum the sea bottom harbours sandy, muddy and rocky type of habitat. These permanently submerged biotopes in marine environment are broadly classified as per the depth limitations. Accordingly, the seafloor upto 3000 metre depth is called as the bathyal region, above 3000 and upto 6000 metre depth as the abyssal and above 6000 metre depth as the hadal.

The sunlight, which is a source of energy for all the life processes has its limitation of penetration in the seawater. Resultingly, except for shallow depths upto 60 metre depth, or so a large part of the subtidal region is an abyss of total darkness. Hence, in the subtidal region, the main source of food is from suspended particles, detritus and carrion eating. Total lack of sunlight has resulted in the partial or total absence of organs of vision in the subtidal organisms. However, there is a strong development of tactile or sense of touch organelle in the subtidal biota. Concurrent development of defense mechanisms, in the form of living light or bioluminescence is one of the outstanding feature of subtidal biota.

A side effect of poor sunlight illumination is the lack of warming in the deep regions. The seawater temperature decreases exponen-

tially over the depth. Accordingly, if the seawater temperature is 32°C at the surface, it decreases to about 2°C at 1000 metre depth and about 0.5°C at 4000 metre depth. It is really a chilled abyss. The constraint of low temperature has radically changed the lifestyle of subtidal biota. These organisms have longer life span, slow growth and low metabolic rates.

Another important environmental characteristic of the subtidal region is the hydrostatic pressure, which decreases with depth at the rate of 1 atmosphere per 10 metre depth. One can imagine the magnitude of hydrostatic pressure, an organism has to bear at great depths. How the deep water biota counteract and overcome the tremendous hydrostatic pressure? These organisms have lost the rigid body forms and developed spongy and gelatinous type of organelles to counteract the weight of overlying water column.

Uninterrupted settling of organic and inorganic materials, feeble mixing of atmospheric gases and sluggish circulation pattern, have resulted in the creation of a low oxygen tension in subtidal ecosystems. While quiet a few of the organisms have adopted for low oxygen environment, a number of organisms have developed anaerobic capabilities. Such organisms can anaerobically oxidize carbon sources by utilizing carbon dioxide, nitrates and reducing them.

Does the abyssal and hadal depths harbour any organisms, at all, was a point of discussion, till recently. However, all the doubts about the very existence of life at great depths

of the world ocean, were cleared with the discovery of *Neopilina galathea* - an aberrant mollusk, from a depth of over 9000 metres in the Mariana Trench (Pacific Ocean) off Philippines in the year 1952. In recent years, with the use of bathyscapes, submersibles, TV and video cameras, the seafloor life has been explored in great details and by now, more than appropriate information about the bioecology of a large part of world ocean has been documented.

The habitat for subtidal life, along the variable depth, consists of troughs, platforms, terraces, vents and trenches. Accordingly, the biotic characterisation specific to a particular habitat, gets manifested. Depending upon the sediment type viz. rocky, sandy, silty, clayey, there prevails a distinct zonation of organisms. Thus, one comes across, attached forms; burrowing forms; creeping forms and migratory forms. This domain of great depths is totally devoid of vegetation mainly because of total absence of sunlight for photosynthetic activity.

In relation to type and availability of food, diverse feeding habits and relevant anatomical modifications and adaptive radiations are observed in subtidal biota. Similarly specialized strategies, relevant to protection or self-defense, breeding and larval development

are developed by these organisms. The aberrant looking deep sea fauna is in reality a most developed and specialized biotic assemblage. Many of the species feared to have become extinct elsewhere, have been found to survive in abyssal and hadal ecosystems. When the very existence of any living being under the extreme stress prevailing in subtidal habitat is doubtful, a wide variety of most diverse type of microorganisms and faunal types are reported to be flourishing in the otherwise calm ecosystems of deep sea bottom.

What is the economic importance of subtidal biota? At present, almost 40% of the World Marine fish catch is from benthic or near-bottom organisms, popularly classified as demersal resources. Some of the commonly exploited demersal resources include a variety of fishes, like croakers, drummes, soles, plaice, crustaceans like, shrimps, prawns, lobsters and crabs and edible bivalves like clams, mussels and oysters. The subtidal regions also harbours numerous varieties of ornamental species viz. corals, pearl oysters, chanks, sponges as also a wide variety of macrophytes of commercial importance. Recent studies have revealed that 90% of the subtidal biota, possess unique type of bioactivity which can judiciously be used for extraction of life saving drugs for alleviating human maladies.