

Ecologically Sensitive Marina

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The human colonization has been along the coastal areas and the oceans are explored extensively for trade and its resources for sustaining the growth of the populace. In past few decades, the rate of anthropogenic pressure and the resource exploitation have conspicuously accelerated the rate of degradation of marine ecosystem. Unfortunately, this has been understood/ realized when the marine ecosystem was already under extreme stress. The stress in general is any deviation of environmental condition beyond the expected range within the carrying capacity. The components of the ecosystem may be variably responsive/ sensitive to the stressor. The stressors are widely variable and distinct physical, chemical or biological components/ processes/ actions. The vulnerability of the ecosystem is the probability that a component (ecological feature) will exhibit stress following exposure to a stressor to which it is sensitive. The evaluation of the ecological features; biological, chemical or physical features/ processes/ structures supposed to have environmental/ social/ cultural/ economic significance; identify the vulnerable area. The correlation of the stressors, induced stress and the sensitive ecological component(s) exposed; comprehensively describe the vulnerability of an ecosystem/ habitat. The information then identify the stressors, actual stress potential, sensitive ecological components, monitoring of the spatio-temporal variations in the extent of ecosystem vulnerability and applied for the management and conservation of the ECOLOGICALLY SENSITIVE MARINA.

To understand the Ecologically Sensitive Marina it is necessary to appraise the components of the marine ecosystem. Apparently, the marine ecosystem necessitates a transdisciplinary research since it is an outcome of multifaceted structural and functional components and their interactions. The hydrodynamics features like geohydrology, hydro-engineering, oceanography, estuarine dynamics, riverine flow dynamics etc. lead to variations in habitat characteristics like geography, slope, geological formations, geochemistry, chemistry, sediment composition, estuarine gradation etc. These in turn lead to micro habitat distinctions and thus the spatio-temporal variations in community association patterns that include microbial/ floral/ fauna diversity and distribution, larval settlement and distribution pattern, animal-plant associations, existing food chains and webs, behavior and ecology of benthic/interstitial/coastal animals etc. The processes at the coastal region influence the intertidal ecosystem that represents special type of

environment, which contrasts sharply with conditions that prevail elsewhere in the sea. The life in the inter-tidal area needs special adaptations to inhabit therein which is alternating marine and terrestrial. On the rocky area, tide pools of various sizes and depths are formed which indicate habitat variations. On the sandy shore or mudflats the slope, sediment composition, grain size and its distribution designate the microhabitats. Sediment disturbance due to foraging and burrowing activities of animals have impacts on other fauna. The keystone species alter recruitment patterns, site selection, survival/ mortality of settling larvae, control food availability, predation etc. Distribution and density of pelagic larval stages also differs indicating variable planktonic community structure and settlement probabilities and juvenile/adult distribution along the intertidal length. Coastal regions are breeding grounds for several species. Prey density and availability as well as sediment penetrability influences habitat use by shorebirds. Diurnal and seasonal changes in water quality influences biodiversity and its distribution. Thus, the marine ecosystem is an optimal study site for many physical, chemical and biological processes.

Over the decades, the marine ecosystem has experienced enhanced stress conditions and it is bound to increase multifold in the future. An assessment of prevailing status, monitoring of the activities and their impacts, ensuring sustainable exploitations of resources and mitigation/ conservation measures would describe the future of the marine ecosystem. With the changing scenario of rapid industrialization, it is necessary to obtain a baseline data on the status of the marine biodiversity present today, before it is too late. This database will be a vital component to assess the impacts of the industrial and human pressure on the marine biota, in time to come.

The coastline of Gujarat is longest in India, has a broad continental shelf and variable habitat characteristics, harboring very rich biota. The intertidal exposure during low tide is also extensive creating distinct micro habitats. The Gulf of Kachchh that is rich in coral and mangrove ecosystems, is a narrow cone with maximum tidal variation of about 5m while Gulf of Khambhat, that has much less biodiversity, is trumpet-shaped with maximum tidal variation of about 12m (second highest in the world). The development along the gulfs poses threat to the marine life. Several Environmental Impact Assessment studies carried out prior

to implementation of the projects for environmental clearance have not evaluated the collective threat. The largest chemical industrial estate of India (Ankleshwar) and the largest ship recycling yard of the world (Alang-Sosyo) are along the Gulf of Khambhat while, petroleum industries are located along the Gulf of Kachchh. The Saurashtra coast has two of the largest fish landing centers (Veraval and Okha) exploiting enormous marine biotic resources. Several small to large ports are located along the Gujarat coast. The developmental planning for next two decades depict that almost entire length of the coast will be utilized for commercial activities.

The planning for sustainable development, mitigation of adverse impacts and implementation of conservation measures is also required. Fortunately, Gujarat is the only state of India to have witnessed the growth in total area under mangrove cover in the past decade indicative of genuine coastal conservation measures. The habitat restoration is also of sincere concern at several places. The basics of the coastal processes will be addressed to understand comprehensively the transdisciplinary research needs. The status of Gujarat coastal region will be discussed to describe the ECOLOGICALLY SENSITIVE MARINA.