Mangroves - The imperative resource of Shenzhen Bay

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Definition: Mangrove formations are one of important types of natural wetland ecosystems in the world (Teas, 1977; Tomlinson, 1986; Duke, 1992). Generally, they are defined as a group of salt tolerant plant communities found in the intertidal zones of tropical and sub-tropical regions. They are also self-generating and self-maintaining littoral plant formations often constituting a dynamic ecological unit with complex assemblages of both plants and animals (Bossi & Cintron, 1990).

Importance: Mangroves provide a number of direct and indirect services, ranging from protection against coastal erosion to the multiple forest products usage by local population (e.g. fuel wood, timber, fodder etc). The long and often branching mangrove creeks where considerable lateral trapping of water occurs, serve as an excellent habitat and nursery for a wide range of invertebrates (e.g. shrimp and crabs) and fish species, many of which are commercially important. Also, they are good recreation grounds for several migratory bids.

Mangroves could well be a hope against disasters, a regulator of coastal ecosystem processes and an alcove of a variety of productive forest resources. These formations are likely to be the early indicators of the effects of climate change as well. The swamps of mangrove are the richest and most productive areas of organic detritus and form the baseline of the food chain. The daily rate of organic production (20 $g/m^2/day$) in mangroves is about 70 times more than that of tropical oceanic waters (Kathiresan, 1997).

Conservation: Scientists from all over the world have realized the need to protect mangrove forests because of their vulnerability, high degree of denudation through

threats imposed by man is endangering some mangrove species already. Increased population pressure for converting mangroves into agricultural lands, renovation of brackish water fisheries, prawn and shrimp farms, salt pans and discharge of effluents from different industries (Clough, 1982), brought in their wake several adverse effects on the natural regeneration of mangroves as well as the process of their succession. Estimates indicate that mangroves are lost at an annual rate of 2% in Asia (Palihawadene & Pinto, 1989) and conversion to aquaculture ponds has been identified as the main threat.

Special attention: Awareness on the importance of mangroves in Southeast Asia was increased during 1980s by the UNESCO supported COMAR (Coastal Marine) program that mobilized and enhanced national capacity to undertake scientific studies of the mangrove habitat (UNEP, 2004).

In China, the mangrove cover is estimated as 23,700 ha and has been placed at the top list of protected resources by appreciating its significant indirect ecological as well as limited direct values (GMRC, 2003). Among several others, the UNEP/GEF South China Sea Project seems unique for being the first program to which all the countries bordering South China Sea have assured cooperation and, also the rationale of work focused on practical and pragmatic ways to address the root causes of priority problems in the coastal zones.

After the incident of recent tragedy - tsunami on 26 December 2004, the mangroves have regained their prime concern at national and international levels. Its all because of the fact that damages caused to the public and property are within limits in the areas with mangrove vegetation than none.

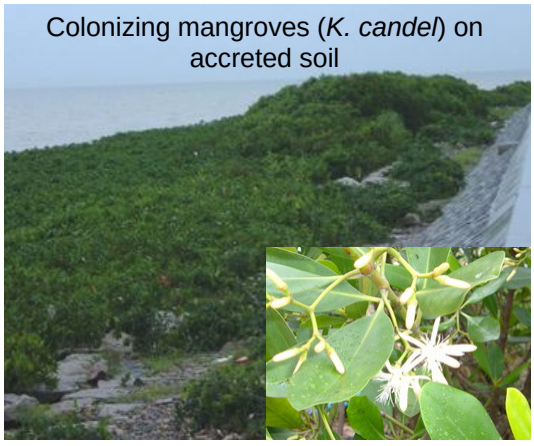
Shenzhen Bay mangroves:

Bay-mangrove boarder at Shenzhen

The noteworthy observation is that mangroves at Shenzhen Bay were although less in aerial extent (368 ha), but found intact owing to the protection offered by the local government. The dominant species (true mangroves based on the classification provided by Tomlinson,

1986) are *Sonneratia apetala*, *S. caseolaris*, *Kandelia candel*, and *Excoecaria agallocha* in the order of their prevalence. Mangrove associates such as *Acanthus ilicifolius*, *Derris trifoliate*, *Thespesia populnea*, *Ipomoea tuba*, *I. pes-caprae*, *Sesuvium portulacastrum* and, salt mashes like *Myriostachya wightiana*, *Suaeda maritime*, *S. nudiflora* and *Aeluropus lagopoides* were found in the vicinity. The tress have attained to a maximum height of about 10m with widespread branches indicating their healthier growth and fewer disturbances by the locals.

The colonization of *K. candel*, on exposed muddy and or even near the rocky margins is exhibiting its toughness to harsh environmental conditions. The same species is also considered for afforestation process locally that seems yielding promising results. Surprisingly, the well known



Colonizing mangroves (*K. candel*) on accreted soil

Mangrove afforestation
(transfer of seedlings to un-vegetated areas)

pioneer group of plant species, *S. apetala* and *S. caseolaris* were seen as back mangroves possibly due to the nature of soil condition prevailing. Generally, this group of plants is recognized for their occurrence as important pioneers along the open coasts on silty and silty-sandy substrates (Gallin et al., 1989). It was assumed that rocky surface, bordering the Bay-mangrove complex might be restricting the system to evolve further in to Bay, and the same reason could be expressed to answer that why pioneers are set backwards.

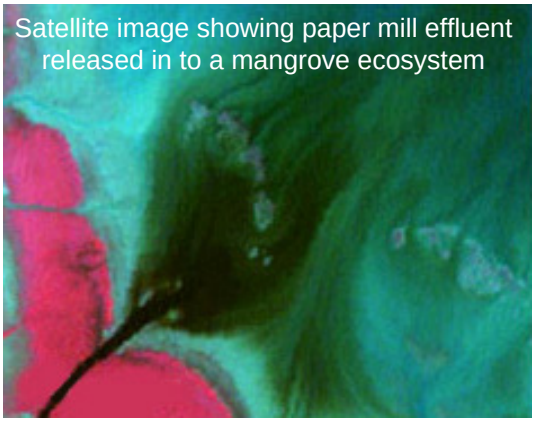
Furthermore, the validation on mangroves in China has been pursued mainly based on assumption and deduction, without the support of real data and case studies (GMRC, 2003). And hence, it was now suggested to focus on the quantitative estimates, besides qualitative parameters already available. The data on different tree

structural variables such as density (stems/0.1 ha), basal area (m^2/0.1 ha), relative density (% composition), relative dominance (% composition), absolute frequency (% composition), species individual ranking and the like (following appropriate methodologies such as PCQ-Method - Cintron & Novelli, 1984), is still to emerge from many of the mangrove localities including Shenzhen Bay. This is also logical since research on mangroves needs sustained effort backed by adequate manpower and finances everywhere.

Public issues:

1. What are the major threats for mangrove vegetation?

The loss of mangroves occurs due to both natural and anthropogenic events. While, sea level rise, tidal activity, cyclonic storm and tsunamis are responsible for the natural destruction of mangroves, the others like fish and shrimp ponds, fuel wood, timber, paddy cultivation, salt pans, cattle grazing are some but important human induced practices claiming significant losses worldwide. Discharge of effluents from the industries is also another prime concern that needs immediate attention. Mass mortality of fish and other fauna dependent on mangroves could be expected along with its strong influence on the colonization and regeneration of mangrove species. For example, a layman can understand the impact of an effluent discharged in to a mangrove ecosystem in one of the Southeast Asian countries shown bellow:



Satellite image showing paper mill effluent released in to a mangrove ecosystem

2. What are transplanted species and their benefits?

Any species intentionally or accidentally transported and released by humans into an environment beyond its present range are called transplanted species. Logically, this kind of introductions will helps in preventing those species from the edge of their extinction. This process also has its own demerits like changes in the local ecosystems by modifying species composition, population structure, food chains etc.

In the case of Shenzhen mangroves, *S. caseolaris* is the


Inflorescence (flowers) of *S. caseolaris*

transplanted species brought from Hainan Island. The idea might be that this species can grow at open coasts and successfully trap sediments. Over a certain time, the sediment builds up and supports the growth of new mangroves further.

3. Are there any special measures to be taken care of to protect the mangroves at Shenzhen Bay?

The conservation and management strategies are different at different paces obeying to their local topography, tidal amplitude, extent of inundation, freshwater runoff, shore elevation, un-vegetated area etc. It is always possible to offer some practical measures to protect or restore the mangrove vegetation, but only after examining the clear-cut data on present situation.

4. What are the views on land reclamation from sea at Mangrove Bay?

It is fact that world is losing biodiversity because of the reclamation of ground adjoining the sea, estuary or river by human interventions. Particularly, in most populated countries like China and India, the land is considered as a permanent asset, where its value is tremendously increasing day by day.

The area of Mangrove Bay at Shenzhen is the new land claimed from sea (~2.32 million sq. m), with a special emphasis on developing housing estates, commercial centers, schools and recreation grounds etc (*http://www.szcentaline.com.cn/market/thes.asp?id=10716*). There also appeared several chances for the survival of mangroves closed by. If the normal high tides fail to bring mangrove seed in, then manual tree plantation has to be carried out here, following the protocols of local government and their interests.


Hope for new mangroves at Mangrove Bay

Finally, mangroves can withstand most of the harsh environmental conditions with their specialized adaptations right from root (e.g. pnuematophores, aerial roots and knee bent roots meant for

supporting the tree) to the shoot system (e.g. viviparous germination). In most cases, they can arrange them selves to be the fittest, if left undisturbed!

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