Floral Diversity of Konkan Coast

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Biodiversity of a place/habitat is the variety (Genetic) of the flora and fauna that exists in/on that place symbiotically, commensally, parasitically or independently as ephemerals or perennials, as well as the microflora and microfauna. Seasonally visiting animals and birds also equally contribute to the biodiversity of a habitat. The extent of interrelationships, associations, interdependence amongst the floral and faunal members and the nature and complexity of food chain and foodweb network established between them are also major parameters or indicators of the biodiversity dynamics.

The aim of the project was to survey and study the biodiversity of the intertidal zone along the Konkan coast and finally identify the hotspots, which will be further promoted for their protection and conservation by formatting and devising a suitable management plan. Only the macro floral biodiversity has been considered here.

The Intertidal Zone

The coast in a transverse section can be broadly distinguished into three zones namely the dunes, the beach and the shoreline or sea. Each of these has its own characteristic floral and faunal composition. The intertidal zone on the coast is the region which lies between the highest high tide mark and lowest low tide mark. The extent of intertidal zone varies from a few metres to over 1 Km depending upon the beach type. The bays or creeks where there is intermixing of fresh water and saline water are also part of the intertidal zone.

So, for convenience the floral vegetation in the intertidal zone has been separately studied for the beach flora, the dune or strand vegetation and the mangrove communities in the estuaries. Many a time it was quite surprising to notice that at certain places there was a total absence or very scanty floral growth inspite of the availability of favourable factors as compared to those places which exhibited similar conditions and harboured a luxuriant flora. This needs more investigation.

The season we visited the coasts from Murud (North Konkan) to Redi (Southern most Konkan beach) was between October 1996 to April 1997. It was not an intensive survey as each beach was visited only once and only the occurrence during that particular season was recorded. The major floral forms collected/observed in the given time span and the area covered are described. Some of the commonly occurring genera of algae and angiosperms occur on most of the beaches, varying only in their abundance, density and extent of cover.

The parameters employed to study the floral cover on the beach or strand/dune or (mangroves) in estuaries were:

For Algae:
1. The dimensions or the area of the beach compared to the total area covered by the algae.
2. Density.
3. Comparative abundance of the species (Dominant, Condominant, Common, Rare etc).
4. Percentage ratio of common to uncommon species.

For Mangroves:
5. The average height and the canopy spread.
6. The variety or number of species encountered.
7. The area covered by the mangrove patch.
For Strand or Dune Vegetation:
8. The number of species recorded.
9. Associations observed.
10. The extent of spread of Ipomoea biloba zone and the genera coexisting along with it.
11. The width of dunes penetrating inland.

The Beach

The beach can be categorised into three major types: Sandy, Rocky and Mixed type. The sandy beaches can be subdivided according to colour and texture variation into Muddy sand, Black metallic sand, very Coarse sand comprising of shell pieces, White sand and Golden yellow fine sand. The intertidal zone of a purely sandy beach hardly harbours any algal flora but this sand when forms a layer in rocky pools and crevices can act as a good substratum for algal growth. Very few beaches like Kunkeshwar, Bhayre and Kolewadi showed presence of algae like Enteromorpha, Padina, Ulva on such a substratum, that too towards the northern rocky headland sides.

Other sandy beaches visited were Guhagar, Velneshwar, Ganeshgule, Ranpar, Gavkhadi, Vetye Madban, Padvanewadi, Kolewadi, Deogad, Mithumbri, Tambaldek, Kunkeshwar, Adhe’, Padle’, Achara, Malvan, Tarkarli, Murud, Kelshi, Anjarle, Vengurla, Ubhada, Kelus, Velaghar and Shiroda. The sandy beaches at above said locations were devoid of any algal flora because of lack of any firm substratum for rooting but the rocky portion with a sandy substratum lodged good and dense flora at most of these places.

Purely rocky and mixed type of beaches seemed to be ideal for algal growth. Amongst rocky beaches, the beach at Sandkhool towards the southern headland was morphologically weathered with wave-cut rocky, uneven platforms, with an intertidal zone of 35-40 metres and backed by steep cliffs. This beach exhibited a dense and luxuriant algal cover with a co-dominance amongst the existing genera. They included Ulva, Sargassum, Dictyota, Hypnea, Ceramium, Chaetomorpha, Polysiphonia, Cladophora, Gelidiurn, Gelidiopsis, Grateloups, Enteromorpha, Padina, Gracillaria and Melobasis.

Rocky wave cut platforms at Purnagad were about 3.5 to 4 km long with a width of 25-30 mts. backed by straight cliffs. Here too, the wave action was vibrant and characteristic pothole formation was seen. Occurrence of peculiar multiple chain of potholes was observed. Other pools, puddles and crevices harboured a good algal cover, though not too dense but in uneven patches. There was no distinct zonation or stratification observed. The algae included mainly Sargassum, Dictyota, Stoechospermum, Gracillaria, Hypnea, Laurencia, Grateloupia, Acanthophora, Enteromorpha, Cladophora, and Chaetomorpha. Very rare occurrence of Caulerpa was seen.

At Ganeshgule the southernmost headland was initially bouldery and gradually towards south the rock was wave-cut with patchy algal distribution.

Kolewadi beach was of mixed type with sand bordered rocks towards the north and the south. Total length of the beach was about 1.5 to 2 km and the intertidal zone being 40-50 mts. wide. To the south of the Sandy beach, on big boulders was dense, abundant algal growth. Dominating genera were Caulerpa, enterolobides, C. scalpeliformis, C. racemosa var. peltata, Polysiphonia, Gelidium, Gelidiopsis, Padina, Dictyota, Enteromorpha, Acanthophora, Hypnea, Bryopsis, Ceramium and Gracillaria. In the rocky patch of 15 x 800 mts dimension almost 80% was covered with algae. All were exhibiting wild and luxuriant growth. Towards Northern headland of the beach were small, rounded boulders scattered uniformly on an area of 20 x 150 mts on which towards the seaside, approximately 5 m wide belt exhibited Dictyota, Padina, Sargassum and Chaetomorpha. On the boulders away from the sea, behind the above said 5 mts patch were seen sparse Ulva and Enteromorpha.

At Mithumbri, the southward portion of the sandy beach was composed of big boulders with almost horizontal or zero beach slope. The algal flora recorded was similar to the one found at Purnagad but more frequent occurrence of Caulerpa racemosa var. peltata was seen.

Kunkeshwar beach behind the temple was sandy with very gradual slope and 2-3 small patches of Sabellaria colonies with Enteromorpha, Ulva growing along with it. Towards north of this sandy beach are flat platforms closely levelled with the adjacent sandy beach, having shallow puddles and crevices with a substratum of sand in between. Algal cover was fairly good (about 60% of the total rocky area) and was more on seaward side. Intertidal zone was 25-30 mts wide. Though the Algal cover was fair and variation was less, calcified algal genera viz. Amphiroa, Jania and Chelosporum were found in abundance on the Kunkeshwar beach.

Murd beach was sandy, very gradually sloping with an intertidal zone of 500 mts and was about 4 km long. Towards south after 1 km, there was a sudden patchy outgrowth of flat rock which were irregularly distributed over an area 1.5 km long and over 100 mts wide. Rocky patches near village Burundi exhibited
maximum biodiversity of both flora and fauna. Algal variety was composed of Polysiphonia, immature Grateloupia, Gelidium, Enteromorpha, Dictyota, Padina, Gelidiopsis, Alnfeftia, Hypnea, Lithophyllum, Caulocanthus, Cheilosporum, Rhizoclonium and Gracillaria. Algal flora occupied about 50% of the rocky surface and the remaining part covered with faunal varieties like Sabellaria, Corals, Sponges and Mytilus beds. Almost 95% of the total rocky patches were densely covered with flora and fauna. The beach was very gradually sloping and wave action was mild.

Utambare-Kelshi beach covers the seaside from the mouth of a narrow river northward to Kelshi. Near the mouth of the estuary were small boulders which gave way to big boulders towards the north with flat platforms towards the sea. The platforms near the light-house in the bay mouth showed thick and dense algal growth. Inside the bay mouth on small boulders as well as on sand threw Ulva, Enteromorpha, Padina, Polysiphonia and on flat rock towards the north was seen Sargassum, Dictyota, Padina followed towards land by Polysiphonia, Cladophora, Ulva, Enteromorpha, Ceramium, Gelidium, Bryopsis, Hypnea and Gracillaria. Total width of this rocky beach was approximately 100 mts out of which 30-40 mts towards the sea were densely covered with algal mat. The rocky stretch was intruded in between transversely by small baylike projections. In the pools and puddles formed in the rock, each was occupied by a dominating algal genus independently. Sargassum was seen flourishing in stagnant pools as otherwise it is seen adhering to steep or sloping rocks continuously splashed by waves. The sea water was muddy and sublittoral zone was exposed.

To south of Utambare, across the small bay are sandy beaches of Aadhé’ and Padlé’ with an intertidal zone of 200 mts where the sand was brownish muddy and the beach was gradually sloping. After 1-1.5 kms was a projecting jetty-like formation of boulders in the sea. Amongst these rocks were 125-130 stunted Avencenia bushes. After this jetty, towards the south flat rock continues for 0.5 km. These rocks have shallow, round potholes whose peripheral borders were elevated. Not much algal cover was encountered except Ulva, Enteromorpha, Rhizoclonium, a few Gracillaria and immature Grateloupia. These occupied hardly 20% of the total platform area.

Murud-Janjira beach is divided into two parts: partly sandy near the village and pure bouldery rock to the south of the village across a weak bay. Huge boulders were seen away from the sea and flat rock beds towards the sea, like those encountered at Sandkhol. Rocks exposed to wave action were 70% covered with algae like Sargassum, Dictyota (2 species), Gracillaria, Grateloupia, Hypnea, Acanthophora, Laurencia and Padina whereas the second stratum slightly away from the sea was comprising of Ulva, Cheatomorpha, Cheilosporum, Jania, Dictyota and Champia. Few pools behind these two algal strata were harbouring Caulerpa racemosa var. peltata. Width of the rocky zone was about 100 mts and the length was 1 km. Out of these 100 mts, about 20 mts wide belt from the sea side was densely covered with algae. Out of the total area covered by algae about 50% of it was occupied by Sargassum, Padina, Dictyota, and Spatoglossum collectively. The growth observed was wild and luxuriant with a good variety and number of faunal members dependent on them.

The beach of Shreevardhan was sandy, 2.5 km long, with an intertidal zone of approximately 350-400 mts which was very gradually sloping. Its northern rocky headland which was composed of big boulders and having a width of about 20 mts and extending northward upto 1.5 kms exhibited a good algal cover. Here the Phaeophyceae and Rhodophyceae members dominated Chlorophyceae. These comprised of Champia, Gracillaria, Dictyota, Hypnea, Grateloupia, Acanthophora, Laurencia, Lithophyllum, Sargassum, Padina, Polysiphonia, Gelidium, Gelidiopsis, Halymenia and a few Ulva. A belt 15 mt width and about 1 km long was covered with good algal mat and of the overall area covered by algae, about 50% was occupied by Champia, Gracillaria, Hypnea and Gelidium. Faunal diversity was almost negligible.

The above discussion shows that the density and variety of algal cover in the intertidal zone are remarkable at the following beaches:

12. Murud-Janjira
13. Shreevardhan
14. Ladghar-Burundi
15. Bhudhal
16. Sandkhel
17. JakiMirya
18. Purnagad
19. Kolewadi
20. Padavanewadi
21. Mithmumbri

The beaches described above were given different grades to quantify the observed algal diversity in terms of highest scores attained by these beaches in the table on the status of beaches. Here, rocky and sandy beaches are assessed separately as the actual algal flora is restricted to rocky beaches than sandy ones. The sandy beaches tend towards higher score because
of their length and wide spread intertidal zone which should not misguide the reader about the real status of the beach. As the scoring pattern has been clarified below the table, it is necessary to elaborate the meaning of the terms as they are relative to each other.

Poor state of algal cover is meant by negligible or scant flora as compared to the total area of the beach as well as occurrence of less than 5 algal genera.

Good algal cover is one where flora is irregularly scattered in patches and the genera recorded are between 6-9.

Very good algal cover can be described as occurrence of a uniform and fairly dense spread which can be at times discontinuous but occupying about 30-40% area of total beach span. About 10 to 12 algal genera were encountered.

Excellent cover is the richest and luxuriant algal growth forming a uniform and thick mat on the substratum, occupying more that 50% area of the total rocky intertidal zone. More than 13 genera were listed.

**Dune and Strand Vegetation**

In a seashore environment, dunes are irregular, undulating small hilly ranges of sand formed behind a sandy shore. These can occur in one, two, or multiple rows extending inside upto 1.5-2.0 kms. These dunes have their own characteristic vegetation with a strong, firm and deep penetrating root system which goes down to the water table below as the topsoil cover is composed of sand. These extensively spread dunes can therefore, form an independent ecosystem itself.

The dune vegetation to a great extent prevents sand erosion by acting as sand binders and the trees growing on dunes protect the inland vegetation and human settlements from strong winds carrying sand, blowing from the sea.

Sand binders like *Ipomoea biloba*, *Cyperus sp.*, *Cynodon dactylon*, *Spinifex squarroso*, *Lauania punnitifida* etc. are seasonal or ephemerals which complete their life cycles in one favourable season and then hibernate underground as the unfavourable season approaches or if there is scarcity of water. As the wind is strong on shores, the mode of seed dispersal is usually anemophilic i.e., carried away by the wind. So the seeds have special modifications and adaptations like lightweight, minute size, developing wing like structures etc. Sometimes a multiple seed complex structure formation is seen in Spinifex, which together is transported, from one place to another. Spinifex is a member of family *Poaceae* with a running habit having underground stolons and spiny, thick leaf blades. The seed complex is enveloped by dried spines forming a sphere which when detached from the parent plant, rolls on sand and is carried away by the wind. In case of *Ipomoea* the seeds are expelled forcefully if even slightly disturbed by wind.

On most of the sandy beaches the dunes are delimited by *Ipomoea biloba* towards the extreme seaward side. But at some places like at Tarkarli this position was occupied by *Cynodon dactylon* whereas at Murud near Garambi, this was replaced by *Sesuvium portulacastrum*. *Ipomoea*, a creeper which forms a uniform dense cover on crests bears conspicuous violet flowers and have bilobed leaves as its specific name indicates.

Beaches at Guhagar, Ranpar, Ambolag, Gavkhadi, Vettye, Madban, Deogad, Tambaldekk, Mithumbri, Murud-Kelsi, Kolthare and Shiroda were having extensive *Casurina equisetifolia* plantations which acted as a wind barrier. These have a width in the range of 0.5 to 1 km and a length of 0.5 to 2 kms. *Casurina* plantations were also noticed on every bar formation near bay mouths, e.g. at Hindale’, Deobag, Dahhol creek, Ranpar, Mithbho etc. which help prevent the sand blocking the bay mouth by binding, it to some extent.

Strand vegetation delimits the beach by forming a thick wall behind the beach. Behind this strand vegetation are other common wild or planted mesophytes. Usually where strand vegetation exists, dune spread is not seen or if present is negligible. Only one or two crests towards the seaside occurred which hardly bear any vegetation. These strands are normally dominated by *Pandanus* sp. along with *Vitex nigundo*, *Crotalaria sp.*, *Zizyphus sp.*, *Calotropis sp.*, *Vitis trifoliata*, *Carissa carandus* and *Opuntia*.

Sole dominance of *Pandanus* strand was encountered at Diveagar, Murud, Kelsi, near Utambare’, Padle’ and Kasheli.

On some beaches like Anjarle’, Tarkarli, Ahrha and Ambolag along with *Pandanus*, *Vitex nigundo*, *Lantana*, *Carissa carandus*, *Zizyphus sp.*, *Crotalaria*, *Calotropis* and *Opuntia* were found equally dominating. These plants tend to switch over their habit towards mild xerophytic physiology as the conditions persist.

Behind these crests and strand, mesophytic angiosperms make their appearance, e.g. *Thespesia populnea*, *Calophyllum inophyllum*, *Clerodendron inerme*, *Pongamia glabra*, *Euphorbia sp.*, *Erythrina sp.* and *Coccus nucifera*. Though these plants are also seen on dunes and crests to grow up to their maximal habit they need soil beneath the sandy layer and cannot survive solely on sand.

Extensive dunes were encountered at Arvi (near
Redi), Ubhadnada, Mithumbruni, Garambi (near Murud), Tarkarli, Velneshwar and Achara. Here, along with the aforesaid vegetation, variation was added by occurrence of plants such as Acanthus sp., Anacardium occidentale, Cyperus sp., Momordica sp., Eugenia sp., Wedelia sp., Indigofera sp., Desmodium sp., Barleria preonites, Elaecarpus sp., Sterculia sp., Odina woodier, Placourtia sp., Achyranthus aspera, Vernonia sineraria, Senecio graharnii, Cassia tora, Ammania basifera, Terminus labialis, Wedelia sp., Boehravia diffusa, Ricinus communis, Eclipta alba, Acanthospermum hispidum and Leucas sp. These plant representatives were not encountered so frequently as were seen at these places.

More towards South of Konkan i.e., Malwan and southwards, Cashew trees were seen very commonly on dunes. At Arvi, amongst Casurina was seen Datura Sp. on the dunes. At Ubhdananda, extensive dunes spread inwardly from the beach till 1 to 1.5 kms which imparted it appearance of a desert eco-system with sparse vegetation cover and dried, stunted herbs and shrubs. Special mention is required for the occurrence of Caesalpenia crista on the dunes along with Pandanus. At Mithumbruni, Zizyphus sp., Ficus bengalensis, Sterculia urens, Odina woodier, Strychnos nux vomica, Placourtia sp. and Salvadora persica occurred on dunes along with other typical dune flora.

Poaceae members e.g. Elusine sp., Ergostis sp., Argyreia speciosa, Setaria sp., and Celosia sp., occurred frequently amongst Ipomea biloba, Spinifex squarrosus, Crotalaria sp. and Cyperus sp. forming crest cover.

Beach length at Ubhdananda near Vengurla was about 3.5 to 4 kms and the dune width about 1.5 kms. At Velagar beach length was approximately 3-3.5 kms and the dunes extended to a width of 1 km. Casurina plantation seemed to be quite old as the girth of trunks was quite large and buttresses were formed at the trunk bases.

Dunes at Garambi (Murud) were in 4 rows. The rearmost dune towards land showed fair growth of mesophytic shrubs and trees like Vitex negundo, Thespesia populnea, Urena sp., Tridax procumbens, Clerodendron inerme, Cocos nucifera etc. which gradually towards seaside was replaced by Zizyphus sp., Calotropis sp., Crotalaria sp., Indigofera sp., and Lantana camara and finally Cyperus sp., Ipomoea biloba, Lavinia pinnatifida, Sesuvium portulacastrum, Cynodon dactylon, Setaria sp., Elusine sp. and Spinifex squarrosus. The dune area at Murud was about 7.5 sq.kms.

In most cases Ipomea-Spinifex association was common where Ipomea usually dominated. Many a time, Ipomea is patchy with Crotalaria sp., Leucas sp., Acanthus sp. and Cyperus sp. evenly distributed. Sometimes Ipomea is negligibly present and was replaced by Sesuvium portulacastrum and Cynodon dactylon. Cynodon, as seen on Tarkarli and Garambi dunes was a bit robust with very strong, pigmented stolon, shorter and swollen nodes and dwarf leaves. Sesuvium is a Portulacaceae member with succulent stolon, reddish due to anthocyanins with oval, thick reddish-green succulent leaves. Flowers are solitary, conspicuous and light pink in colour. Both are herbs with a creeping habit.

The status of dune and the strand vegetation is converted into scores for convenience to judge the biodiversity which is given in tabulated form.

The poor status is meant by sparse and patchy Ipomea biloba and Pandanus occurrence. The ratio between the total dune span and the area covered by the vegetation is quite large. The number of species found are about 5-8 that too infrequently.

Good dune or strand vegetation is indicated by the presence of noticeable Ipomea or Pandanus cover though not continuous or thick. At least 25-30% of span is covered. Along with it about 8-12 species are recorded.

The beach where, about 30-40% of crest/dune area is occupied by Ipomea or Pandanus along with other flora members forming fairly dense and diversified cover can be classified as having very good dune or strand vegetation. About 12 to 15 species are recorded.

Excellent dune or strand vegetation is the beach having a continuous Ipomea cover along with associated members and a Pandanus stretch forming a continuous wall-like barrier at the rear of the beach and exhibiting wild growth. More than 15 species are found on these dunes. Occurrence of unusual and uncommon plants also adds to the score.

**Estuarine Intertidal Vegetation — Mangroves**

Mangroves are the specially adapted plants, which grow in salt water in estuaries on mudflats. These have special physiological and anatomical adaptations to withstand the salinity of water. These require a humid climate with good rainfall and silt or mudflats to anchor. Mangroves also prove to be economically important as they can provide timber, wood for fuel and are used for medicinal purposes by local people. They are of major importance ecologically for they provide breeding places for fish, some crustaceans and other marine/estuarine fauna. Their extensive root and pneumatophore network along with rich silt in mudflats can form a peculiar eco-system in itself.

Mangroves on West coast are only 25% of total
mangroves in India (Deshmukh S. and Chaphekar S.B., 1996). Mangroves on Central West coast i.e. Maharashtra are still in better condition than those on Northern and Southern West coast.

Of all the major estuaries studied, only those are being considered here which still have a good mangrove cover. The parameters employed for the assessment of the status of mangroves in these estuaries were the area covered, average height, the density, number of genera / species, associated mangrove diversity and stress imposed by the local people due to encroachment.

Dabhol creek is one of the richest centres of mangroves. Of the total length of the Vasishthi estuary which is 45 kms, 11 sq. kms area is occupied by the mangrove community. Mangroves are seen in dense patches spreading not less than 1 km near villages Navsha, opposite Bhati, near Sakhari, Peve, Humbargar, Pangari, Karur, Isapur, Bhopan and Chiveli. Mangroves in Dabhol creek have an average height of 8-9 mts and a fairly dense forest formation observed. Mangroves at Pangari were studied very closely. The length of the patch being 2.5-3.0 kms and width being 50-60 mts. Very old specimens of Avicennia marina, Sonneratia alba and Rhizophora mucronata were encountered. From the river mouth good mangrove vegetation starts at a distance of 5-6 kms. Normally Rhizophora and Sonneratia sp. are seen growing to a height of 4-5 mts but at Pangari they were competing with Avicenina which attained height upto 10-12 mts. Total 9 mangrove genera were recorded with 7 mangrove associates.

Mangrove associates are those plants which do grow near mangroves but avoid direct saline conditions and prefer moist soil towards land. So they usually occupy places immediately behind the mangroves towards the land. These are represented by Exocarica agallocha, Acrostichum aureum, Cyperus sp., Salavarda persica, Derris heterophylla, Clerodendron inerme, Atriplex sp., Caesalpenia sp. and Acanthus ilicifolius. Most of the mangroves and their associates occurred commonly in all creeks studied but with varying density and cover. A separate list of mangroves and mangrove associates is attached alongwith.

Healthy mangroves in Savitri bay were seen near Umroli village, the area covered was 2 km x 1 km. Average height of mangroves was 8-9 mts with a fair density. Sonneratia alba and Avicennia marina attained height of about 12 mts. almost all genera of mangroves and mangrove associates were recorded in it. Lumnitzera racemosa was encountered here for the first time. Immediately behind these mangroves the hill slopes were completely covered under mango plantation and land near the bank was employed for paddy cultivation. The other side of the river also harboured a fairly dense patch of mangroves. Another mangrove patch was seen before village Shipole which was sparse and stunted as a bund was built across to reclaim the land for agricultural purposes.

In Vaghon bay, good mangrove habitat was seen at Navanagar and Girye. At Navanagar the diversity was as usual with all common mangrove genera making their appearance but in scattered patches. Kandelia kandel, Sonneratia alba were seen flowering. Girye mangroves exhibited excellent density and an average height of 8-9 mts, like those at Pangari in Dabhol creek. In Girye mangroves, Sonneratia alba, Avicennia marina, A. officinalis and Rhizophora mucronata were found codominating. The mangrove cover in Vaghonan river can be estimated to be about 500 ha. In the bay, the distribution of mangroves is thick and dense but patchy and irregular with many narrow channels running across as compared to those at Umroli and Pangari which are in one or two continuous stretches and are impenetrable.

Mangroves were also found in other locations like Chinchkhari, Jaigad bay, Kolam estuary, Deogad estuary and Karli river but these were found to be of inferior quality and lacking in one or other parameters as compared to the aforesaid mangroves. Though their role and function in their respective environments remains the same their area cover seems to be dwindling.

The mangrove habitat described in the above three bays, at present shows a healthy picture but the increasing pressure of human needs and the future danger of encroaching industrialisation are going to affect their status severely in coming decades if not protected well.

Of the three major estuaries surveyed for the status of mangroves, Vasishthi was found to harbour excellent mangrove cover as far as the employed parameters are concerned. In geographically-protected pockets in the estuary, they exhibit climax formation in terms of average height, the density of the patch, area occupied and the canopy cover. Special attention is needed to the mangroves at Pangari, Peve, Karur, Isapur, Bhopan, Govalkot and Chiveli as any minor alteration in the health of the existing environment would prove dangerous to their present status and indirectly to the faunal members dependent on them and finally to the fishing economics of Dabhol which is well known for its rich fishing grounds.

The mangroves in Savitri bay which seemed to be in need of protective help from the local people as bunds
were seen built across the Savitri bay and the mangroves to reclaim the land for agricultural use. Bunds cause death of mangroves for want of saline water and regular periodical and seasonal variation in the micro-nutrient content in the tidal gush of water. This gradually causes drying up of the trees which were observed near village Shipole. A better condition was seen at Umroli where the mangroves attained an average height 8-9 mts which indicates a healthy growth.

So, a threshold percentage of mangroves have to be decided for each estuary and should be maintained and protected for the betterment of coastal economics.