International Journal of Multidisciplinary Research and Development

International Journal of Multidisciplinary Research and Development

Volume: 2, Issue: 10, 717-720
Oct, 2015.
www.allsubjectjournal.com
e-ISSN: 2349-4182
p-ISSN: 2349-5979
Impact Factor: 5.742

Mahesh V. Gokhale
Department of Botany,
K. B. P. College, Urun-Islampur- 415 409 (MS)
India.

Ajit B. Telave
Department of Botany,
T. C. College, Baramati (MS)
India.

Niranjana S. Chavan
Department of Botany,
Shivaji University,
Kolhapur-416 004 (MS)
India.

Correspondence:
Mahesh V. Gokhale
Department of Botany,
K. B. P. College, Urun-Islampur- 415 409 (MS)
India.

Mangrove succession at Dabhol Estuary, Maharashtra state of India

Mahesh V. Gokhale, Ajit B. Telave, Niranjana S. Chavan

Abstract
Succession of newly formed mangrove patch dominated *Sonneratia alba* at Dabhol, Maharashtra was studied. Frequency and density of species were studied along with stratification. *Sonneratia alba* is most frequent species. There is variation in tree form of *Sonneratia alba.* The parameters further confirm *S. alba* as the pioneer mangrove species.

Keywords: Mangroves, Succession, *Sonneratia alba.*

1. Introduction
Ecological succession is an orderly process of community development. It involves changes in vegetation structure. It modifies the physical environment and tends to stabilize [1]. Succession of mangroves is somewhat difficult to study. But a common assumption is that the zonation of species in space represents their succession in time [2]. There are number of theories explaining/ suggesting the possible way of mangrove succession. Again it may be site specific. It is known that *Sonneratia alba* is a pioneer mangrove species which colonizes newly exposed mud and sandy areas near the mouth of tidal rivers [3]. As a pioneer species S. *alba* maintains its status by colonization rather than regeneration in mangrove forest [4]. There is considerable variation regarding pioneer mangrove species. These species were *Avicennia* and *Acanthus* [5], *Avicennia marina, A. alba* [6], *Porteresia coarctata* [7]. According to Chapman [8], on saline sand pioneer species was *A. marina,* while on mud it was *S. apetala.*
Dabhol estuary known as Vashisti is comparatively larger and well-studied for eco-geography [9]. According to them, the mixed nature of the vegetation towards the sea is reduced and pure patches of *Rhizophora*, *Sonneratia* and *Avicennia* appear. Therefore, this particular estuary provides good material to study such ecological process. In the downstream region of this estuary newly developing mangrove patch is located. It is slightly away from main stream but receiving estuarine water sufficiently. Its physiographic appearance is quite different. Therefore, with the help of quantitative ecological methods, this mangrove patch is studied from mangrove succession point of view.

2. Materials and methods
The patch is located on the north-bank near the mouth of Dabhol estuary (MS) India. It is about a hectare. The quadrats (10 x 10m) were placed across the patch and number of species and individuals were recorded. Quadarts (1 m x 1 m) were also placed within each large quadrat to record the pneumatophore density. Phytosociological parameters were studied as per the standard methods.
The study area is 300 meters away from the estuary and does not have direct water input from main river stream. Small channel provides water through sub-channel. The mangrove patch has grown on both the sides of this sub-channel (Fig.-1).
Previously this particular patch might be occupied by grasses only. There is a strip of grassland of about 20 to 25 mtrs around the mangrove patch. It has merged in the mangrove patch showing a clear buffer zone. This buffer zone is dominated by dwarf individuals of *Avicennia.*

3. Results and discussion
Physiographically the mangrove patch is unique. Density and height of plants is considerably more at the centre along the channel. The location map is given in Fig. 1. Stratification in the mangrove patch is also studied (Fig.-2). Three distinct strata were recorded, there is increase in number of strata towards the mid of the patch, where channel is present. Lowest stratum is represented by dwarf individuals of *Avicennia* and *Aegiceras corniculatum.* It is occurring on

the boundaries. Second stratum is represented by small trees of *Sonnerattia alba, Avicennia marina, Avicennia officinalus, Sonnerattia apetala, Kandelia candel, Bruguiera gymnorrhiza, Rhizophora mucronata, Rhizophora apiculata.* The number of individuals other than *S. alba* are very less. It is present next to dwarf *Avicennia* zone, but mixed population is present at the mid. The patch adjoining *Avicennia* zone and mixed zone is mostly a pure patch of *S. alba*. The last stratum is dominated by the tall tress of *S. alba*. It is present on both the sides of a channel (i.e. exactly at the mid of the patch). These trees are more than 30 ft. in height. It is very interesting to note the variation in tree form of *S. alba*. Near the boundaries there are small trees with comparatively broad canopies while at the mid there are tall trees with very narrow canopies.

Sonneratia alba shows 100% frequency, while *Aegiceras* and *A. officinalis* show the lowest (20%) frequency. *A. marina* and *R. mucronata* are next to *S. alba.* Density is also more for *S. alba* (Table-1).

Raunkiaer's normal frequency diagram indicates that no individuals are present in class C and D. Highest number of individuals are present in class B. It shows decrease in A and E class, respectively. According to Misra [10] higher the class E, greater will be homogeneity. When the classes B, C, D are high, the stand is heterogeneous. Therefore the patch of mangroves is heterogeneous and yet not reached the climax. The most frequent species is *S. alba* (Fig.-3).

Table-2 shows crab mound dynamics, pneumatophore density and proproot density (*Rhizophora*) in quadrats serially across the patch. The boundary area shows lack of crab mounds indicating the transition of grassland / terrestrial land to the mangrove land, while the middle region shows considerable number of crab mounds. Pneumatophore density is also high at the mid than the boundaries. *Rhizophora* individuals are present only at the middle having comparatively low prop root density.

The entire situation indicates that the succession in this particular patch is bidirectional, one direction is from mid (i.e. from channel) to boundary, as the species other than *S. alba* are accumulated inside and it may possibly the original successional pattern. Another direction is from boundary to the mid, this shows entry of dwarf *Avicennia* from boundaries. This particular process should be recent one. Though the patch is not in initial stage of succession, the tree form, size, number of *S. alba* individuals are quite sufficient to confirm it as a pioneer mangrove species.

Similar type of situation i.e. a new developing mangrove patch away from main river stream is also recorded from some other estuaries of Maharashtra and Goa (unpublished). Species of *Sonneratia* i.e. *S. alba* and *S. caseolaris* are the pioneers. Therefore, attention should be paid in relation to sea level rise and anthropogenic impacts on the mangrove ecosystems and especially from mangrove plantation and conservation point of view. Such type of developing mangrove communities should be protected for natural regeneration of mangroves as it is the natural selection of the species on the available habitable sites.

In addition to the primary succession on newly developed mangrove lands, secondary successional patterns should be monitored at different micro-geographic areas. It has great significance in conservation as it provides basal idea about natural species selection.

Table 1: Phytosociological characters of the mangrove patch at Dhabol.

Species	***Sonneratia alba***	***Sonneratia apetala***	***Avicennia dwarf***	***Avicennia marina***	***Avicennia offcinalis***	***Rhizophora mucronata***	***Rhizophora mucronata***	***Kandelia candel***	***Bruguiera gymnorrhiza***	***Aegiceras corniculatum***
Frequency %	100	35	15	40	20	40	30	25	30	20
Density	34.85	0.65	1.4	0.75	0.55	0.65	0.3	0.4	0.4	0.3

Table 2: Crab mound dynamics, pneumatophore density and *Rhizophora* proproot density across the patch of mangrove at Dabhol.

Location	**No. of crab mounds / Quadrat of 5x5 m**	**No. of pneumatophores/ m^2**	**No. of proproots / *Rhizophora* plant.**
Boundary	00	61	---
	00	56	---
	00	50	---
	00	62	---
	00	75	09
	03	66	08
	10	51	03
	27	73	09
	20	97	08
	23	103	10
Mid	16	81	09
	07	65	07
	09	71	05
	05	77	---
	01	57	---
	00	38	---
	00	41	---
	00	29	---
	00	37	---
Boundary	00	26	---

--- *Rhizophora* individual absent.

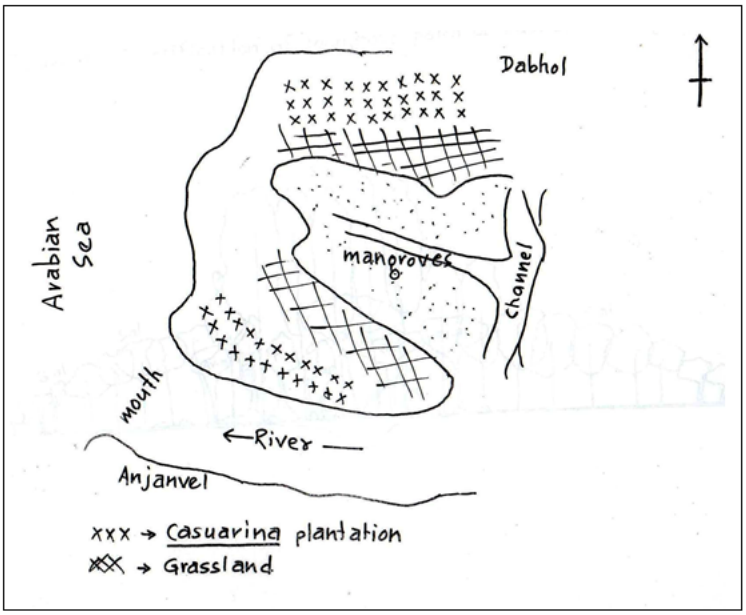

Fig 1: Location sketch map of newly forming mangrove patch at Dabhol estuary.

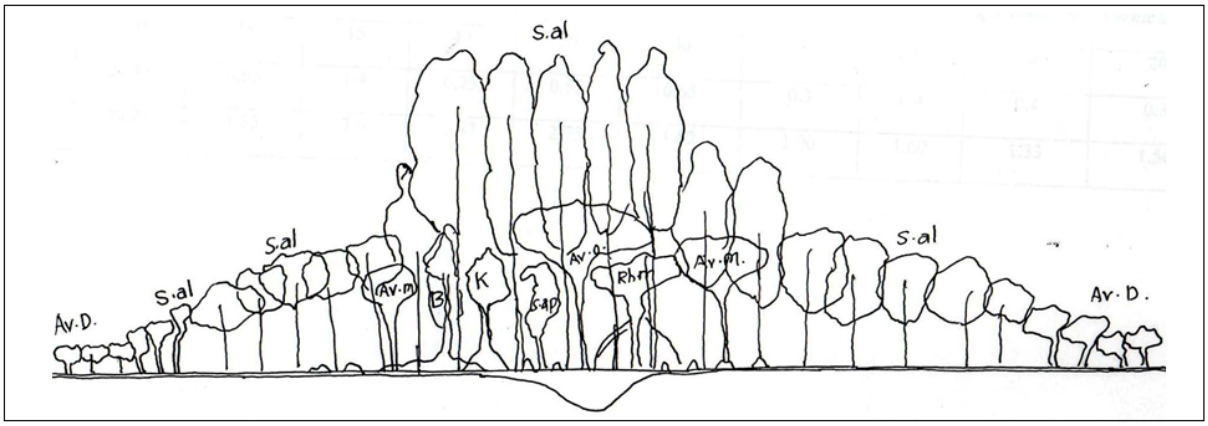

Fig 2: Stratification of mangrove patch at Dabhol Estuary

Av. D - *Avicennia* dwarf
Av. M - *Avicennia marina*
K - *Kandelia candel*
Av. O - *Avicennia officinalis*
S. al - *Sonneratia alba*
B - *Bruguiera gymnorrhiza*
S. ap - *Sonneratia apetala*
Rh. M - *Rhizophora mucronata*

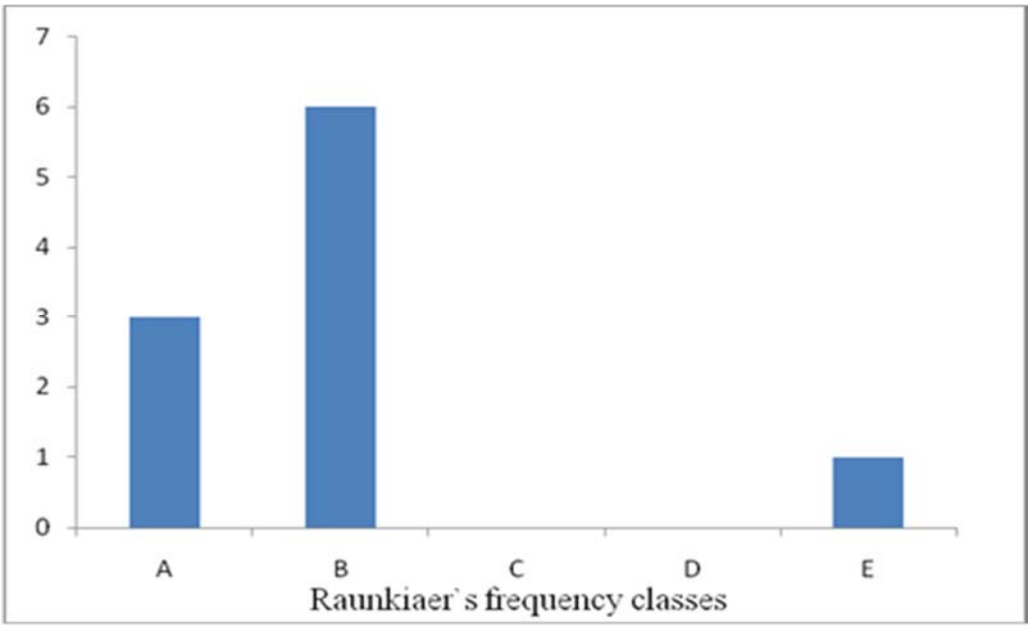

Fig 3: Raunkiaer's normal frequency distribution histogram of the mangrove vegetation

4. References

1. Odum EP. Fundamentals of Ecology Saunders, Philadelphia, 1971.
2. Tomlinson PB. The botany of mangroves. Cambridge Univ. Press, Cambridge, UK, 1986.
3. Aksornkoae S, Maxwell GS, Havanond S, Panichsuko S. Plant in mangrove. Chalongrat Co. Ltd., Bangkok; Thailand, 1992.
4. Chai PPK. Mangrove forest of Sarawak. The Malaysian forester. 1975, 38:108-134.
5. Sidhu SS. Vegetation of East Godavari, Proc. 48th Indian Sci. Congress. 1961; 3:358-359.
6. Sidhu SS. Studies on the mangroves of India. I East Godavari region. Indian Forester. 1963; 89:337-351.
7. Kurlapkar DD. Studies on the mangrove ecosystem of western Maharashtra. Ph. D. thesis, Shivaji University, Kolhapur (MS) India, 1993.
8. Chapman VS. Mangrove biography. In: Proceeding of Intl. Symp. On Biol and manag. of Mangr. Honolulu, Hawaii. Eds.G. Walsh, S. Snedaker and H. Teas. Oct. 1975, 1974. p. I 3.22.
9. Joshi GV, Shinde SD. Eco-geographical studies in Vashisti and Terekhol rivers. Shivaji University Publication, Kolhapur-4 (India) 1978.
10. Misra R. Ecology workbook. Oxford and IBH Publishing Co, 1968.