

CLUSTER ANALYSIS OF FIELD STATIONS AND MANGROVE SPECIES AT CREEKS AND MUDFLAT REGIONS OF MACHILIPATNAM

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ABSTRACT

Present study is carried out to identify the similarity between the mangrove species and field stations distributed in and around creeks and mudflats of Machilipatnam. Agglomerative clustering through Ward's linkage method describe the vegetation analysis in the relation to community structure i.e. species dominance vs field stations. Results showed Agglomerative clustering through Ward's linkage method describe the vegetation analysis in the relation to community structure field stations in region-I Kona is distinct among the other four field stations. Species dominance in region –I there are 6 clusters Aegialitis rotundifolia, Dalbergia spinosa Roxb, Suaeda monoica, Lumnitzera racemosa, Suaeda monoica species are found in a single cluster group. In region-II Chinapandraka and Kruthivenu are distinct among the other four field stations. Species dominance in region–II there are 3 clusters Rhizophora apiculata, Suaeda maritima, Suaeda monoica, Suaeda monoica are found in a single cluster group.

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INTRODUCTION

Studies on mangrove vegetation include the studies on plant communities, their structure, functions, classification and interrelation with interacting environmental factors. The nature of morphological adaptations of mangroves depends on their efficiency to tolerate the environmental condition i.e. the salt content of shore-mud soils Brahmaji Rao (1998). Mangroves are the characteristic intertidal plants distributed in tropical and subtropical coastlines Chapman (1976), Lin (1984) and Tomlinson (1986). Krishnamurthy *et al.* (1987) observed that the Indian coastline mangroves are about 7% of the world mangroves while Untawale (1987) estimated it as 8%. The extent of mangrove forest cover in India is probably the third largest formation of the world after Indonesia and Australia Banerjee (1998).

Objective

The present study is carried out to identify the similarity between the mangrove species and field stations distributed in and around creeks and mudflats of Machilipatnam

Study Area

The study was carried out in the first region consists of the creek based villages around Machilipatnam viz.,

Pallethummalapalem, Kona, Bhavanipuram, Kammavarichervu, Malakayalanka. The second region consists of mudflat based villages Kanuru, Achyyavaripalem, China pandaraka, Interu, Kruthivenu, Nidamaru at which mangrove vegetation is present.



Figure 1 Study areas showing creek and mudflat regions at Machilipatnam in Krishna district of Andhra Pradesh, India

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MATERIALS AND METHODS

Cluster Analysis

The hierarchical classification is used to determine the complete linkage clustering and similarity ratio index for making the dendrogram based on the IVI values. Agglomerative clustering through Ward’s linkage method describe the vegetation analysis in the relation to community structure i.e. species dominance vs field stations.

Agglomerative clustering is made though Ward’s method for each zone by using “SPSS” statistical software. It is a class of techniques used to classify cases into groups that are relatively homogeneous within themselves and heterogeneous between each other, on the basis of a defined set of variables. Dendrograms based on cluster linkage was carried for species wise and field station wise to identify the similarity between the species and field stations.

According to Falcaro and Pickles (2010), this analysis was performed to provide hierarchical clustering of observations applied to coordinate data or distance data. The dendrogram, which was used as a representation was used to graphically present the information concerning which observations were grouped together at various levels of similarity. At the bottom of the dendrogram, each observation was considered its own cluster. Vertical lines extend up for each observation and at various (dis) similarity values where long vertical lines indicate more distinct separation between the groups and shorter lines indicate groups that are not as distinct.

RESULTS

Cluster Analysis Based on Field Stations and Vegetation

The hierarchical classification used to determine the complete linkage clustering and similarity ratio index for making the dendrogram based on the IVI values. Agglomerative clustering through Ward’s linkage method describe the vegetation analysis in the relation to community structure i.e. species dominance vs field stations. In the present study species and field station wise diversity and composition is analyzed with clustering method to know the similarity and correlation for each zone.

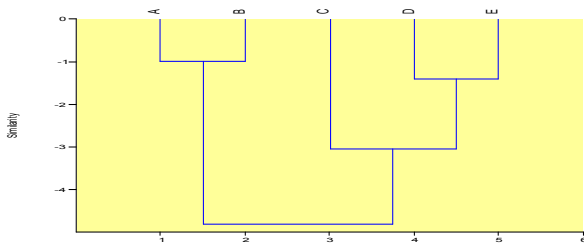


Figure 2 clustering of field stations through Ward’s Linkages method of Region – I

Two clusters are identified in region – I. First cluster is in between Paletthummalapalem & Malakayalanaka villages and second cluster is in between Bhavanipuram & Kammavaricheruvu villages (Figure-2). Kona is distinct among the other four field stations (Table-1)

Table 1 Field stations of region-I

S.no	Field station names
1	Paletthummalapalem
2	Kona
3	Bhavanipuram
4	Kammavaricheruvu
5	Malakayalanaka

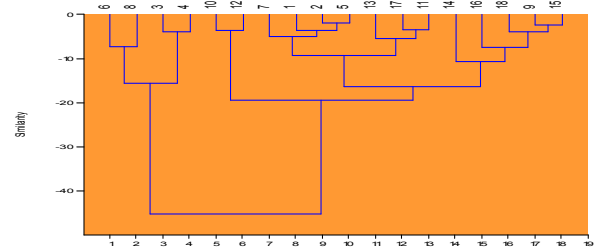


Figure 3 Species wise Clustering through Ward’s Linkages method in Region-I

Species wise cluster analysis is also made for five stations of region –I and found that 6 clusters *Aegialitis rotundifolia*, *Dalbergia spinosa Roxb*, *Suaeda monoica*, *Lumnitzera racemosa*, *Suaeda monoica* species are found in a single cluster group(Figure-3). This group is found t be having maximum number of species (5 species) in a single cluster. 1 cluster group is identified with 4 species and 1 cluster group is identified with 3 species and 3 cluster groups are identified with two species (Table-2).

Table 2 Mangrove species present in the Region – I

S.No.	Name of the Species
1	<i>Aegiceras corniculatum</i>
2	<i>Avicennia alba</i>
3	<i>Avicennia marina</i>
4	<i>Avicennia officinalis</i>
5	<i>Bruguiera cylindrica</i>
6	<i>Bruguiera gymnorhiza</i>
7	<i>Ceriops decandra</i>
8	<i>Excoecaria agallocha</i>
9	<i>Lumnitzera racemosa</i>
10	<i>Rhizophora apiculata</i>
11	<i>Rhizophora mucronata</i>
12	<i>Sonneratia apetala</i>
13	<i>Acanthus Ilicifolius</i>
14	<i>Aegialitis rotundifolia</i>
15	<i>Cuscuta reflexa Roxb.</i>
16	<i>Dalbergia spinosa Roxb.</i>
17	<i>Suaeda maritima</i>
18	<i>Suaeda monoica</i>

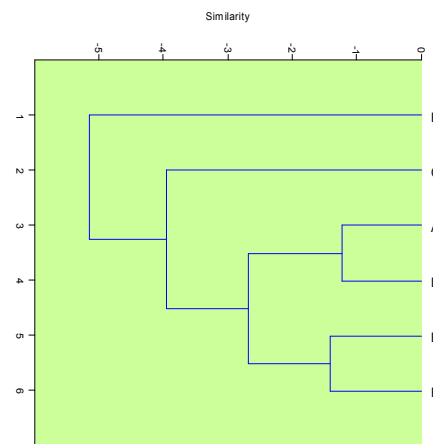


Figure 4 clustering of field stations through Ward’s Linkages method of Region –II

Two clusters are identified in region-2. First cluster is in between Kanuru & Iinteru villages and second cluster is in between Achyyavariplaem & Nidamaru villages (Figure-4). Chinapandraka & Kruthivenu are distinct among the other four field stations (Table-3).

Table 3 Field stations of region-II

S.no	Field station names
1	Kanuru
2	Achyyavariplaem
3	Chinapandraka
4	Iinteru
5	Kruthivenu
6	Nidamaru

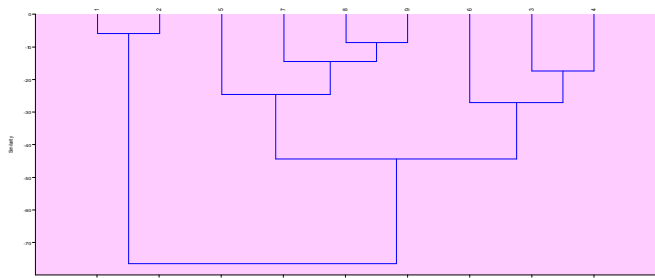


Figure 5 Species wise Clustering through Ward's Linkages method in Region-II

Species wise cluster analysis is also made for six stations of region-II and found that 3 clusters, *Rhizophora apiculata*, *Suaeda maritima*, *Suaeda monoica*, *Suaeda monoica* are found in a single cluster group (Figure-5). This group is found to be having maximum number of species (4 species) in a single cluster. 1 cluster group is identified with 3 species and 1 cluster group is identified with two species (Table-4).

Table 4 Mangrove species present in the Region – II

S.No.	Name of the Plant Species
1	<i>Avicennia officinalis</i>
2	<i>Bruguiera gymnorhiza</i>
3	<i>Ceriops decandra</i>
4	<i>Excoecaria agallocha</i>
5	<i>Rhizophora apiculata</i>
6	<i>Acanthus Ilicifolius</i>
7	<i>Suaeda maritima</i>
8	<i>Suaeda monoica</i>
9	<i>Suaeda monoica</i>

DISCUSSION

The observations conclude that in Region – I the *Avicennia officinalis*, *Avicennia marina* (whose IVI values are 15.91,19.66,17.95,20.18,21.93 and 17.42,14.53,17.95,21.93, 14.91 for villages Palleshummalapalem, Kona, Bhavanipum, Kammavarichervu, Malakayalanka respectively) are widely distributed and hence dominant.

Similar observations are made in the Region – II. In that region also the *Avicennia officinalis*, *Avicennia marina* (whose IVI values are 33.33, 28.79,21. 84,31.82,39.58,26.98 and 33.33,31.82,24.14,31.82,43.75,33.33 for villages Kanuru, Achyyavaripalem, China pandaraka, Interu, Kruthivenu, Nidamaru respectively) are widely distributed and hence dominant.

CONCLUSION

Agglomerative clustering through Ward's linkage method describe the vegetation analysis in the relation to community structure field stations in region-I Kona is distinct among the other four field stations. Species dominance in region –I there are 6 clusters *Aegialitis rotundifolia*, *Dalbergia spinosa Roxb*, *Suaeda monoica*, *Lumnitzera racemosa*, *Suaeda monoica* species are found in a single cluster group. In region-II Chinapandraka and Kruthivenu are distinct among the other four field stations. Species dominance in region –II there are 3 clusters *Rhizophora apiculata*, *Suaeda maritima*, *Suaeda monoica*, *Suaeda monoica* are found in a single cluster group.

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