

Vegetation structure and ordination of Nayagram forest in West Bengal

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Abstract

Ecosystem is always dynamic due to gradual change of composition and fluctuations are due to many factors including biotic intervention. Ecosystem components are biotic and biotic but many individual components play a crucial role to develop ecosystem tuned though complete index value or ordination is static as composition is dynamic. Therefore to explain the structure and composition ordination study is essential. Many exotic alien species have been recorded here which might be a cause of loss of local floral elements time to time. Therefore individual status study and its ordination is a prime focus study on the basis of natural *sal* forest in Nayagarm of Jhargram district in West Bengal. Hope that this could be a boon to study health index in details for the study of faunal composition. The interdependency and species richness study could be a second step of study depending on the preliminary study. So, students, teachers, environmentalists and policy makers would be benefitted through this study. Ordination of vegetation and its structure is therefore a new study to manage the environment on a quantitative basis.

Nayagram is situated in a border region of West Bengal adjacent to Jharkhand and Odisha. The tract is undulated and filled with huge lush green *sal* (*Shorea robusta*) vegetation admixed with degraded lands covered with thorny vegetation. Rice field and fallow lands are discontinuous though lower part of the present study site is with agricultural belt nearer to river Subarnarekha. Heterogeneous composition of forest plants, other microbial

elements are common along with many wild animals that make the ecosystem tuned. Endangered animals like Pangolin and elephant are the common members found here. Various types of small mammals and different kind of insects and reptilian members are available here. Avian diversity is also good in this site. As a whole tuned ecosystem services make the entire landmass a special kind in continuation of tribal populations of this vast

tract. Tribal culture and ethnicity is truly different in this region. The integrity of people and land mass make here a special value. Ecosystem integrity is also a special in this area; people use plants and animals in a managerial way and conserve the ecosystem with potential way but sustainable basis for their own. Health of this ecosystem is also good because of the land mass and its environment. The structure of vegetation, pattern of orientation and diversity of its components even ordination of various degrees of indices make the ecosystem fine and tuned. The productivity of this ecosystem and its uniqueness make the environment so meaningful that every part of its contributors is unique by its nature and specificity. Keeping this view in mind the particular area has been taken into account and vegetation structure and ordination has been placed to know the actual scenario of the forest and degraded land mass.

Study area :

Study area is Nayagram which is situated at Nayagram community development block under Jhargram district of West Bengal.

The frequent tours were conducted during summer, monsoon, and post-monsoon and in winter following botanical data collection standard. The ecological data was collected following standard ecological data collection method⁷. Site-specific status of plants (IVI) was made with the help of local people, departmental help (College, Block Development Office, Forest Dept.). Plant specimens were collected during their reproductive stage and critically identified these using local Flora housed in CNH, Howrah. Identification was made with the help of books, papers of journals,

floras, revisions, monographs and authentic specimens^{1,2,5,6,10}. Economic use and ecological significance have been made using Journal section of Vidyasagar University and with the assistance of Library section of Botanical Survey of India, Jhargram Raj College library. Herbarium specimens were made using CAL herb standard and following the standard and modern herbarium techniques. Specimens of roots, leaves, twigs, fruits and flowers were collected and studied for authenticity of species.

The vegetation survey was done by laying quadrats at random. Vegetation of the above mentioned sites situated in the adjacent to districts of Odisha. In open tract the vegetation study was made by belt transect on three exposures *i.e.* margin (base), centre and extreme centre of the area, according to the principles of “landscape” approach as followed by Whittaker¹¹. The size of the quadrat was fixed by method of “species area curve”⁹. The numbers of quadrats required was determined by plotting the number of species against the number of quadrats. The quadrat analyses were made following Muller-Dombois and Ellenberg⁸. Quadrats of 1m x 1m, 5m x 5m and 10m x 10 m for herbs, shrubs and trees were laid out at random for study of vegetation. 5 quadrats at each site for each type of the selected locality were taken for study. In each quadrat, the following characters were taken: Abundance of each species (for the calculation of density), Basal cover of species taken by measuring girth of a tree at breast height *i.e.* at 1.37 meter (4' 6") is individually measured for all the species. Plant species encountered

in each quadrat was listed and identified on the basis of floristic studies of regional vegetation made by Prain¹⁰ and followed by Mabberley⁵. Frequency density and abundance values will be calculated for each species. The importance value index (IVI), an integrated measure of relative frequency, relative density and relative dominance will be derived following Curtis³.

Nayagram forest is heterogeneous type of forest in dry deciduous red lateritic zone of Southwest Bengal. It is situated aside the river Subarnarekha. Natural forest with abundant *sal* (*Shorea robusta*) is the characteristic of this forest. During winter forest shed off of their leaves and twigs become open broom like and lost its enthusiastic attitude and sometimes shows a heap of leaves in the ground make a covering over the herbaceous vegetation. Total 59 woody species found in natural forest of Naygarm (Table-1). Lower ground species recorded in this forest is 79. During monsoon it looks like green patch of vegetation with a large number of lianas species. Profusely branched small shrubby plants show bush in continuity of *sal* vegetation throughout the entire forest range. Tree species found in natural forest, plantation stand and in degraded forest is 49, 09 and 11 respectively during monsoon. The number of shrub species found here during monsoon is 49, 08 and 09 in natural forest, plantation stand and degraded forest respectively. Herbaceous species found during monsoon in the same site under the three management regimes are 40, 05 and 06 respectively. Therefore, the total number of tree species, shrubby species and herbaceous

species found in this site are 138, 22 and 26 in natural forest, plantation stand and degraded land respectively during monsoon.

In Nayagram natural forest, total number of tree species found is 49. Among them, the important species found here are *Shorea robusta* (IVI, 112.32) followed by *Zizyphus mauritiana* (IVI, 54.0), *Terminalia arjuna* (IVI, 20.41), *Bauhinia purpurea* (IVI, 16.31), *Streblus asper* (IVI, 15.37), *Mallotus philippensis* (IVI, 7.02) and *Albizzia odoratissima* (IVI, 5.32). Other commercially important woody species of this area are *Diospyros kaki* (IVI, 0.32), *Haldinia cordifolia* (IVI, 1.34), and *Aegle marmelos* (IVI, 4.03). During monsoon some of the invaluable tree species found in seedling condition which include *Antidesma ghaesembila* (IVI, 0.56), *Canthium dicoccum* (IVI, 0.89), *Phyllanthus emblica* (IVI, 2.21), *Semecarpus anacardium* (IVI, 0.24), *Morinda citrifolia* (IVI, 1.50), *Nyctanthes arbor-tristis* (IVI, 1.5), *Streblus asper* (IVI, 15.37) and *Zizyphus mauritiana* (IVI, 54.0). But these species are not available in sizable quantity during other seasons. Beside these, *Albizzia lebbeck* (IVI, 1.05), *Butea monosperma* (IVI, 1.54), *Flacourtia indica* (IVI, 0.56), *Gardenia resinifera* (IVI, 0.29), *Mallotus rependus* (IVI, 1.0), *Syzygium cumuni* (IVI, 3.0), *Terminalia crenulata* (IVI, 2.0) are found with low frequency in the forest. Therefore the structure and ordination (specific structural explanation) is unique in the lateritic forest in connection with seasonal fluctuations under any microclimatic condition. Therefore, study and continuous assessment is required to know more in this forest about the species composition and their ecological status.

Table-1. Importance value Index of woody plant species in the study site

| Sr. No. | Name | IVI in Monsoon | IVI in Summer | IVI in Winter |
|---------|---|----------------|---------------|---------------|
| 1. | <i>Aegle marmelos</i> (L.) Correa | 4.03 | 4.05 | 3.98 |
| 2. | <i>Alangium salvifolium</i> (L.f.) Wang. | 3.69 | 4.8 | 5.7 |
| 3. | <i>Albizia lebbbeck</i> (L.) Benth | 1.05 | 1.0 | 1.5 |
| 4. | <i>Albizia odoratissima</i> (L.f.) Benth | 5.32 | 4.6 | 6.2 |
| 5. | <i>Alstonia scholaris</i> (L.) R. Br | 0.12 | 1.2 | 1.0 |
| 6. | <i>Anogeissus latifolia</i> (Roxb. ex DC) Wall | 0.24 | 0.54 | 0.68 |
| 7. | <i>Antidesma ghaesembila</i> Gaertn. | 0.56 | 0.45 | 0.98 |
| 8. | <i>Azadirachta indica</i> A. Juss | 0.23 | 0.12 | 0.52 |
| 9. | <i>Bauhinia purpurea</i> L. | 16.31 | - | - |
| 10. | <i>Bombax ceiba</i> L. | - | 12.54 | 11.30 |
| 11. | <i>Buchanania lanzan</i> Spreng | - | 12.02 | 10.21 |
| 12. | <i>Butea monosperma</i> (Lan.) Taub. | 1.54 | 1.25 | 1.05 |
| 13. | <i>Canthium dicoccum</i> Gaertn | 0.89 | 0.84 | - |
| 14. | <i>Careya arborea</i> Roxb. | 0.94 | 1.85 | 1.35 |
| 15. | <i>Cassia fistula</i> L. | 0.74 | 0.21 | 1.25 |
| 16. | <i>Cleistanthus collinus</i> (Roxb.) Benth. | 0.12 | 1.20 | 1.30 |
| 17. | <i>Cochlospermum religiosum</i> (L.) Alston | - | 23.32 | 21.03 |
| 18. | <i>Croton oblongifolius</i> Roxb. | - | 4.25 | 2.83 |
| 19. | <i>Dalbergia latifolia</i> Roxb. | - | 5.68 | 8.30 |
| 20. | <i>Diospyros kaki</i> Thunb. | 0.32 | - | - |
| 21. | <i>Diospyros melanoxylon</i> Roxb. | 1.58 | 1.54 | - |
| 22. | <i>Ficus religiosa</i> L. | 2.32 | - | - |
| 23. | <i>Flacourtia indica</i> (Burm f.) Merr. | 0.56 | - | - |
| 24. | <i>Gardenia latifolia</i> Ait | 1.21 | 1.0 | 1.25 |
| 25. | <i>Gardenia resinifera</i> Roth. | 0.29 | 0.54 | 0.21 |
| 26. | <i>Haldinia cordifolia</i> (Roxb.) Ridsdale | 1.34 | 0.21 | 1.02 |
| 27. | <i>Hymenodictyon excelsum</i> (Roxb.) Wall | 4.56 | 0.58 | - |
| 28. | <i>Lagerstroemia parviflora</i> | 1.25 | 5.36 | 3.65 |
| 29. | <i>Litsea glutinosa</i> (Lour.) C.B. Rob. | 2.5 | 2.14 | 1.45 |
| 30. | <i>Odina wodier</i> Roxb. | 4.0 | 25.36 | 7.12 |
| 31. | <i>Madhuca longifolia</i> (J. Konig) Macbr. | - | 2.35 | 3.25 |
| 32. | <i>Mallotus philippensis</i> (Lam.) Muell. Arg. | 7.02 | 0.23 | 0.32 |
| 33. | <i>Mallotus rependus</i> (Rottler) Mill Arg. | 1.0 | - | - |

| | | | | |
|-----|---|--------|--------|--------|
| 34. | <i>Miliusa tomentosa</i> (Roxb.) J. Sinclair | 2.0 | - | - |
| 35. | <i>Mitragyna parviflora</i> | 2.0 | 5.21 | 6.3 |
| 36. | <i>Morinda citrifolia</i> L. | 1.5 | 0.25 | - |
| 37. | <i>Nyctanthes arbor-tristis</i> L. | 1.5 | 2.15 | - |
| 38. | <i>Oroxylum indicum</i> (L.) Kurz. | 2.5 | 2.01 | - |
| 39. | <i>Phyllanthus emblica</i> L. | 2.21 | - | - |
| 40. | <i>Pongamia pinnata</i> (L.) Panigrahi | 1.0 | - | - |
| 41. | <i>Pterocarpus marsupium</i> Roxb. | 2.0 | - | - |
| 42. | <i>Samanea saman</i> (Jacq) Merr. | 0.89 | - | - |
| 43. | <i>Scheleichera oleosa</i> (Lour.) Oken | 0.12 | - | - |
| 44. | <i>Semecarpus anacardium</i> L. | 0.24 | - | - |
| 45. | <i>Shorea robusta</i> Gaertn. | 112.32 | 102.35 | 105.3 |
| 46. | <i>Streblus asper</i> Lour | 15.37 | - | - |
| 47. | <i>Strychnos nux-vomica</i> L. | 4.28 | 1.02 | - |
| 48. | <i>Syzygium cumini</i> (L.) Skeels | 1.32 | 2.23 | 3.21 |
| 49. | <i>Syzygium heyneanum</i> Wall | 2.0 | 2.3 | 1.0 |
| 50. | <i>Syzygium nervosum</i> A. Cunn.ex DC. | 3.0 | 1.23 | - |
| 51. | <i>Terminalia arjuna</i> (Roxb.) W. & A. | 20.41 | - | - |
| 52. | <i>Terminalia bellirica</i> (Gaertn) Roxb. | 4.28 | 1.58 | 2.35 |
| 53. | <i>Terminalia chebula</i> Retz. | 1.32 | 2.5 | 1.02 |
| 54. | <i>Terminalia crenulata</i> (Heyne) Roxb. | 2.0 | - | 29.01 |
| 55. | <i>Trema orientalis</i> (L.) Bl. | - | - | 1.2 |
| 56. | <i>Wrightia tomentosa</i> (Roxb.) Roem & Schult | - | 2.0 | 0.74 |
| 57. | <i>Zanthoxylum armatum</i> DC. | - | 2.36 | 2.54 |
| 58. | <i>Zizyphus mauritiana</i> Lan. | 54.0 | 52.32 | 48.95 |
| 59. | <i>Zizyphus xylopyrus</i> (Retz.) Willd. | - | 1.25 | 0.89 |
| | Total | 299.99 | 299.99 | 299.99 |

South West Bengal is a Rarh region highly influenced by people of other region for the huge applications of green medicine in field. It is a source region of such potent medicinal plants⁴. Therefore study of plant status and their regeneration study are essential to know more about the conservation strategies of those potent plants in a particular area.

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Conflict of Interest

None

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