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Population Structure and Regeneration status of *Xylocarpus granatum* Koen. at Revadanda Mangrove forest (Maharashtra)

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Abstract:

Xylocarpus granatum is most important medicinal plant. Population structure of *Xylocarpus granatum* was studied by observing number of individuals of species at the Revadanda mangrove forest. Individuals were categorized on the basis of diameter class i.e. seedling (0-2 cm), sapling (>2-6 cm) and adult (>6 cm). The stand density of tree species is calculated from the mangrove area of Revadanda. The diameter distribution pattern of adult indicates decrease in number of individuals in higher diameter class. As per IUCN category, *Xylocarpus granatum* is least concern plant. The policy should be made to protect this species legally to make awareness about this plant to people with its importance and need of conservation by addressing the prevalent factors which affects natural regeneration of the species.

***Index Terms**:* Conservation, density, diameter, distribution, Population structure, regeneration status

I. INTRODUCTION:

The existence of species completely depends on its regeneration status under available environmental condition. Regeneration is critical phase of forest management because it maintains species composition. The regeneration status of community can be assessed from the population dynamics of seedling and sapling in the forest community. Regeneration status of tree species based on the age and diameter structure of the population (Pritts et al. 1983; ; Khan et al., 1987; Bhaiyan et al., 2003). The population structure was characterized by the sufficient number of seedling, sapling and young trees which represents satisfactory regeneration while inadequate number in seedling and sapling of tree species in a forest indicates poor regeneration (Saxena, 1984). The successful regeneration of species depends on its ability to produce large number of seedlings and the ability of seedling and sapling to survive and grow (Good and Good, 1972). However the presence of sufficient number of seedling, sapling and young trees is greatly influenced by interaction of biotic and abiotic factors of environment (Akasamit et al., 1984; Khan et al., 1986). The intensity magnitude and frequency of disturbance determine the structural composition of forest (Khan et al., 1987; Armesto et al., 1985). The disturbance has negative impact and disturbing the climax (Clement, 1936). The studies on population structure and regeneration status were carried out by several workers (Cao, et al., 1996; Uma et al., 1998; Veblen et al., 1979).

Xylocarpus granatum is belongs to family Meliaceae. It is most frequently occurs in the world and rarely found in the Maharashtra. It is locally known as 'Samudrafal'. It is medium sized tree occurs in the mangrove forest. The fruits of *X. granatum* used in pharmaceutical industries. This plant is least concern as per IUCN data (Ellison et al, 2010). Various researchers from Maharashtra reported this species from very few localities with least number and reported as critically endangered plant (Bhosale, 2002, Jugale, et al. 2009; Chavan and Gokhale, 2013). Fisherman collects seeds and fruits from flowing water for medicinal purpose. So regeneration and distribution is very less.

This study represents regeneration and population status of *X. granatum* at the Revadanda mangrove forest.

II. STUDY AREA:

The study was conducted along the site of Kundalika river in the Raigad district of Maharashtra state, India. Study site situated at latitude $18^0$32.871'N and longitude$72^0$55.787'E. Kundalika river join with Arabian sea through Revadanda estuary. Ecotourism as wel as biotic interfaces has been created large scale disturbance of this mangrove community.

III. METHODOLOGY:

The ability of mangrove seedlings to arrive and germinate to establish seedling was tested by 5m X 5m quadrats with distance from Kundalika river in Revadanda. Seedling and germinating seeds were counted by laying of 20 quadrats of 5m X 5m in 100 x 10m transect. These quadrats were monitored for a three months period to determine reproductive material.

IV. RESULTS:

A) Floristics:

According to stratification composition of forest, plant is occur 0.4 km away from the river bank. The common associate of this species are *Rhizophora mucronata, Avecinnia marina, Sonertia apetala, Sesuvium portulacastrum, Acanthus ilicifolius*. River bank is mostly covered by *Sonertia apetala.*

B) Data Analysis:

Population structure of *X. granatum* studied during post monsoon season by using quadrats. Data was collected in the form seedling, Sapling and adults from different locations of Revadanda mangrove forest and those are labeled as Location 1, Location 2, Location 3 and Location 4. The plant with 0-2 cm diameter treated as a seedling, 3-6 cm as sapling and plants with greater diameter than 6 cm is treated as adult. The seedling, sapling and adults were counted in each quadrat. Diameter of each *Xylocarpus granatum* plant was counted. Plants were classified on the basis of their diameter. Stand density, basal area was calculated per unit area.

Maximum density of seedling found at the location 1 and minimum seedlings were found at the location 4. Maximum sapling found at location 2 and minimum at location 1. Maximum numbers of trees were found in the location 1 and minimum at location 4. At location 1 Trees > sapling > Seedling. At location 2 saplings are more with respect to other locations in the Revadanda mangrove forest. At location 3 seedling and saplings are equal but less than adults. Saplings are dominantly found at the location 4. Distribution of stem in various diameter classes in the total population of the species shows significant difference among the four locations (chi square = 29.91, df =3 and P<0.05). This clearly indicates that, seedlings were grown under canopy so survival rate is less.

Figure 1: Number of individuals with respect to growth and its location

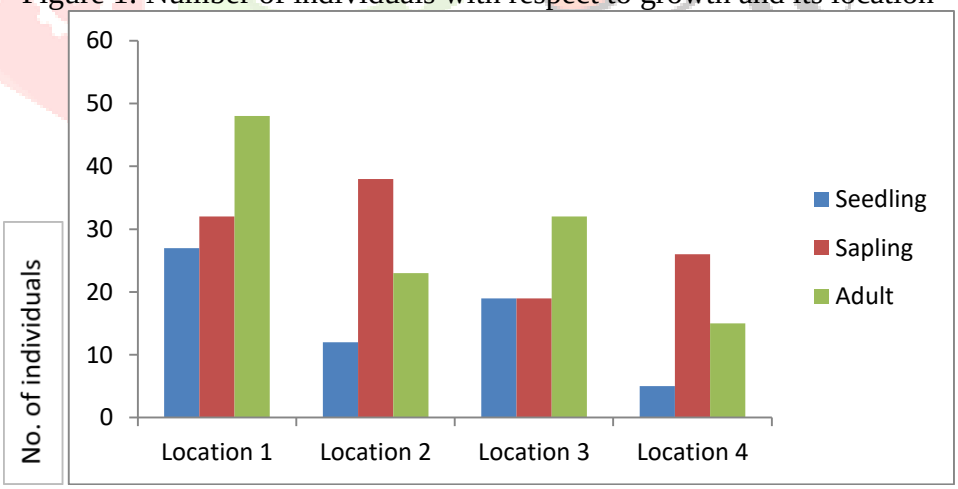

Table 1: Stand Density and Basal area of *Xylocarpus granatum* (>6 cm) at different location of Revadanda mangrove forest

Sr. no.	Parameter	Location 1	Location 2	Location 3	Location 4
1	Stand Density	9.6	4.6	7.4	2.4
2	Basal Area (m^2)	141	13	37	7

Stand density and basal area was calculated for the plants which have diameter greater than six. Maximum density and basal area of *Xylocarpus granatum* plant was recorded from the Location 1. Pattern of stand density shows **Location 1 >Location 3 > Location 2 > Location 4.** (chi square = 32.69, df =3 and P<0.05) Stand density and basal area of this region is more significant for the regeneration of plants.

Assessment of regeneration status of plant communities has a paramount importance for sustainable conservation and management (Khumbongmayum et al., 2006). According to Khumbongmayum et al. (2006), when the number of seedlings of woody plants is greater than saplings and of sapling is greater than mature trees/ shrubs. In the present study, it indicates that the vegetation has not a good regeneration status at location 1 due to canopy cover of larger trees. Regeneration status at location 2 is better than location 1. Species characterized by such lack of individuals at seedling stage are considered as not regenerating and are most vulnerable to local extinction (Khumbongmayum et al., 2006).

IV. DISCUSSION:

Relative proportion of growth form in the total population could provide the regeneration status and structure of population in forest community. Mishra et al. (2003), reported that population structure of different species exhibited decreases in population density in seedling and adult stage. On the contrary, Duchok et al. (2005) observed the dominance of adult individuals of *Illicium griffithii* in different stands and disturbances bear an impact on the natural regeneration of the species. Variation of growth form distribution among the dominant species also reported by Gairola et al. (2014) from the western Himalaya. Number of individuals of selected *Rhododendron* species decreased with the increased of girth may be due to the competition of resources and between species also recorded by many researchers around the world (Zeng, 2002; Li & Chen, 2005). Moreover, the selected *Rhododendron* species were recorded higher large girth class range, indicating the forest is an old one. The girth class distribution attributed to the regeneration and future population stability in forest communities (Pande, 1999)

Present result confirms with Sundriyal and Sharma (1996) study. They reported that the majority of the canopy species showed poor regeneration in Mamlay watershed temperate forest of Sikkim and only 39 were found in regenerated form among the 81 tree species. Iszkulo et al., (2005) also reported that population of *Taxus buccata* inclined toward aging in Western Ukraine. The less proportion of seedling population in the undisturbed stands might be due to the dense canopy and thick litter layer barrier for seedling emergence. Grime (1979) also reported similar results.

The seedling densities decrease close to the parent tree in temperate forests because of density-dependent mortality (Lambers & Clark, 2003). Our result corroborates with the findings of Noguchi and Yoshida (2004) who reported low density of seedling and sapling in stands having heavy logging intensity in hardwood mixed forests of northern Japan.

V. CONCLUSION:

our findings of present study indicate that *Xylocarpus granatum* tree species have a good population structure with seedlings, saplings and trees. The regeneration efficacy from seedling to sapling stage is very poor and also very slow growing in nature. This plant is reported as critically endangered plant in the Maharashtra. So proper conservation methods have to adapt to save *Xylocapus granatum*.

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VII. REFERENCES:

Aksamit, S. E. and Irving, F. D. 1984. Prescribed burning for lowland black spruce regeneration in northern Minnesota. Candian Journal of Forest Research, 14, 107–113.

Armesto, J. J. and Pickett, S. T. A. 1985. Experiments on disturbance in old-field plant communities: Impact on species richness and abundance. Ecology, 66, 230–240.

Bhosale, L. J. 2002. New mangrove records for the coast of Maharashtra: A note Seshaiyana 10 (2):1

Bhuyan, P., Khan, M. L. and Tripathi, R. S. 2003. Tree diversity and population structure in undisturbed and human-impacted stands of tropical wet evergreen forest in Arunachal Pradesh, Eastern Himalayas India. Biodiversity Conservation 12, 1753–1773.

Cao, M., Zhang, J. H., Feng, Z., Deng, J. and Deng, X., 1996. Tree species composition of a seasonal rainforest in Xishuangbanna, South West China. Tropical Ecology 37, 183–192.

Chavan, N. S. and M. V. Gokhale 2013. Critically endangered mangrove species along the coast of Maharashtra: Victim of human encrochment. Proceeding: Dynamics of Mangrove Ecosystem 51-54.

Clements, F. E., 1936. Nature and structure of the climax. J. Ecol., 24, 252–284.

Duchok, R., Kent, K., Devi, K. A., Paul, A., & Khan, M. L. 2005. Population structure and regeneration status of medicinal tree *Illicium griffithii* in relation to disturbance gradients in temperate broad-leaved forest of Arunachal Pradesh. Current Science, 89(4), 673–676.

Ellison, J., Koedam, N.E., Wang, Y., Primavera, J., Jin Eong, O., Wan-Hong Yong, J. & Ngoc Nam, V. (2010). *Xylocarpus granatum*. *The IUCN Red List of Threatened Species* 2010: e.T178845A7624881. https://dx.doi.org/10.2305/IUCN.UK.20102.RLTS.T178845A7624881.en. Downloade d on 17 October 2020.

Gairola, S., Rawal, R. S., Todaria, N. P., & Bhatt, A. 2014. Population structure and regeneration patterns of tree species in climate-sensitive subalpine forests of Indian western Himalaya. Journal of Forestry Research, 25(2), 343–349.

Good, N. F. and Good, R. E., 1972. Population dynamics of tree seedlings and saplings in mature eastern hardwood forests. Bull. Torrey Bot. Club, 99, 172–178.

Grime, J. P. (1979). Plant strategies, vegetation processes, and ecosystem properties (2nd ed., pp. 222). New York, USA: John Wiley and Sons Ltd.

Huston, M. A., A general hypothesis of species diversity. Am. Nat., 1979, 113, 81–101.

Iszkulo, G., Boratynski, A., Didukh, Y., Romaschenko, K. and Pryzhko, N. 2005. Changes of population structure of *Taxus buccata* L. during 25 years in protected area (Carpathians, Western Ukraine). *Polish Journal of Ecology*, 53(1), 13–23.

Jugale, S. B., Bhosale, L. J. Kade, T. D. and Nadaf A. B. 2009. Genetic diversity assessment in intra and inter population of *Xylocarpus granatum* Koen.: a critically endangered and narrowly distributed species of Maharashtra. Current Science 97 (5): 695-696.

Khan, M. L., Rai, J. P. N. and Tripathi, R. S. 1987. Population structure of some tree species in disturbed and protected sub-tropical forests of northeast India. Acta Ecologia., 8, 247–255.

Khan, M. L., Rai, J. P. N. and Tripathi, R. S. 1986. Regeneration and survival of tree seedlings and sprouts in tropical deciduous and subtropical forests of Meghalaya, India. For. Ecol. Manage., 14, 293–304.

Khumbongmayum AD, Khan ML, Tripathi R. S. 2006. Biodiversity conservation in sacred groves of Manipur, Northeast India: population structure and regeneration status of woody species. Biodiversity Conservation 15:2439–2456

Lambers, J. H. R., & Clark, J. S., 2003. Effects of dispersal, shrubs, and density- dependent mortality on seed and seedling distributions in temperate forests. Canadian Journal of Forest Research, 33(5), 783–795.

Li, W. J., & Chen, X. 2005. A preliminary study on structure and regeneration of *Rhododendron delavayi* population in Baili Azalea forest park. Guizhou Science, 23(3), 46–49.

Mishra, B. P., Tripathi, R. S., Tripathi, O. P., & Pandey, H. N. 2003. Effects of disturbance on the regeneration of four dominant and economically important woody species in a broad-leaved subtropical humid forest of Meghalaya, northeast India. Current Science, 84(11), 1449–1453.

Noguchi, M., & Yoshida, T. 2004. Tree regeneration in partially cut conifer-hardwood mixed forests in northern Japan: Roles of establishment substrate and dwarf bamboo. Forest Ecology and Management, 190(2–3), 335–344.

Pande, P. K. 1999. Comparative vegetation analysis and sal (*Shorea robusta*) regeneration in relation to their disturbance magnitude in some sal forests. Tropical Ecology, 40(1), 51–61.

Pritts, M. P. and Hancock, J. E., 1983. The effect of population structure on growth patterns of the weedy goldenrod Solidago pauciflos culose. Canadian. Journa of Botany., 61, 1955–1958.

Saxena, A. K. and Singh, J. S., 1984. Tree population structure of certain Himalayan forest associations and implications concerning their future composition. Vegetatio, 8, 61–69.

Uma Shankar, Lama, S. D. and Bawa, K. S., 1998. Ecosystem reconstruction through 'taungya' plantations following commercial logging of a dry, mixed deciduous forest in Darjeeling Himalaya. For. Ecol. Manage., 102, 131–142.

Veblen, T. T., Ashton, D. H. and Schlsgel, F. J., 1979. Tree regeneration strategies in lowland Nothofagus dominated forest in south-central Chile. Journal of Biogeography., 6, 329–340.

Zeng, H. Y. 2002. A Study on the population structure and distribution pattern of the endangered and rare plant *Rhododendron Huadingense. Journal of Huaihua University*, 21(5), 36–38.

Zhang, W. H., Wang, Y. P., Kang, Y. X., & Liu, X. J. 2004. Age structure and time sequence prediction of populations of an endangered plant, *Larix potaninii* var. *Chinensis.* Biodiversity Science, 12(3), 361–369.

Sundriyal, R. C., & Sharma, E. 1996. Anthropogenic pressure on tree structure and biomass in the temperate forest of Mamlay watershed in Sikkim. Forest Ecology and Management, 81(1–3), 113–134.