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Original Paper

Sustaining NTFP Species in Cauvery Wildlife Sanctuary: Regeneration Trends?

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Abstract: This study investigates the regeneration dynamics of three prominent Non-Timber Forest Product (NTFP) species, namely *Phyllanthus indofischeri*, *Boswellia serrata*, and *Terminalia chebula*, within the Cauvery Wildlife Sanctuary (CWLS) in Karnataka, India. Utilizing 20 plots distributed across diverse habitats within the sanctuary, the research examines tree girth, seedling, and sapling densities of these species. The findings elucidate distinct population dynamics, notably revealing poor regeneration and limited distribution in *T. chebula*, contrasted by robust populations with ongoing regeneration observed in *B. serrata* and *P. indofischeri*. This underscores the necessity for further exploration into reproductive biology and germination ecology, as well as tailored conservation strategies addressing different forest types and considerations of fire impacts on NTFP populations.

Keywords: Cauvery Wildlife Sanctuary, Non-Timber Forest Products (NTFPs), *Phyllanthus indofischeri, Boswellia serrata, Terminalia chebula.*

Introduction

Forests play a pivotal role in providing indispensable socio-economic and environmental benefits crucial for human existence (Millennium Ecosystem Assessment, 2005; Food and Agriculture Organization, 2014). Globally, Non-Timber Forest Products (NTFPs) directly sustain over a billion individuals (MEA, 2005), with an additional three billion benefiting indirectly for various economic and social purposes

(Agrawal et al., 2013). Consequently, NTFPs serve as a vital livelihood source for forest-dependent communities worldwide. Extensive research has underscored the multifaceted contributions of NTFPs to enhancing human well-being and rural livelihoods, garnering widespread recognition on a global scale (Angelsen et al., 2014; Shackleton et al., 2015; Shackleton and Pullanikkatil, 2018). In India, Non-Timber Forest Products (NTFPs) species contribute $2.7 billion annually and constitute 55% of total employment in the forestry sector (FAO, 2014). These NTFPs find application in various domains, including food, medicines, handicrafts, and as sources of subsistence and cash income. Previous research indicates that merely harvesting fruits does not significantly impact NTFP populations; instead, various site-specific factors can influence population structures (Ticktin, 2004; Brummitt and Bachman, 2010; Scoles et al., 2012). Therefore, this study aims to assess the regeneration patterns of key Non-Timber Forest Product species in the Cauvery Wildlife Sanctuary, Karnataka, elucidating the implications for conservation and management strategies.

Study area

The Cauvery Wildlife Sanctuary (CWS) covers an area of approximately 1200 square kilometres and is located between 11º 56’ 49” to 12º 21’ 26” N and 77º 1’ 5” to 77º 46’ 55” E in the Western Ghats of Karnataka, India. It receives an average annual rainfall ranging from 750 mm to 800 mm, primarily during the Northeast monsoon, with additional contributions from the Southwest monsoon. The sanctuary comprises major forest types including Southern tropical dry-deciduous, Riparian, and Scrub forests. The dry forests exhibit a more open landscape dominated by species such as *Anogeissus latifolia*, *Hardwickia binata,* and *Boswellia serrata*.

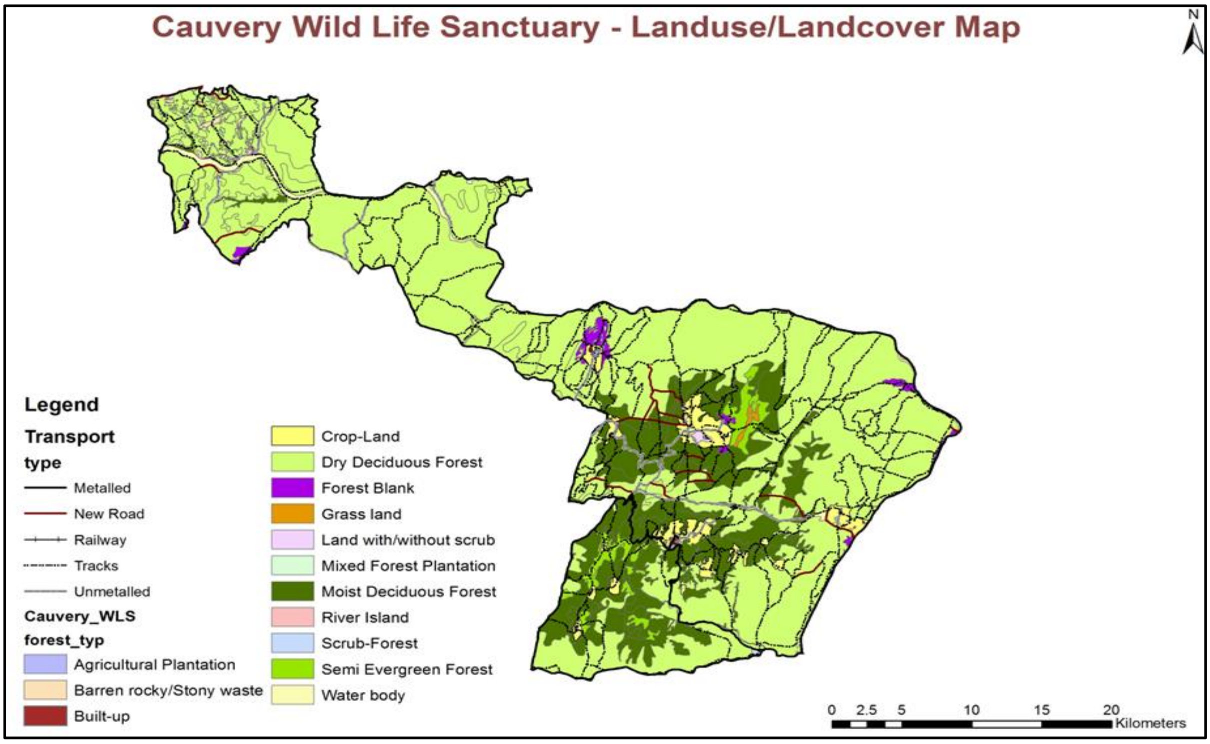

Figure 1: Illustrates the study site of the Cauvery Wildlife Sanctuary

At higher altitudes, the understorey consists of deciduous tree species alongside grasses.The Cauvery Wildlife Sanctuary is rich in herbivores such as Elephants, Gaur, Barking deer, and Cheetal. The river Cauvery, which borders the sanctuary, supports a diverse aquatic ecosystem including Crocodiles, Otters (*Lutra lutra*), and various fish species, notably the "Masheer fish" (*Tor putitora*), colloquially known as the "Tiger in the water." Elephants (*Elephus maximus*) are abundant throughout the sanctuary, ranging from Muthathi to Palar along the Cauvery River. Additionally, the sanctuary provides habitat for Barking deer, Monitor Lizards, Giant grizzled squirrels, Jungle cats, Wild boars, Peacocks, and numerous bird species. Occasional sightings of Panthers, Indian wild dogs, Sloth bears, and Jackals add to the biodiversity. Reptiles such as Pythons and various snake species also inhabit the area.

Methods

The regeneration study involved establishing 20 plots, each measuring 100m x 10m, to assess tree girth, seedlings, and saplings of selected NTFP species across different sites within the sanctuary. Within each plot, the number of trees with a girth greater than 30 cm was recorded, and their girth was measured at a height of 1.37 cm above ground level. Documentation of anthropogenic activities along transects was also conducted. For tree population distribution studies 20 linear transect of 1000 m X 10 m were installed in the forest margin to interior of the forests. In each plot the number of trees (gbh > 30 cm) of selected non-timber forest produces (NTFPs) were counted and their girth (GBH) measured at 1.37 cm above ground level. For each selected NTFPs species in 20 laid transects were recorded, marked in the different forest types where the selected study species occur. The individuals of all selected NTFP tree species in each transects were marked and tagged. On each transects, signs of anthropogenic activities were recorded.

Results

Based on the conducted surveys along linear transects, the size class distribution of *B. serrata* (Figure 2) revealed a varied distribution across different size classes. Similarly, the frequency distribution of *P. indofischeri* (Figure 3) and *T. chebula* (Figure 4) exhibited patterns of occurrence along the transects. Furthermore, the regeneration status of *B. serrata* (Figure 5) demonstrated the presence of individuals across different size classes, indicating ongoing regeneration within the studied area. Additionally, the frequency distribution of *P. indofischeri* along 1000mX10m linear transects (Figure 6) provided insights into its spatial distribution within the habitat. Similarly, the regeneration of *T. chebula* along 100X10m linear transects (Figure 7) showcased the extent of regeneration within the sampled area.

Discussion

The size class distribution of *B. serrata*, along with the frequency distributions of *P. indofischer*i and *T. chebula*, offer insights into the population dynamics and habitat preferences of these plant species. The observed heterogeneity in size class distribution suggests varied growth rates and recruitment patterns within the *B. serrata* population (Sinha et al., 2005). Similarly, the frequency distributions of *P. indofischeri* and *T. chebula* indicate their differing degrees of abundance and distribution within the study area, possibly influenced by habitat characteristics and microenvironmental factors (Ticktin et al., 2012). The presence of regeneration in *B*. serrata underscores the species' capacity for self-renewal and highlights the importance of maintaining suitable habitat conditions for ongoing recruitment. This finding is crucial for the long-term sustainability of *B. serrata* populations, especially in the face of environmental disturbances and anthropogenic pressures. Understanding the factors influencing regeneration success can inform conservation strategies aimed at enhancing the resilience of these populations. The spatial distribution patterns revealed by the frequency distributions of *P. indofischeri* and *T. chebula* along linear transects offer valuable insights into their ecological interactions and habitat preferences. Variations in their occurrence across different transects may reflect niche differentiation, competitive interactions, or responses to environmental gradients. Further research is needed to elucidate the underlying mechanisms driving these distribution patterns and their implications for community dynamics and ecosystem functioning. Factors such as grazing, branch cutting, and fire were identified as primary contributors to population decline and insufficient regeneration, as documented by Sinha et al. (2005) and Ticktin et al. (2012).

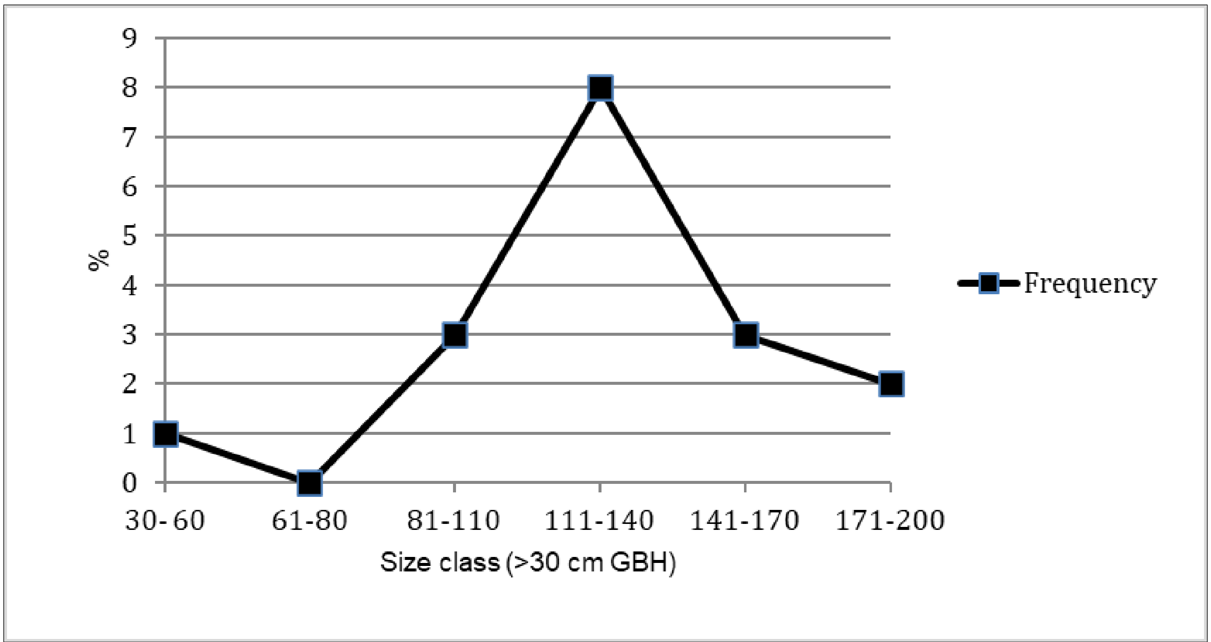

Figure 2: Size Class Distribution of *Boswellia serrata* in 20, 1000mX 10m Linear Transects

Conservation Implications and Management Strategies

The findings presented in this study have important implications for conservation and management practices within the study area. By identifying areas of high regeneration potential and understanding the habitat preferences of key plant species, conservation efforts can be targeted towards preserving critical habitats and enhancing ecosystem resilience. Furthermore, monitoring population dynamics and spatial distributions over time can provide valuable information for adaptive management strategies aimed at mitigating the impacts of habitat degradation and climate change. It is important to acknowledge the limitations of the study, such as the spatial scale of the transect surveys and potential confounding factors influencing population dynamics.

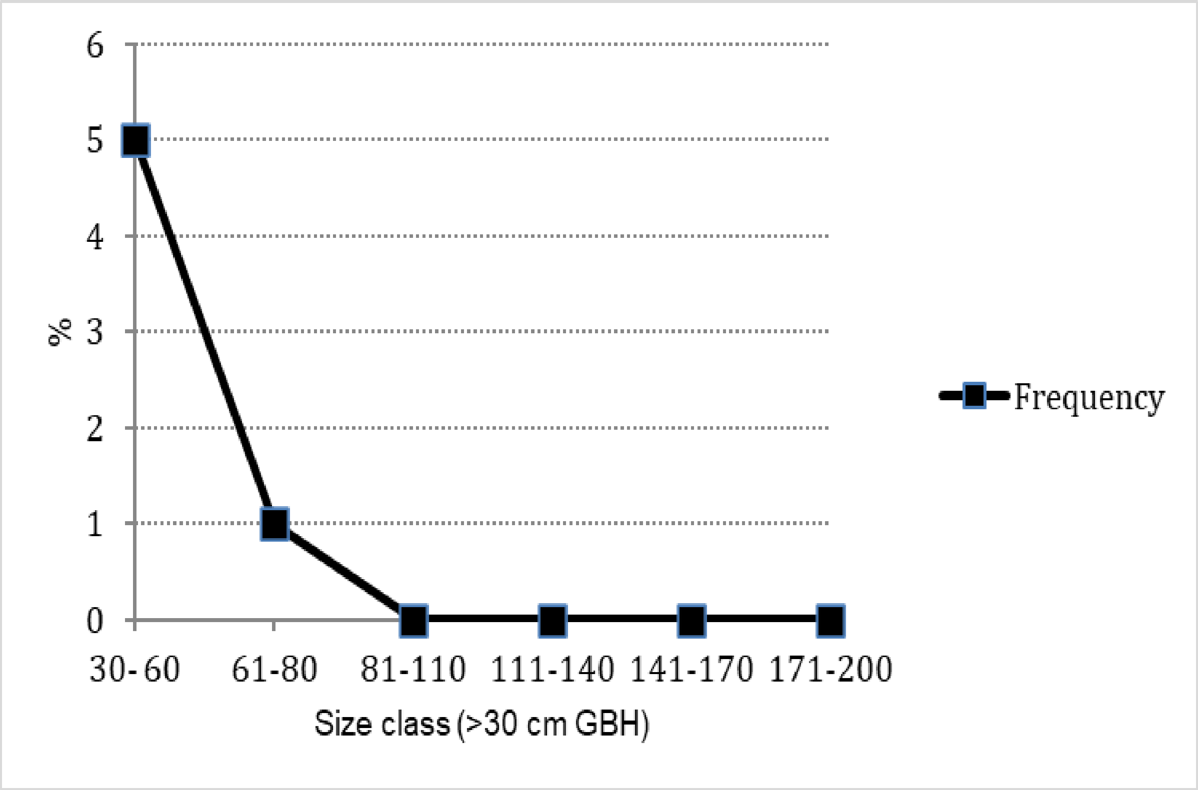

Figure 3: Frequency Distribution of *Phyllanthus indofischeri* in 20, 1000X10m Linear transects

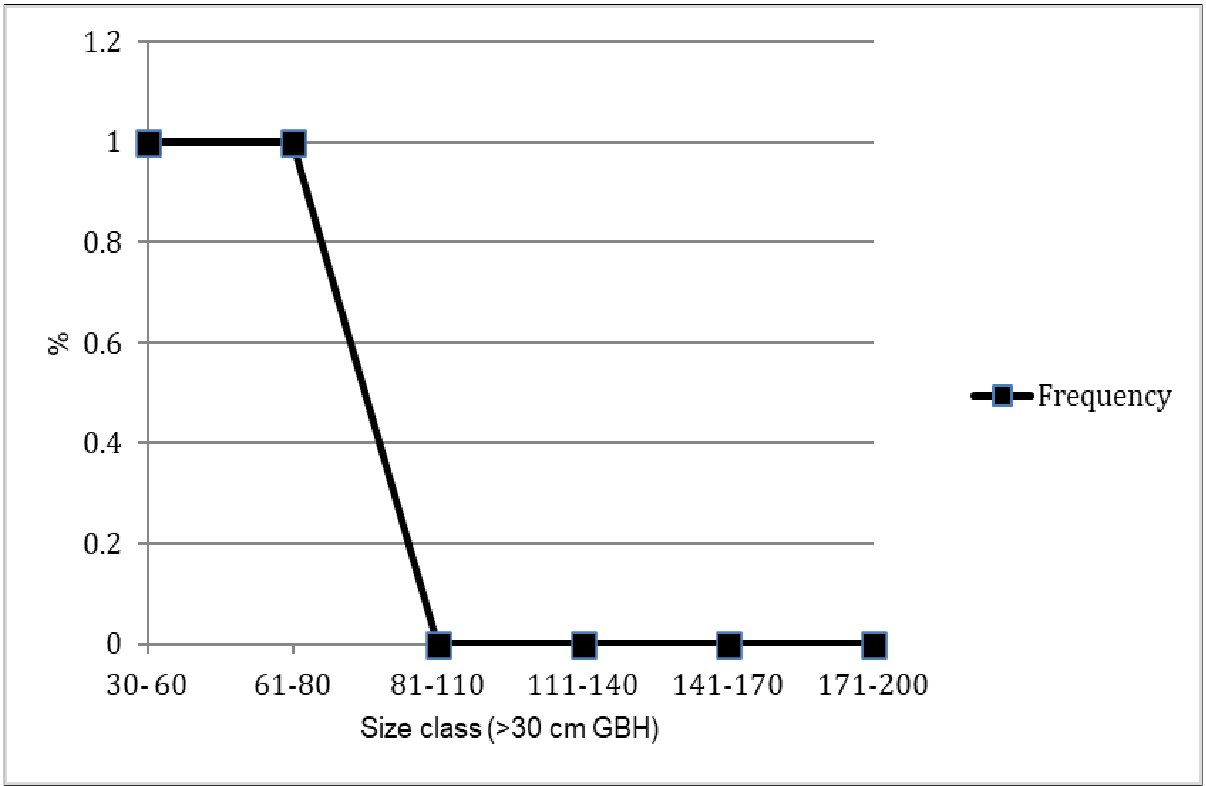

Figure 4: Frequency Distribution of *Terminalia chebula* in 20, 1000mX 10 m Linear transects

Future research could explore additional variables, such as soil characteristics, microclimate conditions, and biotic interactions, to provide a more comprehensive understanding of the factors shaping plant community structure and dynamics within the study area.

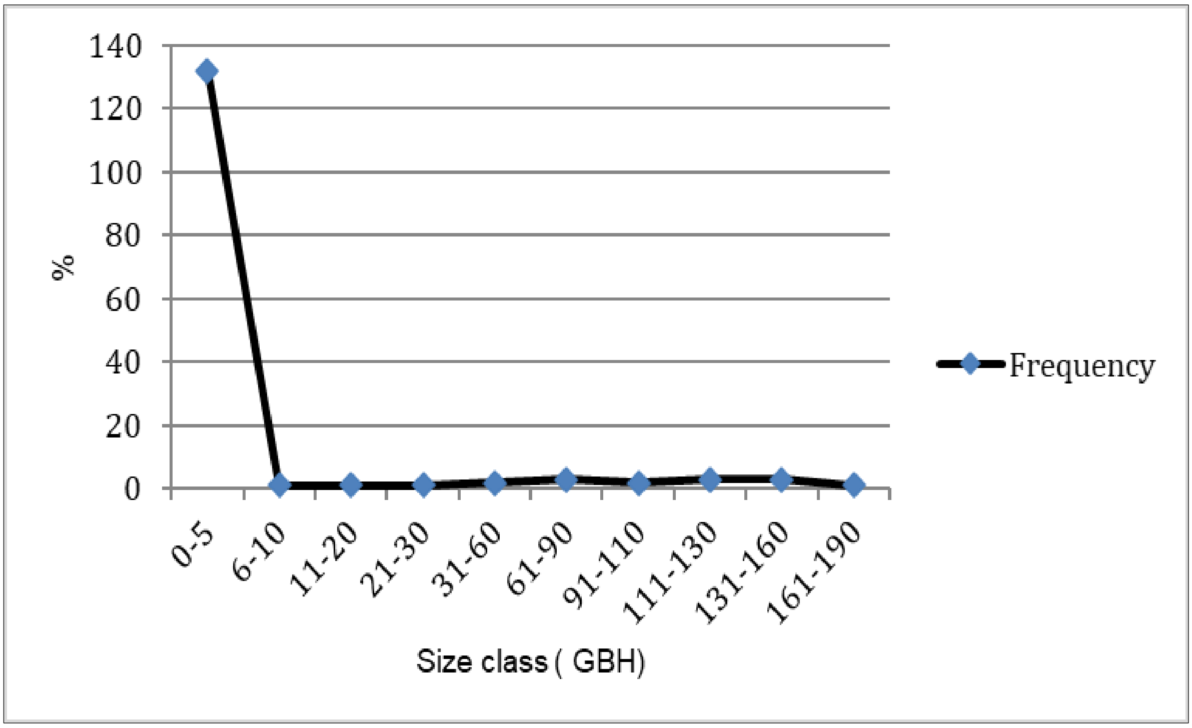

Figure 5: Frequency distribution of regeneration of *Bosewellia serrata*

Figure 6: Frequency distribution of *Phyllanthus indofischeri* in 20, 100 mX 10 m Linear transects

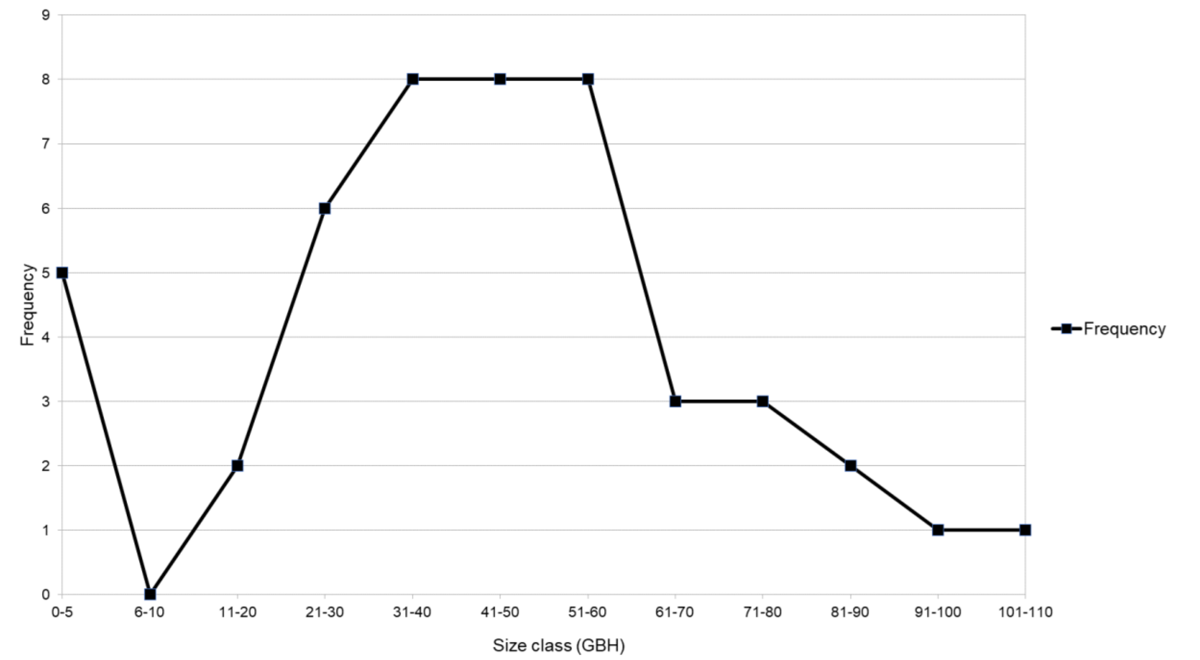

Figure 7: Regeneration of *Terminalia chebula* in 20, 100X 10 m Linear Transects

Conclusion

In conclusion, this study sheds light on the population dynamics and spatial distribution of *B. serrata*, *P. indofischeri*, and *T. chebula* within the surveyed habitat. The analysis of size class distributions, frequency distributions, and regeneration status provides valuable insights into the ecological characteristics and habitat preferences of these plant species. These findings have significant implications for conservation and management.

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