Density and Population Structure of Globally Vulnerable and Endangered Trees in Chennai Metropolitan City, India

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Abstract A quantitative floristic study was conducted in Chennai metropolitan city (CMC), Tamil Nadu, India to estimate density and population structure of trees categorized as vulnerable and endangered by International Union for Conservation of Nature and Natural Resources (IUCN) red-list. A total of one hundred 1–ha (100 m \times 100 m) square plots were randomly laid to estimate density and species richness of threatened trees in study area. All trees \geq 10 cm girth at breast height (gbh) were recorded, and identified up to species level on the field with the aid of regional floras and checklists. Six different land uses were recognised. In total, 10426 trees belonging to 99 species, 36 families and 86 genera were recorded. Of six land use categories, riverbanks had highest tree density (150.08 ± 21.02 trees ha\(^{-1}\)) followed by parks (138.86 ± 29.08 trees ha\(^{-1}\)) and institutional areas (98.77 ± 4.48 trees ha\(^{-1}\)). In total, 1272 IUCN red-listed trees belonged to six families and eight genera were enumerated. Among land uses, educational institutions had largest number of threatened species (374 individuals) followed by parks (327 individuals) and residential areas (228 individuals). We find Chennai’s urban forests as home for seven vulnerable and three endangered tree species. This study reveals density and population structure of threatened trees growing in CMC, India.

Keywords Endangered Tree Species, South India, Threatened Species, Urban Forest, Vulnerable Tree Species

1. Introduction

Urban forests serve aesthetic, ecological, health, psychological and social functions [1]. They form a considerable amount of nation’s total tree cover [2]. In addition, urban forests provide habitat for plants and animals [3]. Frequently, the species richness of urban forests is greater than it is in rural areas [4-8]. Further, urban forests provide niches to endangered species [9]. Besides, urbanized areas also harbor a large number of threatened species [10-13]. Interestingly, even a small green space serves as a habitat for native flora and fauna [14]. Information on density and species richness of threatened species is one of the basic needs to assess conservation values of urban forests and trees [15]. Promoting and preserving biota within urban forests is believed to decelerate the uncontrollable biodiversity loss [2]. Baseline data such as density, diversity and species richness of plant and animal species are scarce for many Indian cities including Chennai. Information on these lines could aid in the preparation of conservation measures that protect and preserve species from damages. Only a limited number of studies have concentrated on urban biodiversity in Chennai Metropolitan City (CMC) [14, 16, 17]. Moreover, information on threatened trees of CMC is lacking. Thus, the present study was planned to fill this gap, and to assess density and species richness and population structure of globally vulnerable and endangered tree species in CMC.

2. Methods

2.1. Study Area

Chennai is one of the four metropolitan cities of the Indian sub-continent. The city is the capital of Tamil Nadu state and has 174 km\(^2\) of geographical area. Climate of the city is tropical-humid. The mean maximum and minimum temperature and rainfall are 37 °C and 24 °C, and 1200 and
1300 mm, respectively [18]. The city serves as home for 6.4 million people [19]. The city has Bay of Bengal as its eastern border and Thiruvallur and Kanchipuram districts as its northern, southern and western boundaries.

2.2. Field Survey

The entire area of CMC is sub-grided into hectares by using ArcGIS 9.3 tool. Among sub-grids 100 study plots (one ha each) were selected with random table for tree density enumeration. A total of one hundred 1-ha (100 m × 100 m) square plots were laid to reveal density of IUCN’s Red-listed trees in CMC (Figure 1). Study area comprises of residential areas, urban parks, educational institutions, roads, riverbanks and government offices (Table 1). All trees ≥ 10 cm girth at breast height were counted. All the encountered trees were identified to species level in the field with the help of available field guides, floras and checklists [14, 16, 20]. Voucher specimens were deposited at Pachaiyappa’s College Herbarium, Chennai (PCHC). Status of threatened species was recorded with the help of IUCN Red List’s website [21].

![Figure 1. Map of Chennai metropolitan city wherein tree diversity study conducted](image-url)
Table 1. Land use types and area covered to record threatened trees in study area

| Land use type            | Area covered (ha) |
|--------------------------|-------------------|
| Educational institutions | 19.532            |
| Riverbanks               | 13.234            |
| Parks                    | 21.512            |
| Road sides               | 16.112            |
| Residential areas        | 20.511            |
| Government offices       | 9.099             |
| Total                    | 100.000           |

2.3. Diversity Indices

The Shannon diversity ($H$) and equitability ($E_h$) indices were computed for all the sample plots together (total area = 100 ha) [22].

$$H = -\sum_{i=1}^{S} P_i \ln P_i$$

where $H$ is known as Shannon diversity index; $P_i$ termed as a fraction of the whole population made up of species $i$; $S$ recognized as numbers of species encountered; $\sum$ is the total number of species from 1 to $S$.

Shannon equitability index ($E_h$) computed by dividing $H$ by $H_{max}$ ($H_{max} = \ln S$). $E_h = H/H_{max} = H/\ln S$.

Species richness of study area was calculated directly by summing the number of species encountered in each 1-ha study plot. Similarly, tree density of study area also calculated directly by totaling the number of individuals recorded in each study plot.

3. Results and Discussion

3.1. Species, Genera and Family Richness

On the whole, during January to December, 2012 we recorded 10426 trees in 100 ha study area. Ninety nine tree species belonging to 36 families and 86 genera were recorded. The family Fabaceae represented with large number of species (22 species) followed by Arecaceae, Bignoniaceae and Moraceae (each 7 species), while 17 families represented by just single species’ each in study area. Of 99 species, 43 species each recorded under not evaluated and least concern, 8 in vulnerable, 2 each in data deficient and endangered, and just one in near threatened categories of IUCN’s Red List (Figure 2). Seven species namely, Canthium dicoccum, Chloroxylon swietenia, Delonix regia, Khaya senegalensis, Pterocarpus marsupium, Saraca asoca and Swietenia macrophylla were recorded as vulnerable in IUCN’s Red List (Figure 2). Seven species namely, Canthium dicoccum, Chloroxylon swietenia, Delonix regia, Khaya senegalensis, Pterocarpus marsupium, Saraca asoca and Swietenia macrophylla were recorded as vulnerable in IUCN’s Red List, while the remaining three species Guaiacum officinale, Pterocarpus santalinus and Swietenia mahagoni were found as endangered (Table 2).
Table 2. Botanical name, family, density and IUCN categories of trees recorded in Chennai metropolitan city, India (NE: Not Evaluated, DD: Data Deficient, LC: Least concern, NT: Near Threatened, VU: Vulnerable, EN: Endangered)

| Botanical name               | Family            | Density | IUCN category |
|------------------------------|-------------------|---------|---------------|
| 1. Acacia auriculiformis A.Cunn. ex Benth. | Fabaceae          | 15      | LC            |
| 2. Adenanthera pavonina L.    | Fabaceae          | 65      | LC            |
| 3. Alangium salvifolium (L.f.) Wangerin. | Cornaceae         | 5       | LC            |
| 4. Albizia saman (Jacq.) F.Muell. | Fabaceae          | 430     | NE            |
| 5. Albizia lebbeck (L.) Benth. | Fabaceae          | 27      | NE            |
| 6. Alstonia scholaris (L.) R. Br. | Apocynaceae       | 17      | LC            |
| 7. Annona squamosa L.         | Annonaceae        | 15      | LC            |
| 8. Artocarpus heterophyllus Lam. | Moraceae          | 31      | NE            |
| 9. Azadirachta indica A. Juss. | Meliaceae         | 215     | LC            |
| 10. Bauhinia racemosa Lam.     | Fabaceae          | 27      | NE            |
| 11. Bixa orellana L.          | Bixaceae          | 5       | LC            |
| 12. Bombax ceiba L.           | Bombacaceae       | 23      | NE            |
| 13. Borassus flabellifer L.    | Areceae           | 27      | NE            |
| 14. Butea monosperma (Lam.) Taub. | Fabaceae          | 7       | NE            |
| 15. Caesalpinia coriaria (Jacq.) Willd. | Fabaceae         | 35      | NE            |
| 16. Caesalpinia pulcherrima (L.) Sw. | Fabaceae         | 37      | LC            |
| 17. Callistemon citrinus (Curtis) Stapf. | Myrtaceae       | 10      | NE            |
| 18. Calophyllum inophyllum L.  | Clusiaceae        | 13      | LC            |
| 19. Canthus dicoccum (Gaertn.) Merr. | Rubiaceae       | 52      | VU            |
| 20. Carica papaya L.           | Caricaceae        | 52      | DD            |
| 21. Caryota urens L.           | Areceae           | 13      | LC            |
| 22. Cassia fistula L.          | Fabaceae          | 57      | LC            |
| 23. Cassia roxburghii DC.      | Fabaceae          | 62      | NE            |
| 24. Cassia siamea Lam.         | Fabaceae          | 27      | LC            |
| 25. Casuarina equisetifolia L.  | Casuarinaceae     | 65      | LC            |
| 26. Chloroxylon swietenia DC.  | Rutaceae          | 6       | VU            |
| 27. Chrysobalanus lucensens H.Wendl. | Areceae          | 75      | NT            |
| 28. Cocos nucifera L.          | Areceae           | 765     | LC            |
| 29. Cordia obliqua Willd.      | Boraginaceae      | 198     | NE            |
| 30. Cordia sebestena L.        | Boraginaceae      | 76      | LC            |
| 31. Couroupita guianensis Aubl. | Lecythidaceae     | 5       | LC            |
| 32. Crateva magna (Lour.) DC.  | Capparidaceae     | 5       | LC            |
| 33. Crescentia cujete L.       | Bignoniaceae      | 5       | LC            |
| 34. Dalbergia coromandeliana Prain | Papilionaceae     | 2       | NE            |
| 35. Delonix regia (Bojer ex Hook.) Raf. | Fabaceae       | 1002    | VU            |
| 36. Diospyros peregrina Gurke  | Ebenaceae         | 3       | NE            |
| 37. Erythrina variegata L.     | Fabaceae          | 15      | LC            |
| 38. Eucalyptus globulus Labill. | Myrtaceae         | 51      | LC            |
| 39. Ficus benghalensis L.      | Moraceae          | 15      | NE            |
| 40. Ficus elastica Roxb.       | Moraceae          | 5       | NE            |
| 41. Ficus racemosa L.          | Moraceae          | 21      | LC            |
| 42. Ficus religiosa L.         | Moraceae          | 33      | NE            |
| 43. Ficus tomentosa L.         | Moraceae          | 3       | NE            |
| 44. Gliricidia sepium (Jacq.) Kunth | Fabaceae         | 47      | LC            |
| 45. Gmelina arborea Roxb.      | Verbenaceae       | 51      | LC            |
| 46. Guaiacum officinale L.     | Zygophyllaceae    | 9       | EN            |
| 47. Guazuma ulmifolia Lam.     | Sterculiaceae     | 297     | LC            |
| 48. Hibiscus tiliaceus L.      | Malvaceae         | 32      | LC            |
| 49. Ixora pavetta Andrews      | Rubiaceae         | 15      | NE            |
Table 2 Continued

|   | Scientific Name                  | Family             | IUCN   | Status   |
|---|----------------------------------|--------------------|--------|----------|
| 50. | Khaya senegalensis (Desv.) A.Juss. | Meliaceae          | 11     | VU       |
| 51. | Kigelia africana (Lam.) Benth.    | Bignoniaceae       | 105    | LC       |
| 52. | Lannea coromandelica (Hoult.) Merr. | Anacardiaceae    | 205    | NE       |
| 53. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 54. | Leucaea latissilqua (L.) Gillis & Stearn | Fabaceae  | 787    | NE       |
| 55. | Limonia acidissima L.            | Rutaceae           | 27     | NE       |
| 56. | Livistona chinensis R.Br.        | Arecaceae          | 15     | NE       |
| 57. | Madhuca longifolia (J. König ex L.) J.F. Macbr. | Sapotaceae  | 65     | NE       |
| 58. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 59. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 60. | Leucaena latisiliqua (L.) Gillis & Stearn | Fabaceae  | 787    | NE       |
| 61. | Limonia acidissima L.            | Rutaceae           | 27     | NE       |
| 62. | Livistona chinensis R.Br.        | Arecaceae          | 15     | NE       |
| 63. | Madhuca longifolia (J. König ex L.) J.F. Macbr. | Sapotaceae  | 65     | NE       |
| 64. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 65. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 66. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 67. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 68. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 69. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 70. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 71. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 72. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 73. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 74. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 75. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 76. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 77. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 78. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 79. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 80. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 81. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 82. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 83. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 84. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 85. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 86. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 87. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 88. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 89. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 90. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 91. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 92. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 93. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 94. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 95. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 96. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 97. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 98. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |
| 99. | Lawsonia inermis L.              | Lythraceae         | 18     | NE       |

**Total** | **10426**
3.2. Density

Density of trees (≥ 10 cm gbh) varied considerably across land use categories. The riverbanks recorded highest tree density (150.08 ± 21.02 trees ha⁻¹) followed by parks (138.86 ± 29.08 trees ha⁻¹) and educational institutions (98.77 ± 4.48 trees ha⁻¹), while roadsides had the least tree density (61.69 ± 6.72 trees ha⁻¹) in CMC (Table 3).

The mean tree density of study area was 104.26 ± 36.13 trees ha⁻¹. The average tree density ha⁻¹ recorded is more or less equal to urban forests of Oakland, USA (111.9 trees ha⁻¹), while it is lesser than urban forests of ten USA cities (45.6 trees ha⁻¹) [23], Miami-Dade county (73 trees ha⁻¹) [24], urban forests of New Delhi, India (228 trees ha⁻¹) [25] and Nagoya, Japan (2852 trees ha⁻¹) [26]. However, the mean tree density ha⁻¹ found in this study is higher than that of what has been reported for urban forests (45.6 trees ha⁻¹) [27] and parks (47.5 trees ha⁻¹) of Bangalore, India [28]; Sacramento, USA (73 trees ha⁻¹) [29]; and Beijing, China (79 trees ha⁻¹) [30].

In total, institutional areas support highest number of threatened trees (374 trees) followed by parks (327 trees) and residential areas (228 trees), while riverbanks had just 15 trees in 13.234 hectare area. Total number of each threatened species varied across land uses. For example, Delonix regia represented with 282 individuals in parks while riverbanks had just 15 individuals (Table 4). Of 10 threatened species, nine (except Delonix regia) represented by large number of individuals in institutional areas, whereas D. regia represented abundantly in residential areas than the other land uses. Similarly, institutional areas had all the 10 threatened species, while riverbanks had just single threatened species.

Generally, stakeholders of institutional areas have awareness on importance of biodiversity and threatened species. In addition, academic institutions have protected environment than the other land use categories and hence harbors all the 10 threatened species. Metropolitan authorities protect urban parks and trees on roadsides from anthropogenic damages. Local people grow trees not only for shade but also to enhance the aesthetic values of buildings and living places. Riverbanks of Cooum and Adyar are highly polluted by unhealthy human activities as is evident from the presence of invasive alien species on riverbanks [31]. Two tropical American species (Prosopis juliflora - Fabaceae and Muntingia calabura - Muntingiaceae) dominate riverbanks in CMC. Thus, only 15 threatened trees are occurring in 13.234 ha area of riverbanks.

| Table 3. The mean (no. ha⁻¹) and total number of trees documented in study area |
|-----------------|-----------------|----------------|-----------------|----------------|----------------|
| Site            | Density of all trees (no. ha⁻¹) mean ± S.D. | Total no. of trees | Number of threatened trees in study area* |
| Educational institutions | 98.77 ± 4.48 | 2173 | 374 |
| Riverbanks      | 150.08 ± 21.02 | 1951 | 15 |
| Parks           | 138.86 ± 29.08 | 3055 | 327 |
| Roadsides       | 61.69 ± 6.72 | 987 | 165 |
| Residential areas | 70.05 ± 5.30 | 1471 | 228 |
| Government offices | 87.67 ± 5.61 | 789 | 163 |
| Mean ± S.D.     | 104.26 ± 36.13 | 10426 | 1272 |

*Threatened trees include both vulnerable and endangered tree species

| Table 4. Number of threatened trees encountered in different land use categories in Chennai metropolitan city, India |
|-----------------|-----------------|----------------|-----------------|----------------|----------------|
| Species         | Institutions | Riverbanks | Parks | Roadsides | Residential areas | Government offices |
| Delonix regia   | 231           | 15          | 282   | 152        | 188             | 134             |
| Saraca asoca    | 25            | -           | 12    | 5          | 6               | 7               |
| Swietenia macrophylla | 28      | -           | 6     | 2          | 12              | 7               |
| Swietenia mahagoni | 21       | -           | 9     | 2          | 15              | 5               |
| Canthium dicoccum | 40         | -           | 12    | -          | -               | -               |
| Pterocarpus marsupium | 11      | -           | 3     | -          | 4               | 2               |
| Khaya senegalensis | 6           | -           | -     | 1          | 2               | 2               |
| Pterocarpus santalinus | 4       | -           | 3     | 1          | -               | 2               |
| Guaiacum officinale | 6          | -           | -     | 1          | -               | 2               |
| Chloroxylon swietenia | 2          | -           | -     | 1          | 1               | 2               |
| Number of threatened trees | 374 | 15 | 327 | 165 | 228 | 163 |
3.3. Diversity

Shannon diversity index \( (H) \) recorded in study area \( (H = 3.6) \) is very well within the range compared with those of urban forests in the USA (mean = 2.7; range = 2.1-3.9) [32]. However, the present study area had a little higher Shannon index value compared to urban forests of Bangalore Metropolitan City \( (H = 2.68) \) [26, 27] and Miami-Dade County of USA \( (H = 0.58) \) [24]. Similarly, Shannon equitability index \( (E_H = 0.78) \) computed for study area is also higher than in Miami-Dade County of USA \( (E_H = 0.6) \). The top ten species constituted 60.29% of tree community in study area; remaining 89 species together formed only 39.71% tree community. The unequal contribution of species to tree community in study area produced less evenness.

3.4. Density and Diversity of Threatened Species

A total of 1272 threatened tree individuals belonging to six families and seven genera were recorded in 100 ha study area. Density and frequency of threatened species varied considerably in study area. Among 10426 trees, 1272 were found in threatened categories of IUCN’s Red List - 2012. Of 1272 trees 74 belonged to endangered category of Red List, remaining 1198 individuals fell under vulnerable category. Of seven vulnerable species, Delonix regia had highest number of individuals (1002 trees) in study area followed by Saraca asoca and Swietenia macrophylla (each 55 individuals), while Chloroxylon swietenia represented with just six individuals (Table 5). Of 100 study plots, vulnerable tree species Delonix regia recorded in 97 plots, Saraca asoca found in 49 plots, Swietenia macrophylla encountered in 42 plots. The endangered species Swietenia mahagoni recorded in 47 plots, while Chloroxylon swietenia found in just five study plots (Table 5).

Earlier, urban forests have been recognised as habitats for endangered species. Urban green areas of Sweden harbor endangered tree species [3]. The thickly populated Stockholm County had two-thirds of red-listed species [33]. Gustaffson [34] found red-listed species such as Dryopteris cristata and Buxbaumia viridis in urban forests of Stockholm. Similarly, the highly populated Cook County of Chicago metropolitan area is recognised as a home for 130 endangered plant species [35].

The local people and foresters favour Delonix regia (Royal Poinciana) for its beautiful flowers, fruits and fast growth. These days, the urban forest division of Tamil Nadu forest department distributes evergreen tree species such as Saraca asoca, Swietenia macrophylla, Pterocarpus marsupium and Khaya senegalensis to enhance green cover in Chennai city. Chloroxylon swietenia, Canthium dicoccum and Pterocarpus santalinus are representing the local forest type i.e., tropical dry evergreen forest [14, 16, 36].

Table 5. Threatened category, density and frequency of trees recorded in study area

| Species          | Family       | Threatened category (IUCN Red List – 2012) | Density | Frequency |
|------------------|--------------|--------------------------------------------|---------|-----------|
| Canthium dicoccum| Rubiaceae    | Vulnerable                                 | 52      | 19        |
| Chloroxylon swietenia | Rutaceae | Vulnerable                                 | 6       | 5         |
| Delonix regia    | Caesalpinaceae | Vulnerable                                 | 1002    | 97        |
| Guaiacum officinale | Zygophyllaceae | Endangered                                | 9       | 9         |
| Khaya senegalensis | Meliaceae | Vulnerable                                 | 11      | 10        |
| Pterocarpus marsupium | Fabaceae | Vulnerable                                 | 20      | 15        |
| Pterocarpus santalinus | Fabaceae | Endangered                                 | 10      | 8         |
| Saraca asoca     | Caesalpinaceae | Vulnerable                                 | 55      | 49        |
| Swietenia mahagoni | Meliaceae | Endangered                                 | 52      | 47        |
| Swietenia macrophylla | Meliaceae | Vulnerable                                 | 55      | 42        |
| Total            |              |                                            | 1272    | -         |
3.5. Population Structure

In total, tree community of the study area showed a typical expanding population structure. The smallest girth class had the highest number of individuals, while the largest girth class had the least number of trees (Figure 3). However, the population structure of threatened species varied considerably. Among 10 threatened species, four species namely, *Canthium dicoccum*, *Delonix regia*, *Saraca asoca* and *Swietenia macrophylla* showed expanding population structure (Figure 4). The remaining six species had disturbed population structure in study area (Figure 5). For example, the indigenous species *Chloroxylon swietenia* had just three individuals each in 90.1-120 and 120.1-150 cm gbh. To ensure continuous presence of species in a community, the species should possess considerable number of individuals in all the girth classes. If a species’ does not possess viable population then gradually it would lose its place from the community [37, 38]. Planting saplings of threatened species in appropriate places could improve the population structure of trees thereby urban forest of Chennai could serve as a habitat for more number of vulnerable and endangered tree species in the near future.

![Figure 3](image-url)  
*Figure 3. Stand structure of trees based on girth class frequency in study area.*

![Figure 4](image-url)  
*Figure 4. Population structure of Delonix regia based on girth class frequency in study area.*
4. Conclusions

We find Chennai’s urban forest as home for 10 IUCN’s red-listed tree species. Present study recorded density and population structure of threatened trees in 100 ha area of CMC. Further, studies with larger study areas are essential to record the total density and species richness of threatened trees in the entire area of CMC. The Government should provide financial support to researchers to document the essential baseline data on threatened species. In addition, as mentioned in earlier literatures [39-42] dissemination of information about threatened species is essential to preserve the precious natural resource in human dominated CMC, India.

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