Assessment of star rating species at Mamiri forest reserve in Ghana

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ABSTRACT

A forest type is closely linked with species diversity since the survival of many species depends on the forest type. The presence of star rating species in a forest is one of the important indicators of high biodiversity or richness of the forest. The star rating species have become endangered and have suffered with extinction in most of the forests in Ghana. The study was carried out in Mamiri Forest Reserve (MFR) to identify the star rating species and also to determine the Genetic Heat Index of the forest reserve. Sweep sampling technique was used in the study. A total area of 8 hectares was divided into plots each measuring 25m × 25m and all the plant species were identified and their various compositions determined. Out of 377 plant species identified, 73 star rating species were recorded. Allanblackia floribunda was found to be the most dominant species and the family Apocynaceae was the most dominant family with the most number of species. Generally, all the star rating species were highly represented, an indication that the biodiversity of the forest reserve is high and could be considered as one of the biodiversity ‘hotspots’ in Africa, requiring a greater conservation priority.

Key Words: Star Rating Species, Mamire Forest Reserve, biodiversity, Genetic Heat Index.

INTRODUCTION

Forest types and their spatial coverage offer a proxy indicator that aids better understanding and monitoring of the dynamics of quality, quantity and condition of forest resources (Hawthorne and Abu-Juam, 1995). The forest type is closely linked with species diversity since the survival of many tree species depends on the forest type. Future growth and overall quality of life are critically dependent on the quality of the environment. The natural resource base and the quality of air, water, land, and forest represent a common heritage for all generations. To destroy that endowment indiscriminately in the pursuit of short-term economic and social goals penalizes both present and, especially future generations and that a better environmental stewardship is essential to sustain development. Investigations into floristic composition and structure of forests are essential for providing information on species richness of the forest and the changes that they undergo that can potentially be useful for management purpose and assist in understanding forest ecology and ecosystem functions. The biological diversity of tropical forests is immune (Jordan, 1995; Swenson, 2009), not only at the genetic level but also at the species, community and ecosystem levels (Sandlund et al., 1992; Lewis, 2009). In a tropical forest community, there is a lack of species dominance (Townsend et al., 2008), which coupled with the high species diversity, makes it very vulnerable (Jacobs, 1998), particularly for unmanaged or ill-managed forests where the forest is disturbed as a result of human activities. Star rating species are threatened by over-exploitation and forest degradation; Black star species, one of the star ratings is globally rare and require high priorities for careful management (Hawthorne and Abu-Juam, 1995). Communities, through ignorance or economic and/or
social necessity, may inadvertently destroy or exhaust the resources on which they depend for survival (Todaro and Smith, 2003). The presence of star rating species in a forest is one of the important indicators of high biodiversity or richness of the forest. It also indicates the level of management of the forest since they cannot withstand wildfires and forest degradation. The abundance of star rating species determines the Genetic Heat Index of the forest. A high Genetic Heat Index (GHI) signifies that the area is relatively rich in rare species (Hawthorne and Abu-Juam, 1995). Consequently, the loss or degradation of the area would represent a highly significant erosion of genetic resources. Mamiri Forest Reserve though relatively small in size, is rich in indigenous species and can serve as a good research, ecotourism and conservation site. The study was therefore designed to identify the star rating species and to determine the Genetic Heat Index of the Mamiri Forest Reserve.

MATERIALS AND METHODS

Study Area

Mamiri Forest Reserve (MFR) is situated at the Asankragwa Forest District, Wassa Amenfi West District of the Western Region. The Forest Management Unit lies between latitudes 5° 20'- 5° 42' North and longitude 2° 20'- 2° 26' West. MFR has a fairly narrow shape and stretches around 15 kilometers from the North to the South. MFR has a tropical climate with two wet seasons a year. The mean annual temperature of MFR is about 27°C. The mean annual rainfall is 1446.13 millimeters, the wettest area is the extreme southwest (FAO, 2004). The reserve is drained to the south by the tributaries of the Semara River that runs southwards.

METHODS

Along the Permanent Sample Plots established by the Forestry Commission of Ghana, a total of 40 plots were demarcated, each measuring 25m × 25m. Out of the 40 plots, nine plots were selected randomly for the study. Within each of these plots, all the plant species were identified with the help of specialists in species identification. Most of the species were identified in the field by their identifiable features such as leaves, flowers, fruits, colours, bark, etc. Specimens of tree species that could not be identified on the spot were collected and later identified using standard reference textbooks (Hutchinson and Dalziel, 1958; Irvine, 1961; Hawthorne, 1993; Hawthorne and Jongkind, 2006). Microsoft excel was used in analyzing the data and the results presented in the form of bar charts.

RESULTS

Identification of star rating species

A total number of 377 plant species belonging to the families Apocynaceae, Meliaceae, Sterculiaceae and Rubiaceae were identified. Out of this number, 73 Star rating species were recorded (Figure 1). Thirty-one Green Star species, 18 Pink Star, 9 Blue Star, 6 Scarlet Star, 5 Black Star and 4 Red Star species were recorded. Figure 2 shows the tree species identified at Mamiri Forest Reserve in descending order of magnitude; Allanblackia floribunda, Cola nitida, Strombosia glaucescens, Turreathus africanus and Dacryodes klaineana. These are trees species with diameters 5 centimeters and above.

The Genetic Heat Index of Mamiri Forest Reserve

The Genetic Heat Index (GHI) is the weighted average which provides a framework for defining the conservation merit of a tract or sample of forest of any size. Figure 3 presents the GHI of Mamiri Forest Reserve in the range, 13 – 77.

DISCUSSION

Identification of star rating species

Allanblackia floribunda (Pink Star) had been found to be the most dominant plant species in the reserve followed by Cola nitida. Allanblackia floribunda and Cola nitida are mostly found in undisturbed evergreen forest and the presence of these species in high quantities could be considered as an indicator of forest richness. This was also observed by Hawthorne, (2006) who reported that Allanblackia floribunda is usually found in evergreen forests. The other star rating species, Green, Pink, Black, Red, Scarlet, and Blue Stars were also found in the Mamiri Forest Reserve. Investigations into the star rating of the plants showed a high proportion of Green Star species. These species are common in Ghana and are of no particular conservation concern (Hawthorne and Gyakari, 2006). The Pink Star species constituted a little over 20 % of the star-rated plant species but are much higher than the Scarlet Star species which in turn were far higher than the Red and Blue Star species. The Pink Star species are of greater conservation concern because of threats from exploitation (Hawthorne and Abu-Juam, 1995).

Serious pressure from heavy exploitation in the past (Hawthorne and Gyakari, 2006) might have undermined the status of the Scarlet and Red Star species and are of conservational concern. As a result of ignorance or
economic and/social necessity, communities might have inadvertently destroyed or exhausted the resources on which they depended for survival (Todaro and Smith, 2003). This is unacceptable because the destruction of

that endowment indiscriminately in the pursuit of short-term economic and social goals could penalize both present and, especially future generations and that a better environmental stewardship is essential to sustain the resources (Todaro and Smith, 2003). The lowest proportion of Black and Blue Star species could be due to the fact that they are of rarity in Ghana (Hawthorne and Gyakari, 2006). Consequently, the Mamire Forest Reserve has a high ecotourism potential and generally an educational site for students due to high representation of the various star rating species.

**Figure 1.** Star ratings of plant species identified in Mamiri Forest Reserve

**Figure 2.** The most dominant tree species identified in Mamiri Forest Reserve

**Figure 3.** The Genetic Heat Index of Mamiri Forest Reserve

**Determination of Genetic Heat Index of Mamire Forest Reserve**

The species richness of a forest ecosystem depends on the number and category of species per unit area (Hawthorne and Abu-Juam, 1995). The star ratings of a species define its weighted average referred to as Genetic Heat Index (GHI), which provides a framework for defining the conservation merit of a tract or sample of forest of any size. Some of the star rating species were relatively abundant in several parts of the forest, and have a high GHI ranking. In Figure 3, it was observed that plots 3 and 6 have a relatively low GHI. This implies that the plots have low biodiversity which could be due to inability of the environment to support the development of star rating species because of forest degradation. Plots 1, 2, 4, 5, and 8 have an average GHI in the range, 40 - 48. The highest indices are found in plots 7 and 9 and this indicates a higher biodiversity. These findings are in
agreement with the observations made by Hawthorne and Abu-Juam (1995) who reported that high GHI values are due to the presence of many diverse star rating species.

CONCLUSION

Seventy-three star rating species were identified and the most dominant plant species was *Allanblackia floribunda* (Pink Star), even though, the species is of commercial interest. Green Star species recorded the highest star rating species and the least star rating was the Red Star species. The Mamiri Forest Reserve though relatively small, is rich in indigenous species and could serve as a good research, ecotourism and conservation site. Generally, the Mamire Forest Reserve has high GHI in the range of 13 – 77. This implies the forest reserve has a high biodiversity and could be considered as a "hotspot" in Africa.

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REFERENCES

Some of the black star species found at the Mamiri forest reserve

Cola umbratili (black star)  Psychotria calceata (black star)

Cola nitida (pink star)  Ceiba pentandra (red star)

Leptoderis meigei (Black star)  Cythia manii (Black star)

Entandrophragma cylindricum (scarlet)  Celtis mildbraedii (Green star)