Abstract

Gorumara National Park is located in Duars and is falling within the territory of Jalpaiguri District of West Bengal. The entire forest tract of Gorumara National Park comes under the North Indian moist tropical forest. The species those are commonly found within the forest and are most important from the economic and ecological stand points is *Shorea robusta.* Gorumara National Park (GNP) is geographically located between 88º 45' 19" to 88º 51' 18" E Longitudes and between 26º 48' 05" to 26º 41' 20" N Latitudes. The National Park is presently consists of two territorial Forest Ranges (North and South), one mobile Forest Range, six Beats (Dhup Jhora, Gorumara, Bichhabhanga, Budhuram, Murti and Khunia) and three camps. The main and most important river running at the boundary or through the National Park is Jaldhaka. It becomes shallow and remain almost with no surface water during dry season and remains full and fierce during monsoon. Other rivers passing through GNP include Murti, Garati and Indong. Few other rivulets and streams are also passing through this Park. Some of these rivulets and streams passing through GNP are seasonal in nature, carrying water only during monsoon and remain dry for rest of the year. Gorumara National Park falls under the 2B/25 (Sal dominated mixed forests), 5B/152 (Sal, Khayer, Sissoo associated deciduous forest), 3C/C1b and 3C/C1c (Sal dominated deciduous forest). The species which is commonly found within the forest and is most important from the economic and ecological standpoint is Sal (*Shorea robusta*). This species occurs with its usual associates, namely Chilauni (*Schima wallichii*), Chikrasi (*Chukrassia tabularis*), Champ (*Magnolia champaca*) and Bahera (*Terminalia bellirica*). The other important tree species of the area are Sidha (*Lagerstroemia parviflora*), Panisaj (*Amoora rohituka*), Kainjal (*Bischofia javanica*), Simul (*Bombax ceiba*), Khair (*Acacia catechu*), Sissoo (*Dalbergia sissoo*) and Siris (*Albizia* spp.). Primary grassland vegetation is invaded first by Khair and Sissoo, and create home for the entry of Simul, Sidha and many other seral species like Toon (*Toona ciliata*), Gamar (*Gmelina arborea*), Kainjal (*Bischofia javanica*), Pithali (*Mallotus nudiflorus*) and Kadam (*Neolamarckia cadamba*) etc. with successive changes in edaphic conditions and progressive stability as one moves away from the river front. Sal Forests (3C/C1) include both Eastern Bhabar (3C/C1b) and Eastern Terai sal (3C/C1c). Sal forests occur on the well drained alluvial soil. The average day temperature varies from 10º C to 25º C from November to February, between 25p C to30P C during May to September and between 22p C to 27p C during the rest of the year. South-west monsoon is the main source of rainfall. Maximum rainfall occurs from mid-June to September, July and August usually are the wettest months. Maximum rainfall occurred from mid-June to September and July-August usually is the wettest months. The average annual rainfall is about 260 to 340 cm per year. Maximum relative humidity varies between 85 % - 95 %, seldom below 75 % with a maximum during June to September and minimum during December to February.

The entire area of Gorumara National Park (GNP) was surveyed during the years 2007 to 2013 with the assistance of Wildlife Wing of Forest Department, Government of West Bengal. During this survey 40 randomly distributed quadrates of 20 m x 20 m has been taken from different Beat areas in three different seasons, namely designated as *pre-monsoon* [March – April], *monsoon* [May – July]

and *post-monsoon* [September – November]. Nested Quadrate technique has been used with 20m x 20m quadrates for trees and 5m x 5m quadrates for shrubs and 1m x 1m quadrates for ground covering herbaceous plants. Recorded data were transferred to MS Excel worksheet and different parameters like Frequency (F), Density (D), Abundance (A), Relative Frequency (RF), Relative Density (RD), Relative Abundance (RA) and Importance Value Index (IVI) of each and every species were determined using appropriate formulae. A total of 876 species of spermatophytes has been recorded from the intensive survey since the year 2006. Of these, angiosperms are represented by 872 species under 521 genera belonging to 155 families . In addition, 4 species of 4 genera from 4 families of gymnosperms have been recorded from the GNP during the present exploration. The largest genus is *Ficus* of Moraceae with 10 species and is followed by *Cyperus* of Cyperaceae, *Litsea* of Lauraceae, *Dioscorea* of Dioscoreaceae, *Cissus* of Vitaceae, *Desmodium* of Fabaceae etc. Out of the recorded flora, 89 species has been recognized as exotics. Out of these 63 has been naturalized, 25 species came from Tropical America, 15 from South America, 12 from Brazil and Mexico and only 6 species are of Asian origin.

April, May, June and July and later September to October may be called as nature's flower festival in GNP flora, because maximum flowering species found to bloom during these two periods every year. December to January appears to be the resting month.

In premonsoon ground covers, *Commelina sufruticosa* (95.54) emerged with highest frequency in Murti, whereas *Ichnocarpus frutescens* (92.86) leads the frequency in Dhupjhora. *Axonopus compressus* (97.33) presented maximum frequency in Gorumara, *Pupalia lappacea* (96.00) in Khunia, *Elatostema monandrum* (98.00) in Bichhabhanga and *Ageratum conyzoides* (97.78) in Budhuram. *Achyrospermum wallichianum, Diplazium esculentum, Oplismenus burmannii* etc. grow with very high frequency in all over the study area. Similarly, highest abandance presented in Murti by *Centella asiatica* (6.47). Whereas *Axonopus compressus* (6.12) presented maximum abundance in Dhupjhora, *Elatostema monandrum* (5.17) in Gorumara, *Ichnocarpus frutescens* (3.46) in Khunia, *Globba racemosa* (11.92) in Bichhabhanga, *Molineria capitulata* (6.00) in Budhuram. *Oplismenus burmannii* (2.10) presented maximum density in Murti whereas maximum density of Dhupjhora presented by *Axonopus compressus* (3.59), *Elatostema monandrum* (2.89) in Gorumara, *Ichnocarpus frutescens* (3.18) in Khunia. Murti Beat presented a maximum IVI values by *Oplismenus burmannii* (15.04), *Centella asiatica* (12.97), *Natsiatum herpeticum* (12.27) etc. in Budhuram. It is found that a few species in premonsoon season leads the maximum IVI of allover the study area. Similarly, a few species like *Chloranthus erectus, Pupalia lappacea, Rungia pectinata, Achyrospermum wallichianum* etc presented the maximum SDI value 1. Simpson's Index (EH) maximum recorded in Murti by *Acacia pennata* (56.59), Dhupjhora by *Pronephreum nudatum* (161.6562), Gorumara by *Achyrospermum wallichianum* (59.79836), Khunia by *Acacia pennata* (116.6408), Bichhabhanga by *Achyranthes bidentata* (86.55733), and in Budhuram by *Anisomeles indica* (154.678). other recorded species cotain maximum EH values in all of the areas are *Elatostema monandrum, Clerodendrum infortunatum, Persicaria chinensis*etc. Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Indices (D) 0.571629, Dhupjhoran 0.510899, Gorumara 0.465165, Khunia 0.655970, Bichhabhanga 0.631930 and Budhuram 0.564817. Similarly Murti Beat presented the Margalef Richness Indices (RI) 30.8748, where, Dhupjhora 28.8762, Gorumara 23.8732, Khunia 27.8668, Bichhabhanga 28.8693 and Budhram 25.8694. In monsoon ground covers, *Axonopus compressus*(98.89) emerged with highest frequency in Murti where, *Achyrospermum wallichianum* (97.14) in Dhupjhora, *Ageratum conyzoides*(94.67) in

Gorumara, *Coffea bengalensis* (96.00) in Khunia, *Ageratum conyzoides*(96.00) in Bichhabhanga and *Achyrospermum wallichianum* (100.00) in Budhuram presented the maximum frequency. During monsoon season, *Acmella calva* (15.50), *Mikania micrantha* (15.23), *Chloranthuserectus* (13.02) etc. presented maximum IVI in Murti, but, *Mikania micrantha* (17.06), *Achyrospermum wallichianum* (13.13), *Piper sylvaticum* (13.05), *Oplismenus burmannii* (12.16) etc. in Dhupjhora, *Axonopus compressus* (17.20), *Mikania micrantha* (13.16)etc. in Gorumara, *Achyrospermum wallichianum* (22.30), *Pronephreum nudatum* (13.91) etc. in Khunia, *Achyrospermum wallichianum* (30.48), *Elatostema monandrum* (13.69), *Piper sylvaticum* (12.71), *Ageratum conyzoides*(12.22)etc. in Bichhabhanga and *Oplismenus compositus* (18.86), *Pronephreum nudatum* (14.52) etc. in Budhuram recorded maximum IVI. Simpson's Index (EH) maximum recorded in Murti by *Rungia pectinata*(63.94906), Dhupjhora by *Youngia japonica* (211.7118), Gorumara by *Molineriacapitulata* (133.4294), Khunia by *Amerimnon stipulatum* (187.9153), Bichhabhanga by *Drymaria cordata* (124.1942), and in Budhuram by *Achyranthes bidentata*(212.4392). Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Indices (D) 0.460650, Dhupjhoran 0.541158, Gorumara 0.553660, Khunia 0.617780, Bichhabhanga 0.670355 and Budhuram 0.639351. Similarly Murti Beat presented the Margalef Richness Indices (RI) 32.8829, where, Dhupjhora 34.8801, Gorumara 29.8748, Khunia 30.8723, Bichhabhanga 34.8736 and Budhram 33.8742. In Postmonsoon ground covers, *Axonopus compressus*(98.89, 97.33) emerged with highest frequency in Murti, Gorumara where, *Ichnocarpus frutescens* (97.14) in Dhupjhora, *Coffea bengalensis* (96.00) in Khunia, *Elatostema monandrum* (98.00) in Bichhabhanga and *Achyrospermum wallichianum* (100.00) in Budhuram presented the maximum frequency. *Chloranthus erectus* (5.51, 8.18) in Dhupjhora and Budhuram, *Elatostema monandrum* (5.15, 6.30) in Gorumara and Bichhabhanga, *Achyrospermumwallichianum* (5.08) in Khuniapresented highiest density. *Chloranthus erectus* (22.18), *Axonopus compressus* (21.20), *Oplismenus burmannii* (17.01) etc.in Budhuram recorded maximum IVI. Simpson's Index (EH) maximum recorded in Murti by *Rungia pectinata* (63.94906), Dhupjhora by *Rumex dentatus* (277.1452), Gorumara by *Molineriacapitulata* (185.58), Khunia by *Blumea lacera* (210.3026), Bichhabhanga by *Saccharum spontaneum* (145.8058), and in Budhuram by *Prunella vulgaris* (257.6947). Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Indices (D) 0.460650, Dhupjhoran 0.460447, Gorumara 0.452730, Khunia 0.710096, Bichhabhanga 0.607251 and Budhuram 0.569362. Similarly Murti Beat presented the Margalef Richness Indices (RI) 32.8829, where, Dhupjhora 34.8846, Gorumara 29.8808, Khunia 36.8735, Bichhabhanga 34.8767 and Budhram 33.8777. Murti Beat presented a maximum IVI values by *Maesa indica* (17.15), *Alpinia nigra* (16.66), *Litseaglutinosa*(16.47), *Ichnocarpus frutescens* (11.82) etc. where Dhupjhora by *Ichnocarpus frutescens* (18.58), *Chromolaena odorata* (16.39), *Argyreia roxburghii* (15.89), *Alpinia nigra* (15.59)etc. Gorumara presented by *Argyreia roxburghii* (21.60), *Chromolaena odorata* (17.18)etc., Khunia by *Alpinia nigra* (27.21), *Argyreia roxburghii* (16.90), *Mikania micrantha* (15.16), *Chromolaenaodorata* (13.23) etc., Bichhabhanga by *Mikania micrantha* (19.52), *Parabaena sagittata* (18.59), *Chromolaena odorata* (17.38) etc.and *Mikania micrantha* (26.15), *Ichnocarpus frutescens* (21.33), *Chromolaena odorata* (19.29), *Tetrastigma serrulatum* (17.79) etc. in Budhuram. It is found that a few species in premonsoon season leads the maximum IVI of allover the study areas. Simpson's Index (EH) maximum recorded in Murti by *Streblus asper*(611.4638), Dhupjhora by *Zizyphus mauritiana* (365.5565), Gorumara by *Abrus pulchellus* (413.3263), Khunia by *Toddalia asiatica*(469.2142), Bichhabhanga by *Actinodaphne obovata* (142.9482), and in Budhuram by *Pterocarpus acerifolius* (161.4426). Incase of Species Richness in premonsoon ground cover of Murti

Beat presented Menhinick Richness Indices (D)1.143027, Dhupjhoran 0.939123, Gorumara 0.919757, Khunia 1.049093, Bichhabhanga 0.939384 and Budhuram 0.955192. Similarly Murti Beat presented the Margalef Richness Indices (RI) 52.8697, where, Dhupjhora 40.8676, Gorumara 35.8637, Khunia 42.8653, Bichhabhanga 33.8607 and Budhram 33.8600. In monsoon ground covers, *Argyreia roxburghii* (100.00, 100.00 & 93.33) emerged with highest frequency in Murti, Dhupjhora and Gorumara where, *Ichnocarpus frutescens* (100) in Khunia, *Pueraria phaseoloides* (100.00) in Bichhabhanga and *Chromolaena odorata* (94.44) in Budhuram presented the maximum frequency. Othe species which have maximum frequency in allover the study ares are *Mikania micrantha* (100.00). Simpson's Index (EH) maximum recorded in Murti by *Glycosmis pentaphylla*(610.1924), Dhupjhora by *Zizyphus mauritiana*(515.5455), Gorumara by *Pterocarpus acerifolius* (568.7283), Khunia by *Abrus pulchellus* (298.1147), Bichhabhanga by *Actinodaphne obovata* (203.4955), and in Budhuram by *Pterocarpus acerifolius* (199.4133). Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Indices (D) 0.853887, Dhupjhoran 0.788811, Gorumara 0.787591, Khunia 0.774749, Bichhabhanga 0.810063 and Budhuram 0.898317. Similarly Murti Beat presented the Margalef Richness Indices (RI) 48.8765, where, Dhupjhora 41.8742, Gorumara 36.8701, Khunia 38.8724, Bichhabhanga 35.8682 and Budhram 35.8645. In Postmonsoon ground covers, *Argyreia roxburghii* (100.00) emerged with highest frequency in Murti, Dhupjhora and Gorumara where, *Ichnocarpus frutescens* (100.00) inKhunia, *Bridelia retusa* (100.00) in Bichhabhanga and *Mikania micrantha* (100.00) in Budhuram presented the maximum frequency. Simpson's Index (EH) maximum recorded in Murti by *Streblus asper* (761.0204), Dhupjhora by *Zizyphus mauritiana* (529.6169), Gorumara by *Pterocarpus* 570.9368), Khunia by *Toddalia asiatica* (600.7942), Bichhabhanga by *Actinodaphne obovata* (195.7899), and in Budhuram by *Pterocarpus acerifolius* (213.4993). Other recorded species cotain maximum EH values in all of the areas are *Streblus asper, Premna latifolia, Abrus pulchellus, Actinodaphne obovata* etc. Incase of Species Richness in premonsoon ground cover of Murti Beat presented Menhinick Richness Indices (D) 0.898177, Dhupjhoran 0.755127, Gorumara 0.785812, Khunia 0.883477, Bichhabhanga 0.802322 and Budhuram 0.862044. Similarly Murti Beat presented the Margalef Richness Indices (RI) 47.8743, where, Dhupjhora 40.8748, Gorumara 36.8702, Khunia 41.8705, Bichhabhanga 34.8676 and Budhram 35.8660. In the tree layer, *Actinidaphne obovata* (100.00) emerged with highest frequency in Murti and Gorumara, where, *Alangium chinensis* (100.00) leads the frequency in Dhupjhora, *Alstonia scholaris* (100.00) in Budhuram and Khunia, *Casaeria vareca* (100.00) in Bichhabhanga. The maximum IVI value leads by *Shorea robusta* in allover the study areas. Simpson's Index (EH) maximum recorded in Murti by *Castanopsis indica* (405.99863), Dhupjhora by *Terminalia belirica* (673.8532), Gorumara by *Ficus benghalensis* (465.3478), Khunia by *Aegle marmelos* (430.883), Bichhabhanga by *Artocarpus chaplasa* (494.5687), and in Budhuram by *Ficus benghalensis* (392.5362). Incase of Species Richness in canopy covers of Murti Beat presented Menhinick Richness Indices (D) 0.783519, Dhupjhoran 0.62, Gorumara 0.72, Khunia 0.66, Bichhabhanga 0.70 and Budhuram 0.70. Similarly Murti Beat presented the Margalef Richness Indices (RI) 36.8703, where, Dhupjhora 32.87, Gorumara 36.87, Khunia 32.87, Bichhabhanga 30.87 and Budhram 32.87.

Total 127 species traditionally used as medicinal plant species has been recorded from GNP and enumerated. From the present survey, a total of 335 species of useful plants has been recorded of which 164 species are medicinal, 45 species ethnovaterinary medicinal, 57 species as vegetable or riped fruits, 20 species used in various religious purposes, 2 species as spice, and 260 species used as fodder for their domestic animals. 39 percent plants collected by the local villagers for their won domestic animals fodder. 8 percent of the total collected species has used as fuel wood in their

earthen oven. A total 127 species of medicinal plants i.e. 19 percent plants collected by few person for medicin purpose. They also collected and use 45 species of medicinal plants to cure their pets from various diseases and disorder. 13 percent of total NTFPs species collected or planted for ornamental or decorative purpose. Out of 82 species i.e. 8 percent of the total NTFPs plants, 20 species used as plant vegetable where whole plants has used to cook. Leaves of 13 species has used as vegetable. 28 species fruits used as vegetable of edible fruits.

20 species of plants i.e. 3 percent of the total NTFPs recorded species has use by the local villagers in their daily cultural and ritual life like marrage, puja or other social programme.