

# SUMMARY



## SUMMARY

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 which is commonly found within the forest and is most important from the economic and ecological stand points is *Shorea robusta*. The National Park is presently consists of two territorial Forest Ranges (North and South), one mobile Forest Range, six Beats (Dhup Jhora, Gorumara, Bichhabhanga, Budhram, Murti and Khunia) and three camps. Gorumara National Park is geographically located between 88° 45' 19" to 88° 51' 18" E Longitudes and between 26° 48' 05" to 26° 41' 20" N Latitudes. It is nearly a flat area with few small undulations which is the characteristic of this region and covering an altitude of 100 m to 136 m only. The National Park spreads in between the prominent localities like Lataguri, Chalsa and Nagrakata beside the National high way 31 that connects Siliguri with Guwahati.

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. The river-bed is rising continuously as a result of the deposition of large quantity of slit, pebbles, boulders and detritus material carrying from the hills. 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. The National park lies in the Bio-geographical zone 7B (Lower Gangetic plain) as recognized by Wildlife Institute of India, Dehradun (Rodgers and Panwar, 1988, subsequently revised in 2000). The entire forest tract of Gorumara National Park comes under the North Indian Moist Tropical Forest of Champion and Seth's (1968) Indian Forest Type classification. 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 champaka*) and Bahera (*Terminalia bellirica*). The other important species which are also seen are Sidha (*Lagerstroemia parviflora*), Panisaj (*Amoora rohituka*), Kainjal (*Bischofia javanica*), Simul (*Bombax ceiba*), Khair (*Acacia catechu*), Sissoo (*Dalbergia sissoo*) and Siris (*Albizia* spp.). Riverine Forests (5B/152) are seen on the bank of river Jaldhaka and other parts of the National Park. It is a deciduous type of forest which is dominated by Khair, Sissoo and association of tall grasses. 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. Tanki (*Bauhinia purpurea*) is fairly common in the neighborhood of river

beds where the permanent water table is quite deep. Harra (*Grewia asiatica*), Kainjal, Chalta (*Dillenia indica*) and some other seral species like Toon, Gamar etc. appear to do well where the water table is not low. 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. Course gravels and boulders in the bhabar area carry a fair percentage of sal in admixture of various deciduous species chiefly by Bahera, Sidha, Tartari (*Dillenia pentagyna*), Odal (*Sterculia villosa*), Kumbhi (*Careya arborea*) and Chilaune (*Schima wallichii*). The numerous other species those are found there include Parari (*Stereospermum tetragonum*), Kowla (*Machilus villosa*), Angari (*Phoebe attenuata*) and Bahera (*Terminalia bellirica*).

The average day temperature varies from 10°C to 25°C from November to February, between 25p C to 30p 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 annual average humidity also remain quite high, i.e. 90.52 in the morning and 74.27 in the afternoon. The Sun-shine begins to rise from October and maximum Sum-shine is received up to November. After November, the Sun-shine start to decrease and during December to February the nights remain very cold with much fog and dew formations.

The importance of the Gorumara National Park from the ecological, conservational and economic points of view the absence of a detailed flora, mainly of vascular plants was felt seriously –

- i. To prepare a detailed spermatophytic flora of Gorumara National Park
- ii. To prepare flowering and fruiting calendars of its floristic elements, this will be useful to the future workers in numerous other branches of science including medicine, reproductive biology, crop improvement programs, etc.
- iii. To evaluate the recorded taxa for their endemic/ rare/ threatened status and to determine their population structure and distribution pattern
- iv. To recognize the disturbances created by various anthropogenic and/or physical agents on local vegetation
- v. To prepare a detailed data base on the exotic plants growing in the park
- vi. To understand the pattern of diversity of flora in the park
- vii. To record the NTFP potential of the park and their substantial utilization
- viii. To understand the key points of conservation of flora and vegetation of the park; etc.

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. With the complete recording of field-characters in field notebooks, the specimens were temporarily preserved in polythene bags in the field, with the mouth being kept air tight. Old news prints were used to rap the specimens and then put into a light herbarium press and tied tightly with rope. All the specimens were properly poisoned by dipping in 6 % solution of HgCl<sub>2</sub> in rectified spirit (ethanol), decanting and then again placing within the blotters and in the press. Properly dried specimens were mounted on standard herbarium sheets (41.5 x 28 cm) using glue and stitched with threads. There after the herbarium labels (15.5 x 10 cm) with important information recorded in the field were fixed on the right hand bottom corner of each herbarium-sheet. These labels contained the following important information: (a) Area under exploration, (b) Field number, (c) Date of collection, (d) Name, (e) Family, (f) Vernacular names, (e) Locality, (f) Altitudes, (g) Habit and habitat, (h) Flowers and fruits, (j) Notes, (k) Name of collector and determinator, etc. The specimens were then temporarily stored in a Herbarium cabinets in the NBU Herbarium for further study.

During this survey 40 randomly distributed quadrates of 20m x 20m 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. The smaller quadrates were nested within the large [i.e. 20m x 20m] quadrates. 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 Important Value Index (IVI) of each and every species were determined using appropriate formulae.

The spermatophytic plants with their accepted names as per *The Plant List*, through proper taxonomic treatments of recorded species and infra-specific taxa, collected from Gorumara National Park has been arranged in compliance with the presently accepted APG-III (2009) system of classification. Further, for better convenience the presentation of each species in the enumeration the genera and species under the families are arranged in alphabetical order. In case of Gymnosperms, family, genera and species also arranged in alphabetical order. The following sequence of enumeration is taken into consideration while enumerating each identified plants.

(a) Accepted name, (b) Basionym if any, (c) Synonyms if any, (d) Homonym if any, (e) Vernacular name if any, (f) Description, (g) Flowering and fruiting periods, (h) Specimen cited, (i) Local distribution, and

After the comprehensive floristic survey, it is noted that the Gorumara National Park is presented enormously rich flora. 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 present floristic work on GNP deals with the recorded 155 Spermatophytic families, out of which 125 are dicotyledonous and the remaining 30 are monocotyledonous; 675 species under 406 genera are recorded from 125 dicotyledons families and 197 species belonging to 115 genera in 30 monocot families. Only 4 species of gymnosperm belonging to 4 genera under 4 families were recorded under.

The study area is comparatively too small and is housing only 876 species of vascular plants as has been recorded through the intensive survey since the year 2007. Of these, angiosperms are represented by 872 species under 525 genera belonging to 159 families. In addition, 4 species of 4 genera from 4 families of gymnosperms have been recorded from the GNP. 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 of GNP flora, because maximum flowering species (9% of the total studied flowering species in each month) found to bloom during these two periods every year. December to January appears to be the resting month.

The sampling was done in three different seasons of the year: (i) Pre-monsoon [March to April], Monsoon [May to July] and Post-monsoon [September to November]. The data obtained were computed to determine different phytosociological parameters, namely Frequency (F), Density (D), Abundance (A), Relative Frequency (RF), Relative Density (RD), Relative Abundance (RA) and Important Value Index (IVI). And, finally, using these processed data different diversity and richness Index were calculated for better understanding of the vegetation.

In premonsoon ground covers, *Commelina sufruticosa* (95.54) emerged with highest frequency in Murti where, *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 presented very high frequency in all over the study areas. Similarly highest abundance presented in Murti by *Centella asiatica* (6.47). where, *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, *Molinaria capitulata* (6.00) in Budhuram. *Oplismenus burmannii* (2.10) presented maximum density in Murti where, maximum density of Dhupjhora presented by *Axonopus compressus* (3.59), *Elatostema monandrum* (2.89) in Gorumara, *Ichnocarpus frutescens* (3.18) in Khunia, *Elatostema monandrum* (3.94) in Bichhabhanga and in Budhuram by *Chloranthus erectus* (4.87). Murti Beat presented a maximum IVI values by *Oplismenus burmannii* (15.04), *Centella asiatica* (12.97), *Natsiatum herpeticum* (12.27) etc, Khunia by *Ichnocarpus frutescens* (20.19), *Pupalia lappacea* (16.34), *Axonopus compressus* (15.46), *Acmella calva* (14.20)etc, Bichhabhanga by *Globba racemosa* (24.50), *Elatostema monandrum* (20.43), *Ageratum conyzoides* (20.35), *Acmella calva* (17.09)etc. and *Chloranthus erectus* (23.15), *Ageratum conyzoides* (19.71), *Axonopus compressus* (18.52), *Mikania micrantha* (16.49)etc. in Budhuram. It is found that a few species in premonsoon season leads the maximum IVI of allover the study areas. Similarly, a few number of 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*, *Coffea bengalensis*, *Commelina diffusa*, *Synedrella nodiflora*, *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. Similarly highest abundance presented in Murti by *Duchesnea indica*(6.23), *Mikania micrantha* (4.73) in Dhupjhora, *Acacia pennata* (1.90) in Gorumara, *Achyrospermum wallichianum*(5.52) in Khunia and (19.50) in Bichhabhanga and *Oplismenus compositus* (6.45) in Budhuram. *Acmella calva*(3.77) presented highest density in Murti, while, *Mikania micrantha* (4.53) in Dhupjhora, *Axonopus compressus*(2.88) in Gorumara, *Achyrospermum wallichianum* (5.08) in Khunia, *Achyrospermum wallichianum* (4.68) in Bichhabhanga and *Oplismenus compositus* (5.44) in Budhuram presented highest density. During monsoon season, *Acmella calva* (15.50), *Mikania micrantha* (15.23), *Oplismenus burmannii* (14.48), *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), *Axonopus compressus*(16.85), *Ichnocarpus frutescens*(13.91), *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. Few common species like *Acaciapennata*, *Achyrospermum wallichianum*, *Clerodendrum infortunatum*, *Synedrella nodiflora* etc showing maximum SDI in allover the study areas. 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 *Achyrosperrum wallichianum* (100.00) in Budhuram presented the maximum frequency. Similarly highest abundance presented in Murti, Dhupjhora by *Acmella calva* (4.99, 6.39), *Axonopus compressus* (7.09) in Dhupjhora, *Diplazium esculentum* (7.33) in Gorumara, *Achyrosperrum wallichianum*(5.52) in Khunia and (19.50) in Bichhabhanga and *Chloranthus erectus* (9.44) in Budhuram. During postmonsoon season, *Acmella calva*(15.50), *Mikania micrantha* (15.23), *Oplismenus burmannii* (14.48), *Chloranthuserectus* (13.02)etc. presented maximum IVI in Murti, but, *Chloranthus erectus* (15.78), *Ageratum conyzoides* (15.19), *Cyperus compressus* (15.15), *Acmella calva* (15.03)in Dhupjhora, *Elatostema monandrum* (17.54) etc in Gorumara, *Achyrosperrum wallichianum* (20.18), *Axonopus compressus* (15.21), *Ichnocarpus frutescens* (12.52), *Pronephreum nudatum* (12.52) etc. in Khunia, *Achyrosperrum wallichianum* (27.49), *Elatostema monandrum* (19.71), *Ageratum conyzoides* (17.27), *Mikania micrantha* (15.74)etc.in Bichhabhanga and *Chloranthus erectus* (22.18), *Axonopus compressus* (21.20), *Ageratum conyzoides* (20.72), *Oplismenus burmannii* (17.01) etc. in Budhuram recorded maximum IVI.

Few common species like *Acaciapennata*, *Achyrosperrum wallichianum*, *Achyranthes bidentata*, *Anisomeles indica*, *Blumea lacera*, *Centella asiatica*, *Synedrella nodiflora* etc showing maximum SDI in allover the study areas.

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.

In premonsoon ground covers, *Ichnocarpus frutescens* (100.00) emerged with highest frequency in Murti where, *Chromolaena odorata* (96.43) leads the frequency in Dhupjhora. *Argyreia roxburghii* (96.67) presented maximum frequency in Gorumara, *Mikania micrantha* (95.00 and 100.00) in Khunia and Budhuram, *Litsea glutinosa*, *Bridelia retusa* (100.00) in Bichhabhanga. *Chromolaena odorata*, *Chromolaena odorata* etc presented very high frequency in all over the study areas.

Similarly highest abundance presented in Murti, Dhupjhora and Khunia by *Alpinia nigra* (17.75). Where, *Parabaena sagittata* (8.38), in Gorumara, *Morinda angustifolia* (8.08), in Bichhabhanga, *Mikania micrantha* (9.06) in Budhuram. *Maesa indica* (5.39) presented maximum density in Murti where, maximum density of Dhupjhora, Bichhabhanga and Budhuram presented by *Mikania micrantha* (4.25, 5.75 and 9.06), *Argyreia roxburghii* (5.23) in Gorumara and *Croton caudatus* (4.45) in Khunia. other species which were presented a interesting density values in allover the study areas are *Parabaena sagittata*, *Alpinia nigra*, *Maesa indica* etc.

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). Similarly highest abundance presented in Murti by *Holarrhena pubescens* (18.25), *Croton caudatus* (13.21) in Dhupjhora, *Parabaena sagittata* (14.25) in Gorumara, *Alpinia nigra*(64.80) in Khunia, *Maesa indica* (12.05) in Bichhabhanga and *Chromolaena odorata* (12.76) in Budhuram. *Argyreia roxburghii* (9.64) presented highiest density in Murti, while, *Mikania micrantha* (11.64) in Dhupjhora, *Mikania micrantha* (8.90) in Gorumara, *Ichnocarpus frutescens* (100) in Khunia, *Maesa indica*(12.05) in Bichhabhanga and *Chromolaena odorata* (12.06) in Budhuram presented highiest density. During monsoon season, *Argyreia roxburghii* (20.68), *Ichnocarpus frutescens* (20.49), *Mikania micrantha* (18.97), *Chromolaena odorata* (17.85) etc. presented maximum IVI in Murti. 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) in Khunia, *Bridelia retusa* (100.00) in Bichhabhanga and *Mikania micrantha* (100.00) in Budhuram presented the maximum frequency. During postmonsoon season, *Argyreia roxburghii* (23.81), *Ichnocarpus frutescens* (23.59), *Mikania micrantha* (21.83), *Chromolaena odorata* (20.55) etc. presented maximum IVI in Murti. 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. Similarly highest abundance presented in Murti, Dhupjhora, Bichhabhanga and Budhuram by *Shorea robusta* (respectively 21.00, 26.86, 28.30 and 34.89). *Shorea robusta* (respectively 21.00, 26.86, 21.00, 28.30 and 34.89) presented maximum density in Murti, Dhupjhora, Gorumara, Bichhabhanga and Budhuram. Where, maximum density of Khunia presented by *Albizia lucidior* (28.30). The maximum IVI value leads by *Shorea robusta* in allover the study areas. *Actinodaphne sikkimensis*, *Aglaia spectabilis*, *Artocarpus chaplasa* etc showing maximum SDI 1 in allover the study area. 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 chaplasi* (494.5687), and in Budhram by *Ficus benghalensis* (392.5362). In case 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 Budhram 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 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 ethnoveterinary 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 own 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 medicine 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 marriage, puja or other social programme.