Bidhan Chandra College
Asansol

Green Audit
2020 - 2021

Prepared by Eco club Coordinators

Department of Environmental Studies
Department of Zoology
Department of Botany

BIDHAN CHANDRA COLLEGE
ESTD - 1961
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Green Audit

Introduction

A nation's growth starts from its educational institutions, where the ecology is thought as the prime factor of development associated with the environment. A clean and healthy environment aids effective learning and provides a conducive learning environment. Educational Institutions, nowadays, are becoming more sensitive to environmental factors and more concepts are being introduced to make them eco-friendly. To preserve the environment within the campus, various viewpoints are applied by several educational institutes to solve their environmental problems such as promotion of the energy savings by installing more efficient electronics and electrical equipment, proper segregation and recycle of waste, water use reduction, water harvesting and conservation among others. The activities pursued by colleges can also create a variety of adverse environmental impact.

Green Audit is a process of systematic identification, quantification, recording, reporting and analysis of components of environmental diversity of various establishments. It aims to analyse environmental practices within and outside of concerned sites, which will have an impact on the eco-friendly ambience. It is otherwise the systematic examination of the interactions between any operation and its surroundings.

Methodology

- **Pre-Audit Activities**

Select and schedule facilities to audit, based on:

A. Plan the audit

B. Selection of the audit team
   i) Confirm their availability
   ii) Assigning of the Audit responsibilities

C. Scheduling of the audit facility
   - Discussing the audit programmes
   - Acquiring the background information
   - On-site visiting

D. Preparation of the Questionnaire (if necessary)

E. Understanding the scope of audit

F. Determination of the applicable requirements and resource necessities

- **During Audit Process on Site:**

A. Identify and understand management control system
   1. Review background information
   2. Review Audit plan

B. Assess management control system
   1. Analyse the strengths and weaknesses of the internal controls
   2. Adopt Audit Plan and resource allocation

C. Gather Audit evidence
    1. Collect Data
    2. Ensure protocol steps are completed
    3. Review all observations
    4. Conduct further testing if required

D. Evaluate Audit findings
    1. Development of complete list of findings
    2. Assembly of the necessary documents
    3. Integration and summarization of the findings
    4. Evaluate the observations of audit program

- **Post Audit Activities**

A. Issue of the draft report
    1. Correction of the closing report
    2. Distribution of the draft report
    3. Allocation of time for correction

B. Issue of the final report
    1. Correction of the draft report
    2. Highlight requirement for the action plan
    3. Action plan preparation and implementation

Follow up in action plan

PLANT AUDIT

Flora/Plant audit is a systematic process of identifying and collection of plant data. Trees play a pivotal role in our ecosystem. So, in order to conserve our biodiversity, we should have knowledge about the plants in our surroundings.

Our college is rich in plants covering an area of almost eight acres. We try to conserve our biodiversity by regular tree plantation program and also try to maintain the existing vegetation. The present study was aimed at determining the vascular plant species richness of an urban green-space- the Bidhan Chandra College campus, Asansol.

For this, the species richness data was obtained by both secondary sources and intensive surveys. The data from the primary and

secondary sources resulted in the documentation of 812 species belonging to 542 genera under 124 families, of which 534 species (65.8%) exists today. *Leguminosae* and *Poaceae* were the dominant dicotyledonous and monocotyledonous families respectively and an inventory of all the species recorded is provided. Considering the rapidly changing urban land use in the city, much attention should be paid towards the conservation of these green spaces, for which such studies provide baseline data.

The Campus houses a good number of plants and the perusal of literature reveals that there is no published record on the flora of this campus which represents an interesting floristic composition. The findings of the study may be helpful for further research in Botany or allied disciplines.

Objective

Maintaining existing trees and adding new trees are essential.

Conservation of flora and fauna in our surroundings.

Knowledge about medicinal plants.

Knowledge about economically important plants.

Knowledge about plant-animal interaction.

Knowledge about weather and climatic conditions of the surrounding.

PLANT DATA COLLECTION BY QUADRAT METHOD

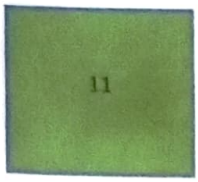
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35
36	37	38	39	40
41	42	43	44	45
46	47	48	49	50

25X25 m^2

Each square is of 25mx25m, total area of plant vegetation is divided into 50 quadrats, among them the highlighted quadrats are studied because the remaining quadrats contain repeatition of previous species.

- Swietenia macrophylla
- Annona squamosa
- Syzygium cumini
- Ixora finlaysoniana
- Tabernaemontana divericata
- Nyctanthes arbor-tristis
- Polyalthia longifolia
- Scoparia dulsis
- Sida cordifolia
- Croton bonplandianum
- Evolvulus nummularius
- Alternanthera sessilis
- Pimenta dioica

- Sterculia foetida
- Ficus benghalensis
- Mangifera indica
- Mimusops elengi
- Acacia auriculiformis
- Sida acuta
- Oldenlandia corymbosa



- Trophis aspera
- Spondias pinnata
- Aegle marmelos
- Neolamarckia kadamba
- Croton bonplandianum
- Crozophora rottleri
- Solanum nigrum

- Peltophorum pterocarpum
- Psidium guajava
- Nerium oleander
- Ixora coccinea
- Hibiscus rosa-sinensis
- Adenanthera pavonina
- Mussaenda erythophylla
- Acalypha wilkesiana
- Kalanchoe pinnata
- Dracena marginata
- Bauhinia acuminata
- Eucalyptus globulus

- Nyctanthes arbortristis
- Curcuma longa
- Ocimum tenuiflorum
- Ocimum sanctum
- Dalbergia sisso
- Kalanchoe pinnata
- Cinnamomum tamala
- Aegle marmelos
- Murraya paniculata
- Phyllanthus emblica
- Hyophorb elagenicaulis
- Tridax procumbens
- Hyophorbe lagenicaulis

- Pterospermum acerifolium
- Azadirachta indica
- Polyalthia longifolia
- Mangifera indica
- Tectona grandis
- Hyophorbe lagenicaulis
- Acacia auriculiformis
- Trema orientalis

- Adenanthera pavonina
- Polyalthia longifolia
- Psidium guajava
- Nymphaea nouchali
- Dalbergia sisso
- Euphorbia hirta
- Alternanthera sessilis
- Phyllanthus niruri
- Sida acuta

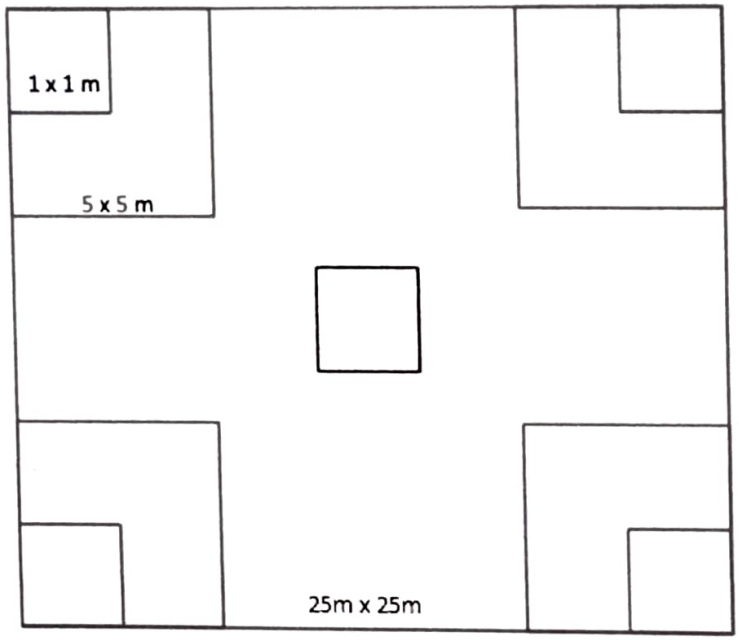
- Cocos nucifera
- Tectona grandis
- Ficus religiosa
- Artocarpus heterophyllus
- Anisomeles indica
- Blumia lasera

- Areca catechu
- Murraya paniculata
- Rosa sp
- Polyalthia longifolia
- Bauhinia variegate
- Peltophorum pterocarpum

- Polyalthia longifolia
- Mangifera indica
- Mimusops elengi
- Codiaeum variegatum
- Dypsis lutescens
- Sida cordifolia
- Sida rhombifilia

Sampling Process

A random sampling with nested quadrat was utilized to study the strata of vegetation. Trees and tree saplings above 5 feet in height were classified as trees during the count. The tree and shrub layers were analysed by quadrat method using the sizes 25 x 25 m and 5 x 5 m respectively and the herbs were analysed by 1 x 1 m Quadrat. Basically a nested quadrat was placed having a size of 25 x 25m (for trees) within which 5 x 5 m quadrat was placed for analysing the shrubs within which 1m x 1m quadrat was placed for the study of herbaceous plant. A total of 50 sampling plots were studied at each forest type with the 5 x 5 m quadrate being inside the 25 x 25 m quadrat. Photographs of different Specimens were collected for identification.



Phyto-sociological analysis

The data for each life form were recorded in the study area which were categorized as trees, herbs and shrubs.

Density

Density is a numerical strength of a species in relation to a unit area. This parameter gives an idea about the dominance and rarity of a species and is also an indicator of the standing biomass and productivity of the region (Ambashat et al,1995). The percentage of a species with respect to different species in the unit area is called as Relative density. They are calculated as:

Density (D)= Total number of individual of a Species /Total number of quadrat studied

Relative Density (RD) = Density of a Species/Sum of the Densities of all the Species x 100

Frequency:

Frequency is the degree of dispersion in terms of percentage occurrence. In a sampling only the names of the species encountered in the different quadrat are listed. Frequency basically gives us an idea how frequent a species is encountered in the area. The frequency percentage of a species with respect to different species in the unit area is called as Relative Frequency.

Frequency (F%) = Number of Quadrat in which species occurred /Total number of Quadrat Studied x 100

Relative Frequency (RF) = Frequency of a Species /Sum of Frequencies of all Species x 100

Abundance

Abundance is the total number of individual of a species in a sampling area. It basically gives an idea of the occurrence of a species in the Sampling unit. Relative abundance is the percentage ratio between the Abundance of species with that of sum of abundance of all species in the sampling unit.

Abundance (A) = Number of Individual of a species occurring /Total Number of Quadrat Studied

Relative Abundance (A) = Abundance of a Species/
Sum of Abundances of all Species x 100

Basal area

Basal area implies the area covered by the tree which is basically calculated by taking a measurement at breast height i.e. 1.37m of a tree trunk above the ground. Basal area indicates the weight, size, volume and provides information regarding the proportion of its dominance in the sampling area. Basal area is calculated as;

Basal area (BA) = (CBH)2 / 4Π

CBH: Circumference at Breast height.

Diversity indices

Diversity indices serve as important surrogates for measuring Biodiversity (Sarkar and Margules,2003).

Species Diversity It is the effective number of different species that are represented in a collection of individuals. Species richness and species evenness are the two component of Species diversity. Shannon- Wiener index (1963), incorporates both the parameter and is one of the most widely used index for measuring species diversity in an ecosystem (Ilorkar and Khatri ,2003). Lower the dominance higher is the diversity.

Species Richness

The number of different species represented in a sampling unit or the habitat per unit area is called as Species Richness. Species richness is simply a count of species, and it does not take into account the abundances of the species or their relative abundance distributions (Colwell,2009).Menhinick"s index (1964) and has been used to understand the Species richness.

Concentration of dominance

Simpson index (1949)is used to measure the degree of concentration of dominance of species which basically gives priority to the Dominant species

DATA COLLECTION

LIST OF TREES

SL NO.	BOTANICAL NAME	FAMILY
1	Swietenia macrophylla	Meliaceae
2	Samanea saman	Fabaceae
3	Peltophorum pterocarpum	Fabaceae
4	Tectona grandis	Lamiaceae
5	Sterculia foetida	Malvaceae
6	Dalbergia sisso	Fabaceae
7	Mangifera indica	Anacardiaceae
8	Ficus benghalensis	Moraceae
9	Syzygium cumini	Myrtaceae
10	Annona squamosa	Annonaceae
11	Mimusops elengi	Sapotaceae
12	Ficus religiosa	Moraceae
13	Polyalthia longifolia	Annonaceae
14	Adenanthera pavonina	Fabaceae
15	Ficus virens	Moraceae
16	Bridelia retusa	Phyllanthaceae
17	Pterospermum acerifolium	Sterculiaceae
18	Elaeocarpus ganitrus	Elaeocarpaceae
19	Psidium guajava	Myrtaceae
20	Gardenia jasminoides	Rubiaceae
21	Acacia auriculiformis	Fabaceae
22	Azadirachta indica	Meliaceae

23	Hyophorbe lagenicaulis	Arecaceae
24	Albizia lebbeck	Fabaceae
25	Saraca asoca	Fabaceae
26	Phyllanthus emblica	Phyllanthaceae
27	Trophis aspera	Moraceae
28	Artocarpus heterophyllus	Moraceae
29	Aegle marmelos	Rutaceae
30	Areca catechu	Arecaceae
31	Cocos nucifera	Arecaceae
32	Neolamarckia kadamba	Rubiaceae
33	Spondias pinnata	Anacardiaceae
34	Manilkara japota	Sapotaceae
35	Magnolia champaca	Magnoliaceae
35	Magnolia champaca	Magnoliaceae
36	Plumeria rubra	Apocynaceae
37	Ficus hispida	Moraceae
38	Eucalyptus globulus	Myrtaceae

LIST OF HERBS

SL.NO.	BOTANICAL NAME	FAMILY
1	Acalypha indica	Euphorbiaceae
2	Achyranthes aspera	Amaranthaceae
3	Ageratum conyzoides	Asteraceae
4	Alternanthera philoxeroides	Amaranthaceae

5	Alternanthera sessilis	Amaranthaceae
6	Amaranthus viridis	Amaranthusviridis
7	Andrographis paniculata	Acanthaceae
8	Blumea lacera	Asteraceae
9	Catharanthus roseus	Apocynaceae
10	Cleome rutidosperma	Capparidaceae
11	Commelina benghalensis	Commelinaceae
12	Cynodon dactylon	Poaceae
13	Cyperus rotundus	Cyperaceae
14	Eclipta prostrata	Asteraceae
15	Eleusine indica	Poaceae
16	Eragrostis tenella	Poaceae
17	Kyllinga monocephala	Cyperaceae
18	Ocimum sanctum	Lamiaceae
19	Oldenlandia corymbosa	Rubiaceae
20	Peperomia pellucida	Piperaceae
21	Ruellia tuberosa	Acanthaceae
22	Phyllanthus niruri	Phyllantheceae
23	Euphorbia hirta	Euphorbiaceae
24	Lindenbergia indica	Scrophulariaceae
25	Scoparia dulcis	Scrophulariaceae
26	Solanum nigrum	Solanaceae
27	Vandellia crustacea	Scrophulariaceae
28	Vernonia cineria	Asteraceae

LIST OF SHURBS

SL. NO.`	BOTANICAL NAME	FAMILY
1	Ixora coccinea	Rubiaceae
2	Lantana camara	Verbenaceae
3	Sida acuta	Malvaceae
4	Sida rhombifolia	Malvaceae
5	Sida acuta	Malvaceae
6	Tabernaemontana divaricata	Apocynaceae
7	Nerium indicum	Apocynaceae
8	Adhatoda vasica	Acanthaceae
9	Hibiscus rosa-sinensis	Malvaceae

PLANT SURVEY

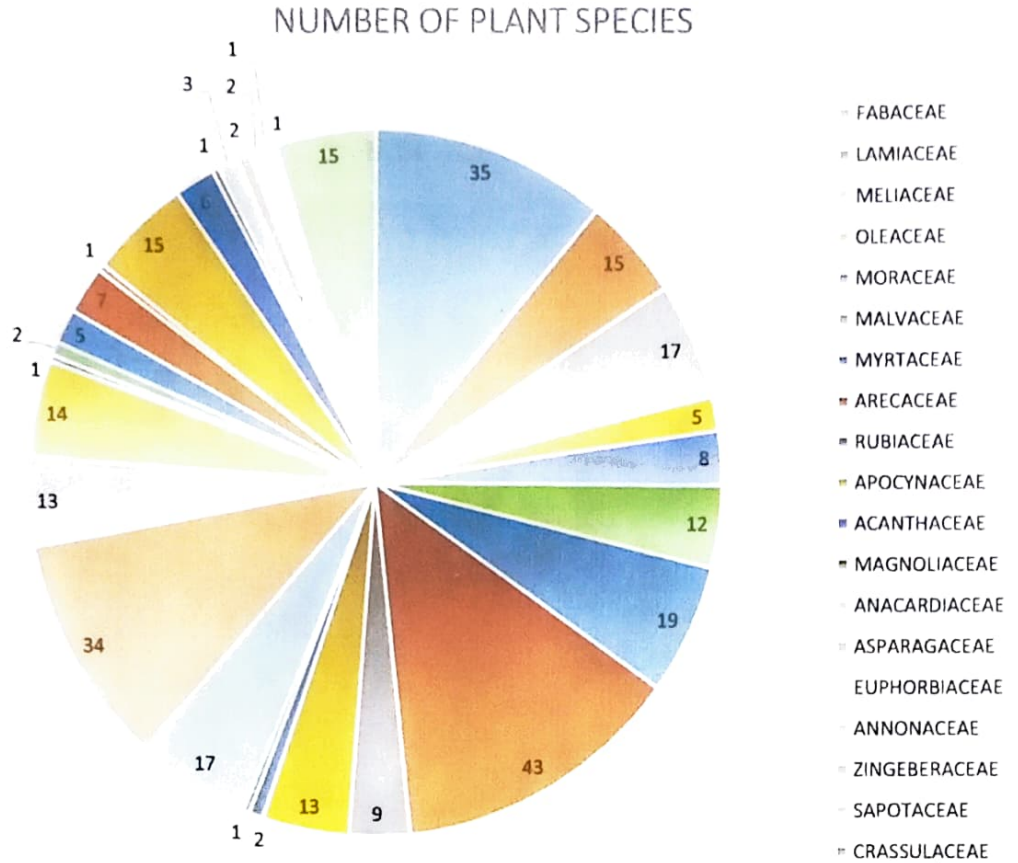
Scientific Name	Local Name	Family	Numbers
Swietenia macrophylla	Mahogany	Meliaceae	14
Samanea saman	Khirish, Rain Tree	Fabaceae	1
Peltophorum pterocarpum	Radhachura	Fabaceae	12
Tectona grandis	Shagun	Lamiaceae	1
Sterculia foetida	Bakshabadam	Malvaceae	4
Dalbergia sisso	Sisso	Fabaceae	6
Mangifera indica	Aam	Anacardiaceae	15
Ficus benghalensis	Bot	Moraceae	1
Syzygium cumini	Jam	Myrtaceae	6

Annona squamosa	Aata	Annonaceae	2
Mimusops elengi	Bakul	Sapotaceae	1
Ficus religiosa	Peepul	Moraceae	2
Polyalthia longifolia	Debdaru	Annonaceae	12
Codiaeum variegatum	Garden Croton	Euphorbiaceae	8
Dracena marginata	Dragon tree	Asparagaceae	24
Kalanchoe pinnata	Pathorkuchi	Crassulaceae	5
Acalypha wilkesiana	Curly Acalypha	Euphorbiaceae	4
Ixora finlaysoniana	Sadarongon	Rubiaceae	1
Trema orientalis	Chikan, Indian nettle tree	Tiliaceae	7
Tabernaemontana divericata	Tagor	Apocynaceae	6
Cinnamomum tamala	Tejpata	Lauraceae	1
Cordyline fruticosa	Baby doll Ti plant	Asparagaceae	10
Terminalia catappa	Indian almond	Combretaceae	1
Adenanthera pavonina	Raktachandan	Fabaceae	1
Ficus virens	Pakur	Moraceae	1
Bridelia retusa	Kosoi, Gilo, Kuhir	Phyllanthaceae	1
Pterospermum acerifolium	Muchkund, Muskanda	Sterculiaceae	2
Elaeocarpus ganitrus	Rudraksha	Elaeocarpaceae	1
Cinnamomum camphora	Camphor Tree	Lauraceae	1
Mussaenda erythophylla	Mussaenda	Rubiaceae	1

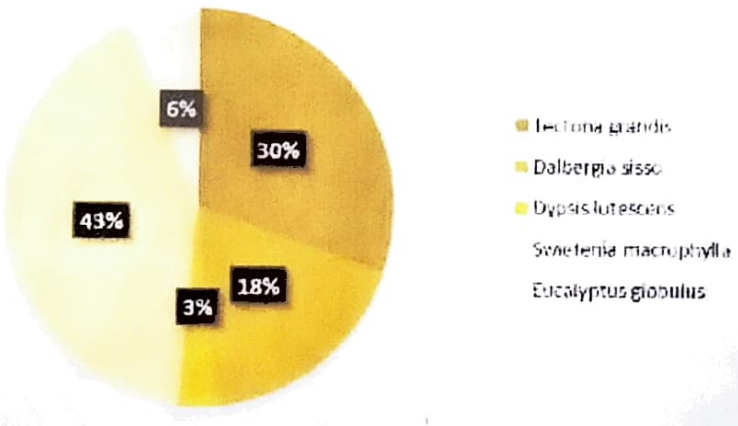
Bauhinia variegata	Raktakanchan	Caesalpiniaceae	1
Thuja orientalis	Mandirjhau	Cupressaceae	15
Hibiscus rosa-sinensis	Jaba	Malvaceae	8
Psidium guajava	Peyara	Myrtaceae	9
Gardenia jasminoides	Gardenia	Rubiaceae	1
Nerium oleander	Karabi	Apocynaceae	4
Ixora coccinea	Lal rangan	Rubiaceae	5
Acacia auriculiformis	Akashmoni	Fabaceae	10
Azadirachta indica	Neem	Meliaceae	3
Hyophorbe lagenicaulis	Bottle palm	Arecaceae	33
Bauhinia acuminata	Sadakanchan	Fabaceae	3
Albizia lebbeck	Sirish	Fabaceae	2
Saraca asoca	Ashoka	Fabaceae	1
Phyllanthus emblica	Amloki	Phyllanthaceae	2
Justicia adhatoda	Basak	Acanthaceae	2
Combretum indicum	Madhobilata	Combretaceae	1
Trophis aspera	Sheora	Moraceae	3
Artocarpus heterophyllus	Kathal	Moraceae	1
Aegle marmelos	Bel	Rutaceae	1
Areca catechu	Supari	Arecaceae	7
Cocos nucifera	Narkel	Arecaceae	3
Neolamarckia kadamba	Kadam	Rubiaceae	1

Murraya paniculata	kamini	Rutaceae	3
Spondias pinnata	Aamra	Anacardiaceae	2
Duranta erecta	Duranta	Verbenaceae	15
Manilkara japota	Sabeda	Sapotaceae	1
Pimenta dioica	Allspice	Myrtaceae	2
Magnolia champaca	Swarnochampa	Magnoliaceae	1
Plumeria rubra	Frangipani	Apocynaceae	3
Rosa sp	Rose	Rosaceae	6
Jasminum sambac	Beli	Oleaceae	1
Ficus hispida	Dumur	Moraceae	1
Dypsis lutescens	Areca palm	Arecaceae	14
Eucalyptus globulus	Eucalyptus	Myrtaceae	2
Ocimum tenuiflorum	Krishna tulsi	Lamiaceae	8
Ocimum sanctum	Tulsi	Lamiaceae	6
Nymphaea nouchali	Lal shaluk	Nymphaeceae	1
Cleistanthus collinus	Parashi	Euphorbiaceae	1
Nyctanthes arbor-tristis	Shuili	Oleaceae	4
Curcuma longa	Halud	Zingiberaceae	1

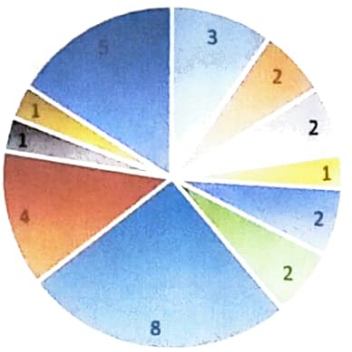
DATA REPRESENTATION



ECONOMICALLY IMPORTANT PLANT



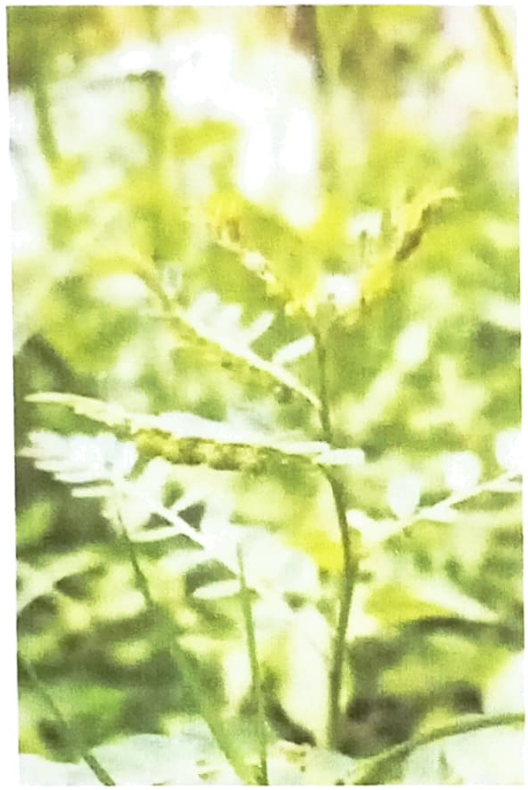
MEDICINAL PLANTS



OUR GREEN CAMPUS

MEMBERS OF OUR GREEN CAMPUS

Sidar hombifolia

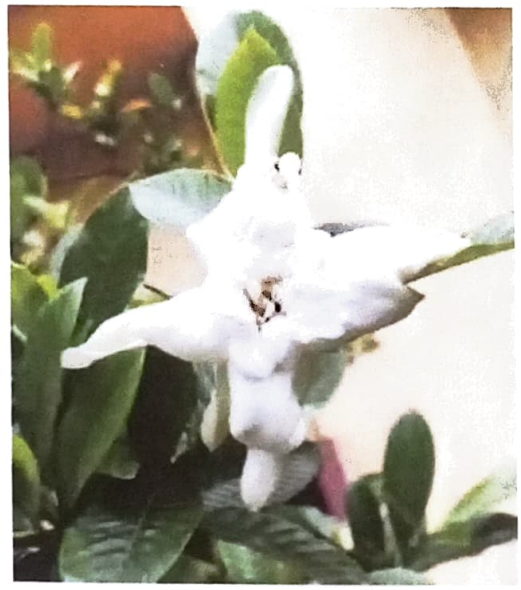


Phyllanthus niruri

Catharanthus roseus

Duranta repens

Swietenia mahagoni



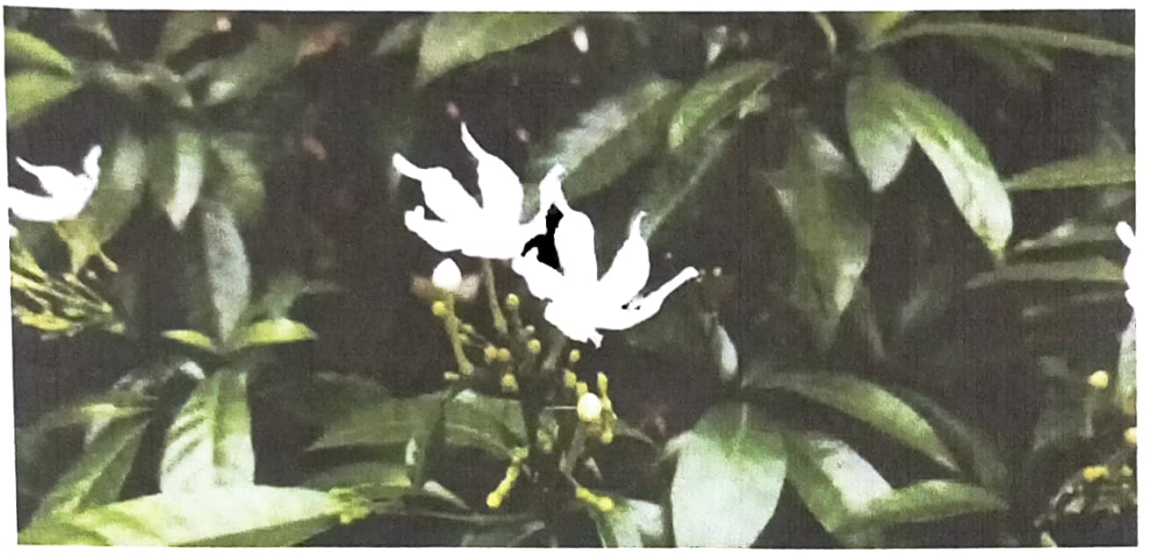
Gardenia jasminoides

Alternanthe rasessilis

Euphorbia hirta

Oldenlandia corymbosa

Bauhinia acuminata



Tabernaemontana divaricate

Murraya paniculata

Tridax procumbens

Ruellia tuberosa

Saraca asoca

Polyalthia longifolia

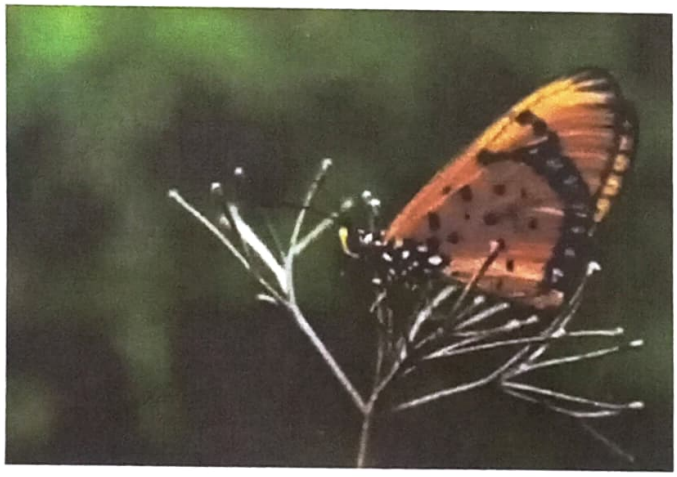
Tectona grandis

ANIMAL AUDIT

The famous saying **"Until one has loved an animal, a part of one's so remains awakened"** describes the Importance of Animals. Animals are the beauty of our nature as well as their behavioural responses are a source of inspiration for many. Without them, our nature is like a flower having no fragrance and no colour.

For maintaining a healthy ecological balance on earth, animals and marine species are as important as humans. Each organism on this earth has a unique place in the food chain that helps contribute to the ecosystem in its own special way. The eco-system is all about relationships between different organisms connected through food webs and food chains. Even if a single wildlife species gets extinct from the eco-system, it may disturb the whole food chain ultimately leading to disastrous results.

Consider a simple example of a bee that is vital for the growth of certain crops due to their pollen carrying roles. If bees get reduced in numbers, the growth of food crops would definitely lower owing to a lack of pollination. Similarly, if a species gets increased in number, again it can have an adverse effect on the ecological balance. As the Nation's growth starts from its educational institutions, where the ecology is thought as a prime factor of development associated with environment. So, a report on faunal diversity of this college was made.



➢ List of Annelids found in the College Campus

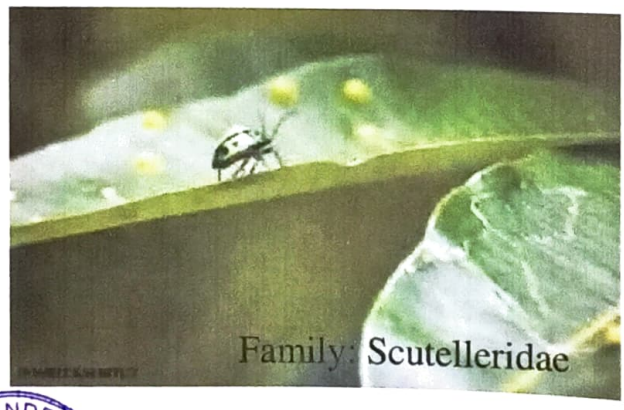
1. *Eiseniafetida* (Common Name: Red Wigglers)
2. *Perionyx excavates*
3. *Phertima sp.*

➢ List of Arthropods found in the College Campus

1. *Rhysida* sp. (Common Name: Common Centiped)
2. *Scolopendra* sp.
3. *Periplaneta* sp.
4. Family: Scutelleridae (Common Name: Jewel Bug)
5. Family: Coccinellidae (Common Name: Lady Bird Beetles)
6. *Culex* sp.
7. *Aedes* sp.
8. Chironomous Larva
9. *Musca domesticus*
10. Family: Scutelleridae
11. Millipeds
12. *Apis*sp.
13. *Cyclops sp.*
14. *Mantis sp.*
15. *Macrotermes*
16. *Papiliodemodocus (Lime Butterfly)*
17. *Junoniaatlites (Grey Pansy)*
18. *Appiasolferna (Black veined albatross)*
19. *Euremahecabe (Common grass yellow butterfly)*
20. *Diplacodestrivialis (Ground skimmer butterfly)*
21. *Acraea terpsicore (Tawny Coaster)*

22. *Kalidasalanata*
23. *Tutubing kalabaw*
24. *Ceriagrioncoromandelianum*
25. *Crocothemis servilia*

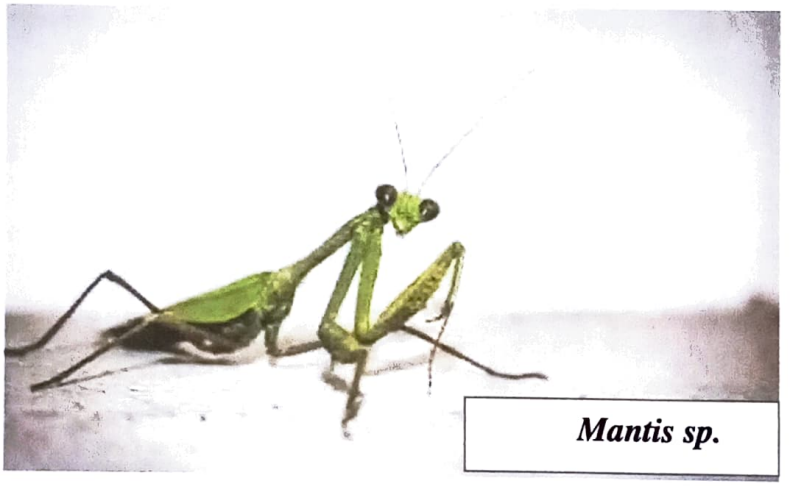
Photographs of a few arthropods at B.C.College campus



Tutubing kalabaw

Crocothemis servilia

Ceriagrion coromandelianum



Mantis sp.

List of Molluscs found in the College Campus

1. *Pila sp*
2. *Achatina sp.*

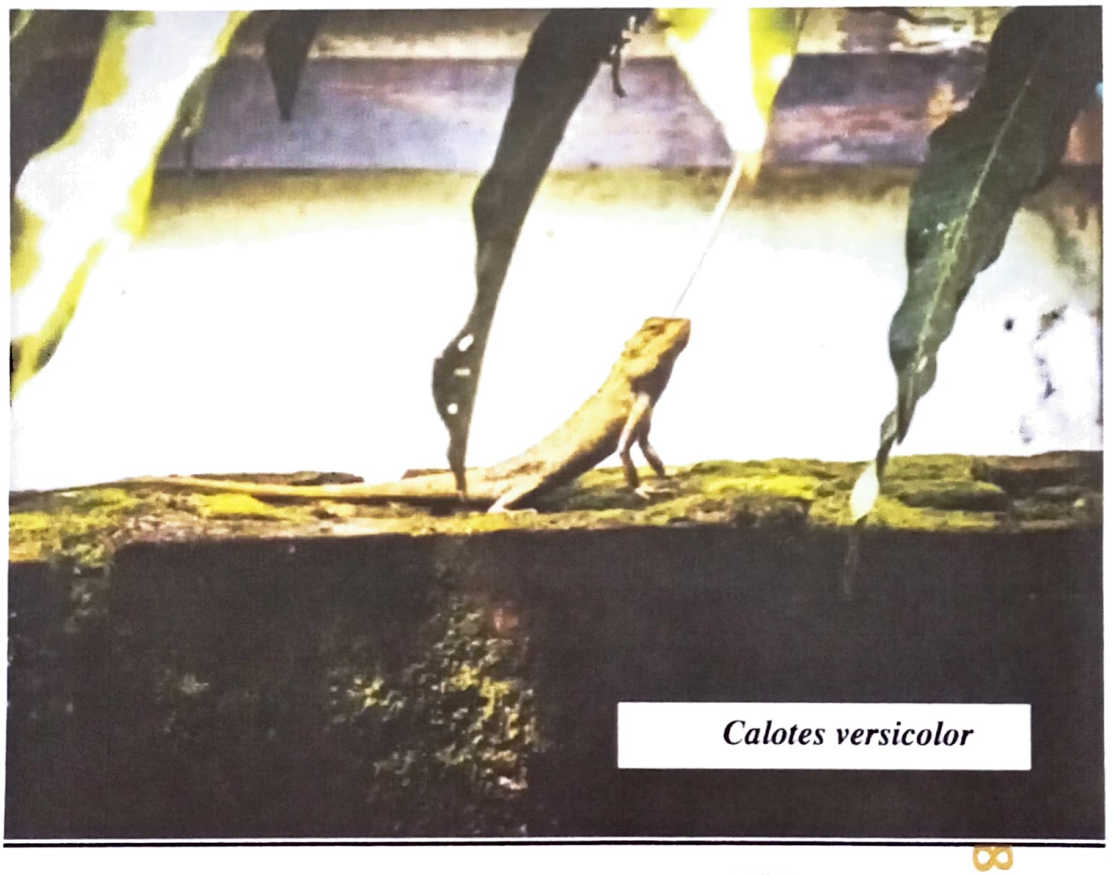
List of Amphibia Found in the college Campus:

1. *Bufo sp.*
2. *Rana sp.*

List of Reptiles found in the College Campus

1. *Vipera sp.*
2. *Fowlea piscaletor*
3. *Calotes versicolor*
4. *Chamaeleo zeylanicus*
5. *Amphiesma stolatum*
6. *Oligodon arnensis*
7. *Ahaetulla nasuta*
8. *Hemidactylus*

Photographs of Reptile at B.C.College campus



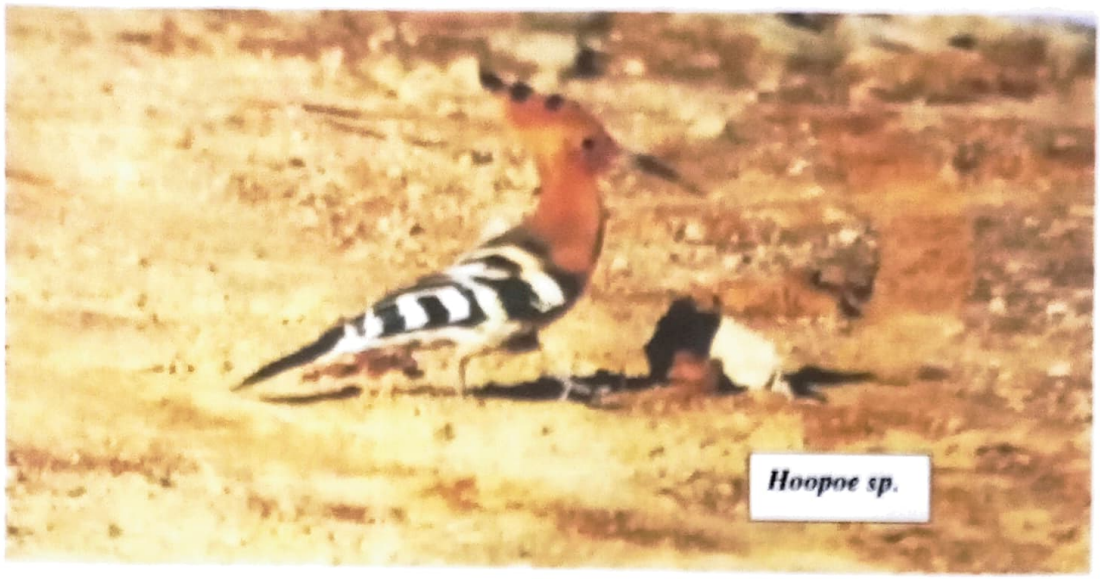
Calotes versicolor

List of Aves found in the College Campus

1. *Columba sp.*
2. *Pycnonotus sp.*
3. *Psittacula sp.*
4. *Passer sp.*
5. *Corvus sp.*
6. *Eudynamys sp.*
7. *Centropus*
8. *Acridotheres*
9. *Spilopelia*
10. *Turdoides*
11. *Cinnyris*
12. *Bubo*
13. *Dicurus*
14. *Upupa*
15. *Copsychus*
16. *Hoopoe*

Photographs of a few birds at B.C.College campus

Dicurus sp.



Hoopoe sp.

Acridotheres tristis

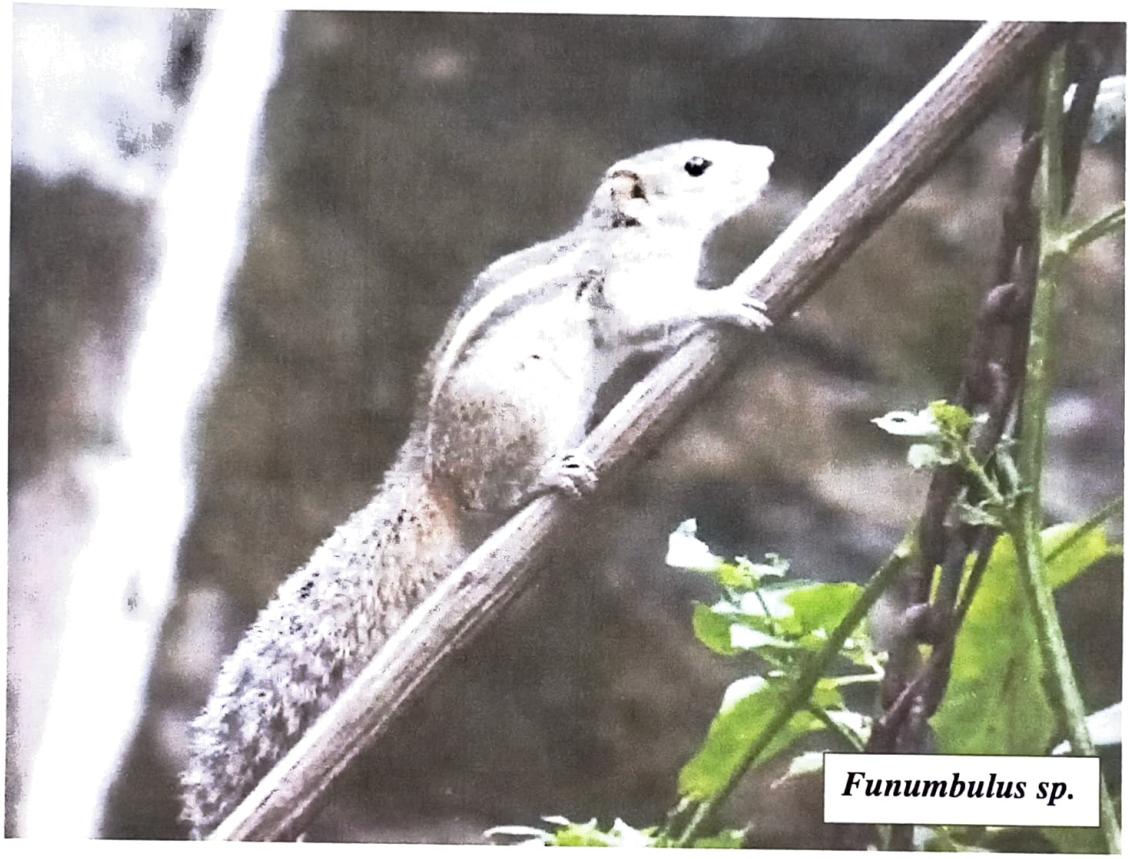
Acridotheres ginginianus

Pycnonotus sp.

Copsychus sp.

List of Mammals found in the College Campus

1. *Canis sp.*
2. *Felis sp.*
3. *Funumbulus sp.*
4. *Rattus norvegicus*
5. *Sorex sp.*



Funumbulus sp.

Discussion: The campus of Bidhan Chandra College is rich in faunal biodiversity. The arthropod biodiversity as well as avian biodiversity of this campus is very high which is due to abundance of a lot of trees within the campus. The interaction of the flora and fauna within the campus are depicted in most of the pictures attached with this report.

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Limitation: Within this pandemic situation a regular survey of the faunal diversity was not possible. A few specimens were unidentified as the animals sometimes camouflaged within their habitat. As the study was conducted in the day time mostly, the nocturnal animals may have been missed.

Carbon Footprint

1) Establish a system of carpooling among the staff to reduce the number of four wheelers and two wheelers coming to the college.
2) Introduce college bus services to the students and staff.
3) Encourage staff and students to use cycles.
4) Establish a more efficient cooking system to save LPG
5) Usage of generators should be discouraged

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