Biodiversity Assessment Report of Christian Medical College, Chittoor Campus.

ECOLOGICAL BASELINE REPORT

2020

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1 *EXECUTIVE SUMMARY AND RECOMMENDATIONS*

A biodiversity survey was conducted on Christian Medical College, Chittoor Campus. The key findings of the survey were:

1.1 *ECOLOGY:*

- The Christian Medical College occurs as a fragment of Eastern Ghats. It's ecological context and biodiversity is represented largely from this ecoregion and landscape.

- A network of protected areas and patches of forests ranging from small patches of social forests, revenue land, reserve forests to large ones like the Koundinya Wildlife Sanctuary, Sri Venkateswara National Park and Pulicut Lake contribute to an ebb and flow of wildlife populations in the larger landscape and CMC Chittoor campus.

- The structural complexity of the landscape has created a wide range of habitats and niches that support a wide range of biodiversity including some that are rare, specific and endemic to this landscape.

- Ridges are identified to be acting as windbreaks supporting dense growth of vegetation North of the ridges.

- A total of 6 streams are noted to start from within the campus. Three from Mapakshi and three from Ramapuram respectively. They join two separate tributaries that then join River Ponnai independently.

- The vegetation of the landscape and its habitats could be classified into 7 categories. They include tropical dry evergreen forest, southern tropical thorn scrub, dry grassland savannah, dry & rocky areas, swamps, agricultural land and waterbodies.

1.2 FLORA:

- The Christian Medical College Chittoor campus supports at least 241 species of flora, of which the most dominant group includes 123 herb species, 24 shrub species, 12 climber species, 26 liana species, 41 trees, 5 hydrophytes and 2 parasites.

- A nativity assessment revealed that among the dominant group, 191 (79%) are native, 10 (4%) are endemic, 22 (9%) are exotic invasive plants and 18 (8%) are exotic cultivated species that include Indian natives from other regions and exotic ornamental species.

- A qualitative assessment of flora rarity based on number of individuals seem to suggest that 37 species are rare, 111 species are uncommon and 93 are common.

- A habitat corelate assessment revealed that 95 species are of the Southern tropical thorn forest, 54 species are of the tropical dry evergreen, 27 belong to dry grassland savannah, 26 to the agriculture land, 21 are marsh and aquatic associated, 7 are dry, rocky area associated, 2 are riparian, 8 are garden and avenue species

- Most of the native vegetation is retained along mountainous and rocky parts of the campus.

- Significant and endemic species are noted to be predominantly occurring in the mountainous, undulating and rocky regions that had least human interventions and human driven change.

- Twenty-two species are exotic invasive plants and eighteen are exotic cultivated species as listed by TN ENVIS and National Biodiversity Authority. Either of these groups of species need to be systemmatically monitored.

- Most of the plants chosen for ornamental and shade purposes are noted to be exotic. These have highly negative implications for biodiversity and human residents like water shortage issues.

- Notable invasive species of the study area include *Chromolaena odorata, Catharanthus roseus*, *Lantana camara*, *Croton bonplandianum*, *Parthenium hysterophorus*, *Tridax procumbens*, *Cleome viscosa*, *Marsilea quadrifolia*, *Passiflora foetida*, *Dodonaea viscosa*, *Typha angustifolia.*

1.3 FAUNA:

- The Christian Medical College Chittoor campus supports at least 118 species of birds, 62 species of butterflies, 29 species of reptiles, 17 species of amphibians and 15 mammals.

- Diversity of birds is considered good. Extended surveys are likely to record up to 200 species on campus.

- An analysis of migratory status of birds revealed that majority are residents (95 species) while 23 species are migrants.

- A habitat correlate assessment of birds showed that 104 are terrestrial while 14 are aquatic habitat preferring.

- An assessment of feeding habits of birds revealed that the majority are of the insectivore's species (68 species) while 15 are granivores, 13 are raptors (carnivores), 8 are frugivores, 4 are aerial insectivores, 3 are nectarivores and two are piscivores (fish eating).

- A qualitative assessment of habitat choice revealed that the diverse habitats were directly responsible for the diversity of birds seen, their habitat choice for feeding and breeding. Some chose bare ground (e.g. Nightjar) while others

chose short grasslands (e.g. larks), others tall grasslands (e.g. munias), others-rocky areas (e.g. Painted Spurfowl, Martins) still others -scrub habitats (e.g. bulbuls) and so on.

- The largest numbers of breeding birds are seen in the main check dam area where a combination of waterbody and scrub habitat occurr and the valley provided a safe space by its structural complexity.

- A disproportionately low number of butterfly species are recorded. The reason for low number of records is not clear but may partly be attributed to the heavy drought of 2018. It may also suggest a poor habitat quality.

- Diversity and abundance of herpetofauna is considered healthy. Extended surveys are likely to record about 80 species of herpetofauna.

- Occurrence of all reptile species with the exception of two – the Spotted house Gecko (*Hemidactylus parvimaculatus*) and Common House Gecko (*Hemidactylus frenatus*) are very strongly associated with the rocky areas of the campus.

- Presence of species like Cobra can be partly attributed to high habitat modification which is human driven.

- Occurrence of amphibian fauna specifically endemic and significant species such as Gunther's Toad and Burrowing Frog sp. (*Sphaerotheca pluvialis*) are strictly attributed to structural complexity of the campus and specifically its current ability to support ephemeral rock pools and temporary springs.

- The survey also yielded more unidentified amphibian species. It is suspected that these are undescribed species, new to science.

- Structural complexity was noted to be crucial for different mammals at different levels. Mammals such as Porcupines used hillocks for denning. Bats

were noted to choose both caves and rock crevices for roosting. Riverine areas were noted to be crucial for Civets and Indian Wild boar. Jungle Cats were noted to predominantly use grasslands.

1.4 THREATENED BIODIVERSITY:

- Endemic flora such as *Andrographis serpylifolia*, *Caralluma adscendens* var. *attenuata, Cyanotis tuberosa, Euphorbia deccanensis* var. *nallamalayana, Leucas longifolia* and *Ochna gamblei* were recorded.

- Flora such as *Cassine glauca, C. paniculata, Drypetes sepiaria, Ficus mollis, Pancratium triflorum* are represented by just one or two individuals and are therefore considered rare and must be monitored and protected.

- Birds of prey such as Black-winged Kite, Short-toed Snake Eagle, Indian Spotted Eagle, Tawny Eagle, Bonelli's Eagle, Shikra, Besra, Brahminy Kite, White-eyed Buzzard are recognised in Schedule I with highest protection in the Indian Wildlife Protection Act,1972.

- Grey Jungle Fowl is recognised as Schedule II species in the Indian Wildlife protection Act, 1972.

- Indian Spotted Eagle is listed as species 'vulnerable' to extinction by International Union for Conservation of Nature.

- Thirteen species of birds are recognised as species threatened by extinction in the future and listed in Appendix II of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). They are Plum-headed Parakeet, Common Kestrel, Black-winged Kite, Short-toed Snake Eagle, Indian Spotted Eagle, Tawny Eagle, Bonelli's Eagle, Shikra, Besra, Brahminy Kite, White-eyed Buzzard and Grey Jungle Fowl.

- Two butterfly species are listed in Schedule I of the Indian Wildlife Protection Act, 1972. They are the Danaid Eggfly and Crimson Rose.

- Three butterfly species are listed in Schedule II of the Indian Wildlife Protection Act, 1972. They are the Gram Blue, Indian Peacock Royal and the Pea Blue.

- Four reptile species are recognised as Schedule I species in the Indian Wildlife Act,1972. They include the Indian Golden Gecko, the Indian Monitor, the Indian Rock Python and the Indian Flap-shelled Turtle.

- Four reptile species are listed as Schedule II species. They include the Indian Chameleon, Oriental Ratsnake, the Indian Cobra and Olive Keelback.

- Seven reptile species are listed as Schedule IV species. They include the Common Sand Boa, Common Bronzeback Snake, Streaked Kukri Snake, Common Cat Snake, Brahminy Blindsnake, Saw-scaled Viper and the Indian Star Tortoise.

- Two reptile species are listed as 'Vulnerable' by the International Union for Conservation of Nature (IUCN). They are Otai's Day gecko and the Indian Star Tortoise.

- The Indian Star Tortoise, Indian Monitor Lizard and Indian Rock Python are listed in Appendix I of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) as species threatened with extinction.

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) also recognises the Indian Chameleon, the Indian Flapshell Turtle, the Indian Sand boa, the Indian Cobra in Appendix II as protected and likely threatened with extinction in the future.

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) also lists Olive Keelback in Appendix III as a species that is 'Vulnerable'.

- The Indian golden gecko, the Otai's day gecko, the Treutler's gecko, and the Giant leaf-toed gecko are identified as species highly restricted in geographic range and endemic to the region.

- Five amphibian species - the Common Skittering Frog, Indian Six-toed Frog, Jerdon's Bullfrog, Indian Bullfrog and Marbled Balloon Frog are noted to be listed in Schedule IV of the Indian Wildlife Protection Act.

- The Indian six-toed frog and Indian Bullfrog are noted by Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) as species likely to be threatened with extinction in the future.

- The Gunther's Toad and Burrowing Frog sp. (*Sphaerotheca pluvialis*) have been identified as endemic to the region. The Gunther's Toad is also recognised as 'Data Deficient' by International Union for Conservation of Nature (IUCN). Both species can be considered as significant species and records for the region.

- Five mammal species are listed as Schedule II of the Indian Wildlife Protection Act, 1972. They are Jungle Cat, Common Indian Mongoose, Ruddy Mongoose, Small Indian Civet and Bonnet Macaque.

- Two mammal species are listed as Schedule III species of the Indian Wildlife Protection Act, 1972. They are the Indian Spotted Deer, Indian Wild Pig.

- Four mammal species are listed Schedule IV species of the Indian Wildlife Protection Act, 1972. They are the Indian Flying Fox, Indian Hare, the Indian Palm Squirrel and the Indian Crested Porcupine.

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) recognised Jungle Cat, Indian Flying Fox and Bonnet Macaque as protected in Appendix II which lists species likely to be threatened with extinction in the future.

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) recognised Indian Grey Mongoose, Ruddy Mongoose and Small Indian Civet as protected in Appendix III which lists species that are vulnerable.

1.5 ENVIRONMENTALLY IMPORTANT AREAS:

All environmentally important areas have been identified through a process of sensitivity assessment and mapping. They are referred to as 'ecozones'. Some of the characters of environmentally important areas are discussed below.

- Hilly areas have retained most of their native vegetation including forest patches or grasslands. They are contiguous and play a long-term role in ecological resilience.

- Hilly areas also support most of the rare, endemic or significant species. Such as the scrubland birds and Gunther's frog, Golden Gecko, Treutler's Gecko, Otai's Day Gecko, Burrowing Frog sp. (*Sphaerotheca pluvialis*).

- Hilly areas were also noted to support rare and endemic flora such as *Anisochilus carnosus*, *Caralluma* spp., *Euphorbia deccanensis* var *nallamalayana*, *Ochna gamblei*. They were also noted to host habitat specialist species such as *Dopatrium junceum*, *Portulaca tuberosa, Rotala densiflora* which can be found only in the rocky areas of the campus.

- Riverine areas with a buffer of 100 m help act as passive 'Assisted Natural Regeneration' measure and have the ability to help in long-term ecological resilience.

- Contiguous habitat with an undisturbed core can help in long-term ecological resilience. In this context, a few 'wildlife corridors' and core area have been identified.

- One primary corridor and two secondary (riverine) corridors have been identified. These corridors help maintain habitat contiguity with habitats both outside and inside the campus. They provide safe passage to animals and help with natural regeneration and therefore assist in long-term ecological resilience.

- The Central Ridge acts as windbreak and supports wide range of biodiversity particularly North of the break. Good number of breeding signs and fauna colonies were also noted in such areas.

- Riverine habitats additionally were noted to act as refuges and provided safe passages to animals moving within the campus.

1.6 ENVIRONMENTAL ISSUES & IMPACT

A few potentially long-term challenges and environmental issues include the following.

- At least 23 invasive species have been identified on campus.

- Tree planting undertaken on campus is likely to negatively affect biodiversity, long-term ecological resilience and water table.

- Invasive species including some ornamental plants currently in use can lead to water issues including water shortage, soil poisoning and ground water poisoning in the long-term.

- Presence of Dogs and Cats on campus is likely to be highly detrimental to biodiversity.

- Release of fishes, particularly invasive species (African Catfish) to control mosquito has been noted in ponds. It is likely to affect aquatic biodiversity negatively both inside and outside the campus.

- Mosquito and other insect control (currently stopped) by pesticides is likely to negatively affect biodiversity.

- Increased light pollution over long-term is likely to affect biodiversity particularly insect diversity adversely.

- Absence of a periodic monitoring of water treatment plant can affect the riverine areas and may lead to cases of poisoning and the likes.

- Habitat modification may be perceived as one of the biggest threats to biodiversity on campus. Therefore, all kinds of habitat modification including those perceived as 'green' may be restricted to human-use areas.

- Absence of insect-friendly light both on street and in buildings can impact insects, bats and other fauna.

- Placement of roads require ecological review as they can impact fauna in the long-term.

1.7 RECOMMENDATIONS:

A summary of recommendations for long-term biodiversity resilience is provided below;

- Structural complexity and heterogeneity of the campus by its undulating and mountainous terrain along with rocks, boulders and other components are a unique feature which helps support diverse, unique flora and fauna. Therefore, usage of heavy machinery like JCB in natural areas shall be reconsidered and cautiously used. Such features are delicate and shall be maintained.

- Riverine habitats shall be protected, not modified and kept undisturbed.

- Any habitat modification including those perceived as 'green' may be restricted to the human-use areas.

- Efforts must be taken to keep the core area free of anthropogenic effects of all kinds.

- Corridors and contiguity of habitat must be maintained with habitats both within and outside the campus.

- All pollution types (air, water, sound, light, heat etc.) must be periodically monitored and actions must be taken to control them.

- Light pollution – foreseen as a potential threat on long-term ecology of insects must be monitored and controlled. Insect friendly lights may be installed.

- High vigilance is recommended during high fire-incidence months (December to June) towards smart control of fire.

- Systematic reduction of flammable biomass to reduce fires in critical areas.

- Systematic removal of invasive flora to both reduce flammable biomass and enhance biodiversity.

- Systematic control and removal of animals such as dogs and cats within provisions of Indian law must undertaken periodically.

- Habitat restoration has a strong potential to increase long-term biodiversity resilience and must be systematically undertaken.

- No animals (feral dogs, cats or wild animals) may be fed on campus by residents.

- Insecticides, pesticides and herbicides may not be used on campus.

- Systematic and curated choice of flora for ornamental and shade purposes around buildings.

- Tree planting shall not be undertaken on campus since the campus is delicate in its biodiversity structure and could lead to ecological collapse in the long run.

- Ornamental and shade species chosen shall be non-invasive species. Any species listed as invasive by the National Biodiversity Authority, State Wildlife authority and State environment departments may be not planted.

- Roads may not bifurcate 'ecozones'.

- Roads where in use may be ensured to add fauna friendly features providing safe passage structures in canals. Roads may also include features that prevent fauna from getting onto roads since roads can also act as ecological traps.

- Active roads may be placed internally between buildings to reduce road kills and prevent trapping of animals and insects that are drawn to roads and artificial lights.

- Glass paned buildings may be avoided where possible. Windows and glass panes when used may be insect and bird-friendly.

1.8 OTHER RECOMMENDATIONS:

Systems towards long-term monitoring may be put in place.

- A long-term biodiversity system may be considered, designed and put in place.
- CMC Chittoor campus may participate in setting up an automated weather station in collaboration with state meteorological department for long-term monitoring.
- CMC Chittoor campus may participate voluntarily in setting up automated air quality monitoring system in collaboration with state authorities or national monitoring agencies towards long-term monitoring and control.
- Monthly testing of water quality may be undertaken and systematically logged.
- Bi-annual testing of soil and hospital campus for toxic chemical and bio-medical components may be undertaken and systematically logged.
- An independent Environmental Committee may be set up to ensure biodiversity and sustainability goals are met by action and implementation. It may work in tandem with the administrative department to ensure its goals are met.

MAIN SECTION

2 INTRODUCTION

The team surveyed the Christian Medical College, Chittoor Campus and its surroundings over a span of about 15 days primarily in 2018 & 2019 for floristic survey and over a span of 20 days for faunal surveys. The days were spread well over the year and seasons to ensure maximum species accumulation. The survey was undertaken both within and around the campus to gain perspective of the larger landscape. The primary goal was to establish an ecological baseline of the campus.

2.1 OBJECTIVES:

The objectives of the survey are as follows.

2.1.1 Flora:

- Record all flora (plants) across the campus with photographs wherever possible

- Enable CMC Chittoor campus to set conservation priorities by identifying flora of conservation value and their distribution on grounds of endemicity, rarity and other threatened categories as per scientific studies and field survey.

- Identification of areas of high-density occurrence of sensitive flora and ecological resources within the campus.

2.1.2 Fauna:

- Record all fauna (amphibians, birds, butterflies, mammals, and reptiles) occurring on CMC Chittoor campus with photographs wherever possible.

- Enable CMC Chittoor campus set conservation priorities by assessing sensitivity and evaluating the species occurring on campus as per national and international wildlife conservation priorities such as International Union

for Conservation of Nature - Red List and provisions in the Indian law like Indian Wildlife Protection Act 1972 .

- Enable CMC Chittoor campus to set conservation priorities by identifying species of conservation value and their distribution on grounds of endemicity, rarity and other threatened categories as per scientific studies and field survey.

- Identification of areas of high density occurrence of sensitive fauna and ecological resources within the campus.

2.1.3 ***Ecology:***

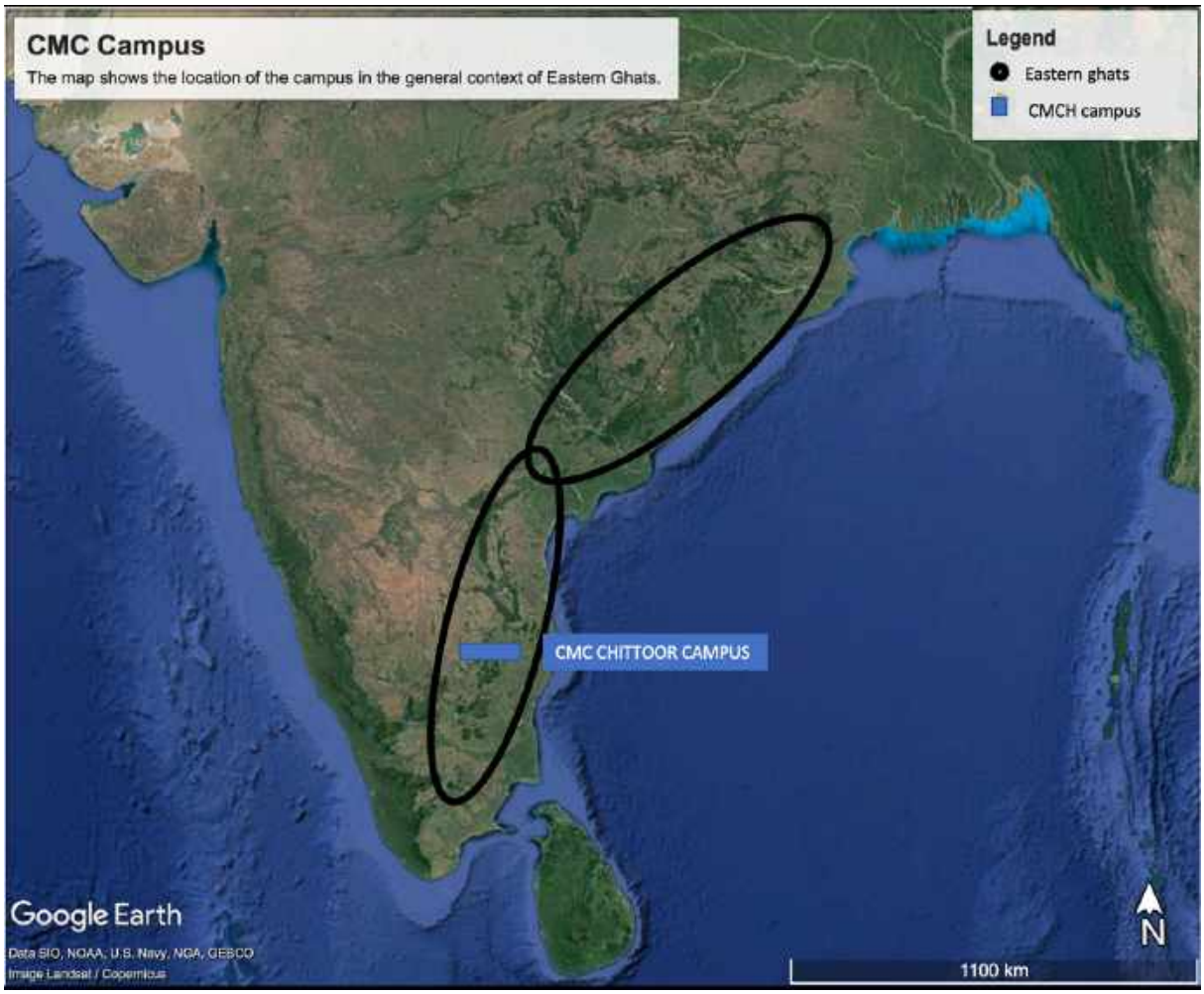
- Identification of ecologically sensitive areas and other ecological resources like feeding grounds, breeding grounds and wildlife corridors that are crucial habitats for the long-term sustenance, ecological resilience of the biodiversity on campus as a standalone unit along with its ability to support biodiversity overall specifically for threatened or endemic species(if any).

- Basic assessment of sensitivity, threats and potential impact on flora and fauna and potential mitigation measures.

- Create conservation targets through the survey and studies to inform master plan of CMC Chittoor campus to minimise impact on the environment.

3 STUDY AREA

Christian Medical College (CMC), Chittoor campus is situated in Chittoor district, Andhra Pradesh. The Christian Medical College, Chittoor Campus falls as a fragment, an off shoot of Eastern Ghats, situated in the border of Tamil Nadu and Andhra Pradesh. It is an undulating terrain with diverse vegetation types. Its characters are drawn from the larger ecology of Eastern Ghats landscape.



Map 1: Ecological context of CMC, Chittoor Campus

3.1 CLASSIFICATION OF THE REGION

Classification Scheme	Classification
Biogeographic Province of India [1]	6E: Deccan Peninsula-Deccan South
Agro Ecological Sub Region [2] (Indian Council of Agricultural Research)	Deccan Plateau, hot arid eco region (8.3)
Agro-Climatic Region [2] (Planning Commission)	Southern Plateau and Hills Region (X)
Agro Climatic Zone [2] (National Agricultural Research Project)	Southern zone of Andhra Pradesh (AP-3)

3.2 RAINFALL OF THE REGION[2]

Rainfall	Average (mm)	Normal Onset (specific week and month)	Normal Cessation (specific week and month)
SW monsoon (June-Sep):	438	1st week of June	3rd week September
NE Monsoon(Oct-Dec):	396	1st week of October	Last week of December
Winter (Jan- Feb)	12		
Summer (March-May)	88		
Annual	**934**		

3.3 LAND USE PATTERN OF THE REGION[3]

Land use pattern of the district (latest statistics)	Area ('000 ha)	Land use pattern of the district (latest statistics)	Area ('000 ha)
Geographical area	1515.1	Land under Misc. tree crops and groves	28.6
Forest area	452	Barren and uncultivable land	154.4
Land under non- agricultural use	146.4	Current fallows	174.3
Permanent pastures	33.9	Other fallows	118.2
Cultivable wasteland	42.1		

[1] http://wiienvis.nic.in/Database/HtmlPages/biozonemap.htm
[2] . http://nicra-icar.in/nicrarevised/images/statewiseplans/Andhra%20pradesh%20(Pdf)/ANGRAU,%20Hyderabad/AP2-Chittoor%2031.1.2011.pdf
[3] www.crida.in/CP-2012/statewiseplans/.../ANGRAU.../AP2-Chittoor%2031.1.2011.pdf

Views of the CMC Chittoor Campus

View from Central Ridge at the Eastern corner of the campus looking West.

View from the valley located centrally between Ramapuram and Mapakshi looking West

View from Western corner of Central ridge into the campus

View of grasslands surrounding the existing main block

View from Central ridge at the SW Corner of the campus looking South

View of Agriculture from SE corner of the campus looking NW into the Campus

3.4 CHARACTERS OF THE CMC, CHITTOOR CAMPUS:

It includes a predominant native vegetation called the Tropical Dry Evergreen forest along with scrub jungle and grassland. This 650 acre campus encompasses social forestry land (scrub and grassland mosaic), agricultural fields and Mango groves.

The campus is surrounded by many pockets of forests. It also has three globally recognised Key Biodiversity Areas[4] and Important Bird Areas[5]. These areas are considered important to the long-term survival of birds, host critically threatened species and as locations globally important for the long-term persistence of biodiversity. The sites include the Koundinya Wildlife Sanctuary which is set about 20 km North of Koundinya Wildlife Sanctuary, the Sri Venkateshwara National Park set 50 km North of the Campus and Pulicut Bird Sanctuary set 100 km west of the campus. The three sites are recognised as both Key Biodiversity Areas and Important Bird Areas by global conservation authorities such as International Union for Conservation of Nature (IUCN) and Birdlife International. Many species of conservation significance are known to occur in these sites of conservation significance. They range across all taxa groups. Some include large mammals such as Leopard, Sloth Bear, Golden Jackal among others. It also includes endemic bird species such as Yellow-throated Bulbul. These network of protected areas and natural habitats act as ''source populations'' of species that move out and occupy broader habitats in the landscape and are critical to long-term persistence of biodiversity in the broader landscape. Such populations help keep healthy populations of species in possibly fragmented or 'deteriorating habitats' in the locality as individuals move between habitats. It is one of the basis of being identified as Key Biodiversity Areas and Important Bird Areas. The CMC Chittoor campus draws many elements of ecology ranging from physical characters to various flora and fauna from these sites including endemic and threatened fauna.

[4] http://www.keybiodiversityareas.org/site/mapsearch

[5] BirdLife International (2020) Country profile: India. Available from http://www.birdlife.org/datazone/country/india. Checked: 2020-03-22

Map 2:Key Biodiversity Areas & Important Bird Areas around CMC, Chittoor campus

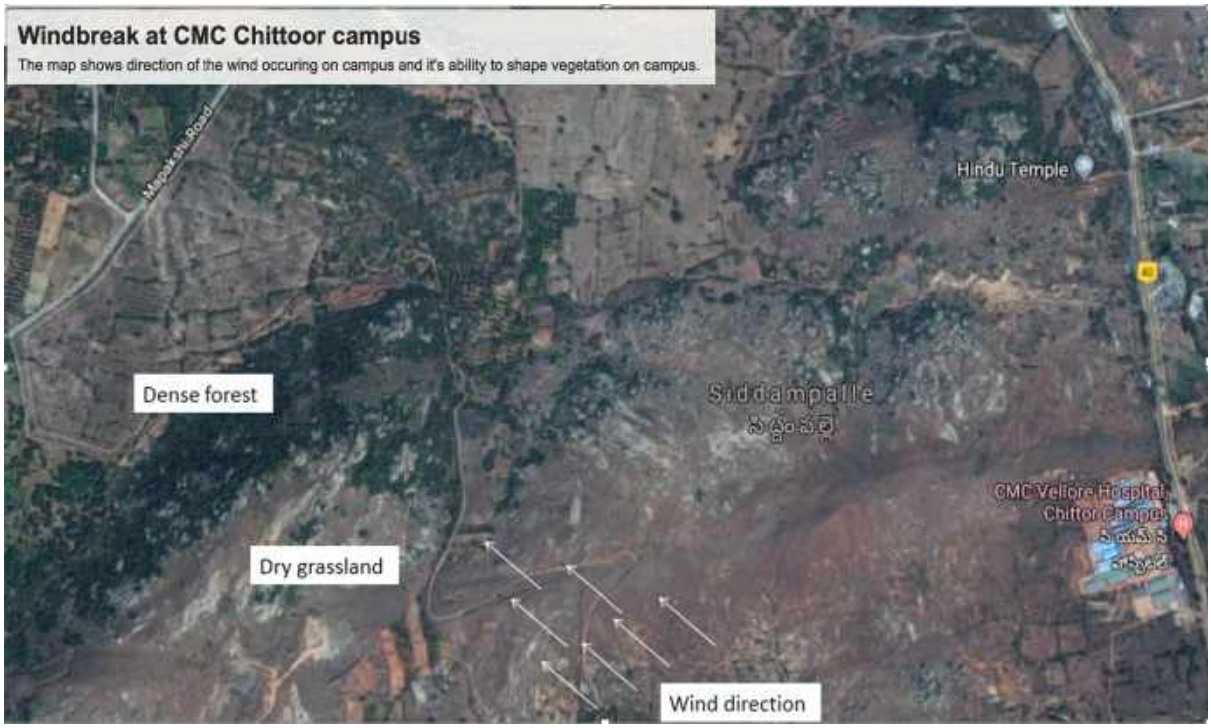
Data source: Sri Venkateswara National Park and Wildlife Sanctuary[6] Pulicat lake[7] Kaundinya Wildlife Sanctuary[8]

Land classified as social forestry are located within the premise of the Hospital and surrounding area, as are Reserve forests. Both are category of forests protected under the Indian Forest Rights Act. Many fragments of forests belonging to varying protection levels are also present in the vicinity of the campus. They include Sanctuary, Reserve Forests, Social Forests, Revenue Forests, Poromboke land and Darakastu land(DKT). Irrespective of their land category and landuse, these patches have managed to retain native vegetation. An indicative map showing all forest patches including such lands surrounding CMC Chittoor Campus is provided in the map below.

[6] BirdLife International (2020) Important Bird Areas factsheet: Sri Venkateswara Wildlife Sanctuary and National Park. Downloaded from http://www.birdlife.org on 11/03/2020.
[7] BirdLife International (2020) Important Bird Areas factsheet: Pulicat Lake. Downloaded from http://www.birdlife.org on 11/03/2020.
[8] BirdLife International (2020) Important Bird Areas factsheet: Kaundinya Wildlife Sanctuary. Downloaded from http://www.birdlife.org on 11/03/20

Map 3: Forests around CMC, Chittoor Campus

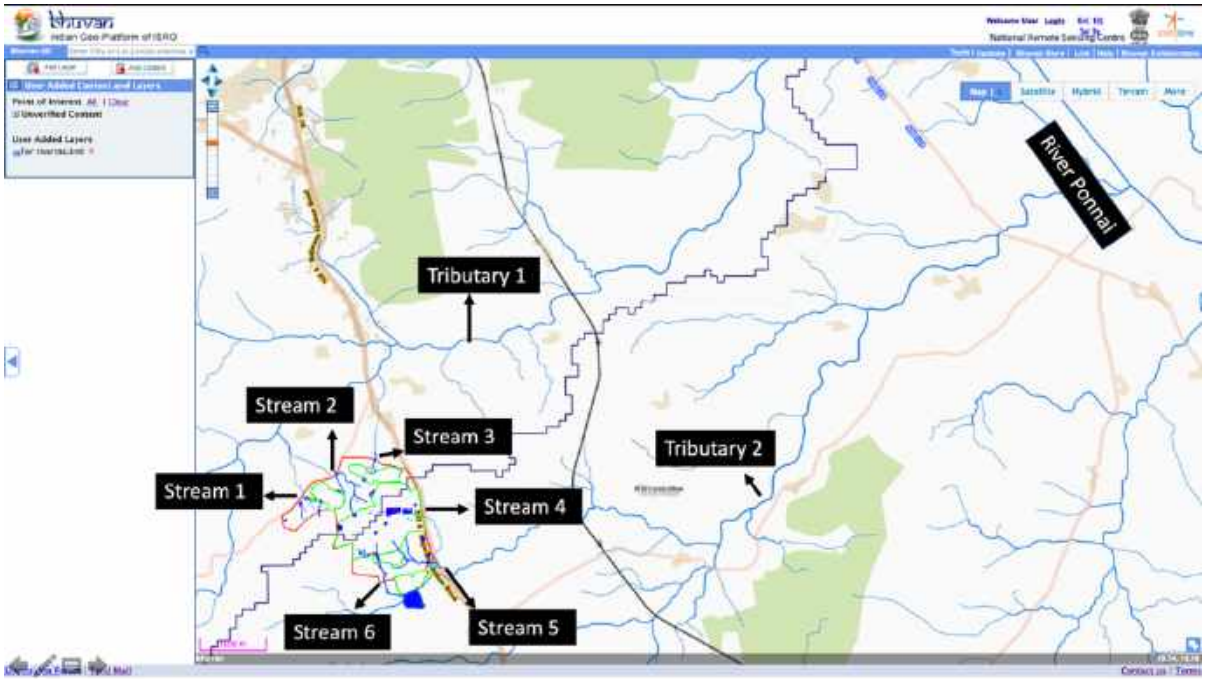
The social forest land is a habitat mosaic of low altitudes dry savannah grassland, rocky hillocks, and tropical dry forests components. The grasslands on these rocky hillocks act as an excellent water catchment area for several small streams and rivulets that are flowing along the valleys. The undulating landscape thus creates several habitats and microhabitats. Element that shape the vegetation in this landscape include wind, fire and landscape (e.g rock formations). Based on such factors the crests of the rocky hillocks are occupied with scrub jungles and rock faces have many lithophytes (rock dwelling plants). The rocky and bouldered areas of the campus also host many unique species that are highly seasonal and occur only during the monsoon and are critical to the ecology of the landscape. A case in point are the ephemeral rock pools. The rocky and bouldered crests have also evaded elements of fire due to absence of fuel load from plants and anthropogenic influence and host unique species specialised to live in such habitats. The stature of the vegetation and positioning of the vegetation is on the north face of the mountains based on the wind direction. Most ridges, particularly the Central ridge of the campus acts as strong windbreak driving ecology at the local level. An indicative map showing windbreak at Central ridge is provided below.



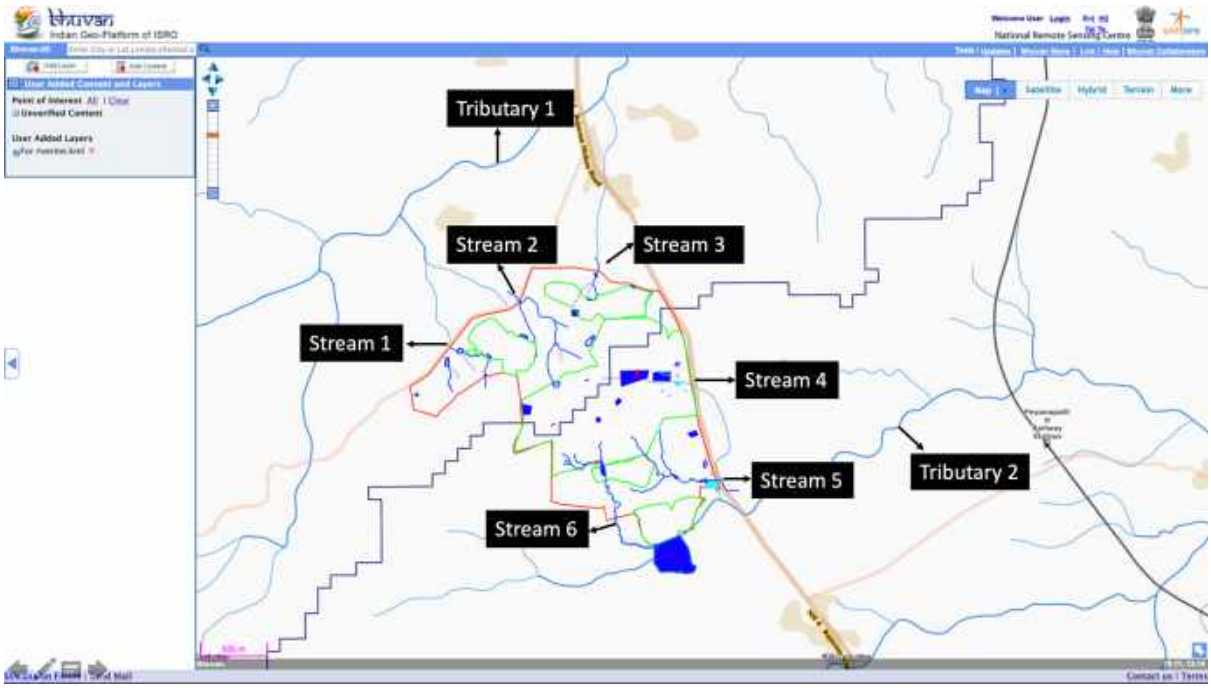
Map 4: Windbreak at Chittoor Campus

The campus further has some prominent water bodies that are home to many aquatic and riparian flora. The aquatic habitats are shaped by predominant landscape elements like slope (angle) , depth and substrates (soil, rock and boulders). This has led to parts of the campus acting as catchment where water from hilly slopes are directed naturally. The campus also has seasonal springs within the campus. A combination of substrate with minerals and such temporary springs has also led to rise of mineral licks that are favoured by some fauna. Such physical factors like substrates and slopes have also created habitats like marshes which are positioned in the eastern edges of the campus before it flows out to join the river Ponnai. Three check dams are present on campus. A large tank exists outside the south eastern corner of the campus. In addition more micro check dams are being constructed as a part of water harvesting and integrated conservation program by CMC, Chittoor campus. A total of six streams are noted to be flowing out of campus; three flowing out of Mapakshi Campus and three flowing out of Ramapuram joining two separate tributaries before joining River Ponnai.

A map made from overlay of riverine map of CMC Chittoor in 2D hydrology map by BHUVAN[9] - an Indian Geo-platform of Indian Space Research Organisation and National Remote Sensing Centre is provided below.



Map 5:A wide view of riverine zones in CMC Chittoor joining River Ponnai



Map 6:A close up view of riverine zones in CMC Chittoor joining River Ponnai

[9] https://bhuvan.nrsc.gov.in/bhuvan_links.php

3.5 VEGETATION & HABITATS

The habitats in any given region determine the diversity and abundance of species they can support. The structural complexity of the campus is noted to drive the vegetation and habitats. Habitats noted currently are categorised and adapted following two primary references- 'A revised survey of the Forest types of India' by Champion and Seth[10] and 'The flowering plants of Madras City and its immediate neighbourhood' revised edition by Livingstone and Henry[11]. Based on these widely accepted classification system of Indian forests, forest types such as Tropical dry evergreen forest, Tropical thorn forest (Scrub jungle), low altitude grassland or grassland savannah were recognised from the campus. Further, other habitats such as aquatic, marsh, fallow agricultural lands, moist, riparian, dry and rocky areas are also recognised within and around the CMC Chittoor Campus. Rao et al[12]., also mentions similar vegetation types or habitats in this region while studying the "flora and vegetation of Andhra Pradesh".

Tropical dry evergreen forest (TDEF) – According to Champion and Seth, the tropical dry evergreen forests are usually composed of coriaceous, evergreen leaved species with few deciduous emergent trees not more than 20 m high.

Southern tropical thorn scrub (scrub forest) – This vegetation is also known as scrub jungle. Characters include the following: The forest strata are not very distinct. Trees are mostly thorny with short trunk and branched crown attains a height not more than 9m. The second stratum usually composed of spiny and xerophytic shrubs. The ground layer usually has herbaceous vegetation. It is only notable during monsoon or wet season.

[10] Champion, S.H. and Seth, S.K. 1968. A revised survey of the Forest types of India. New Delhi.
[11] Livingstone, C. and Henry, A.N. 1994. Revised Edition: The Flowering Plants of Madras City and its Immediate Neighbourhood. Government Press. Madras.
[11]Rao, B.R.P., Sridhar, R.R.M, Pullaiah, T., 2008. Flora and vegetation of Andhra Pradesh. New Delhi Academy of Sciences 12, 1-13.

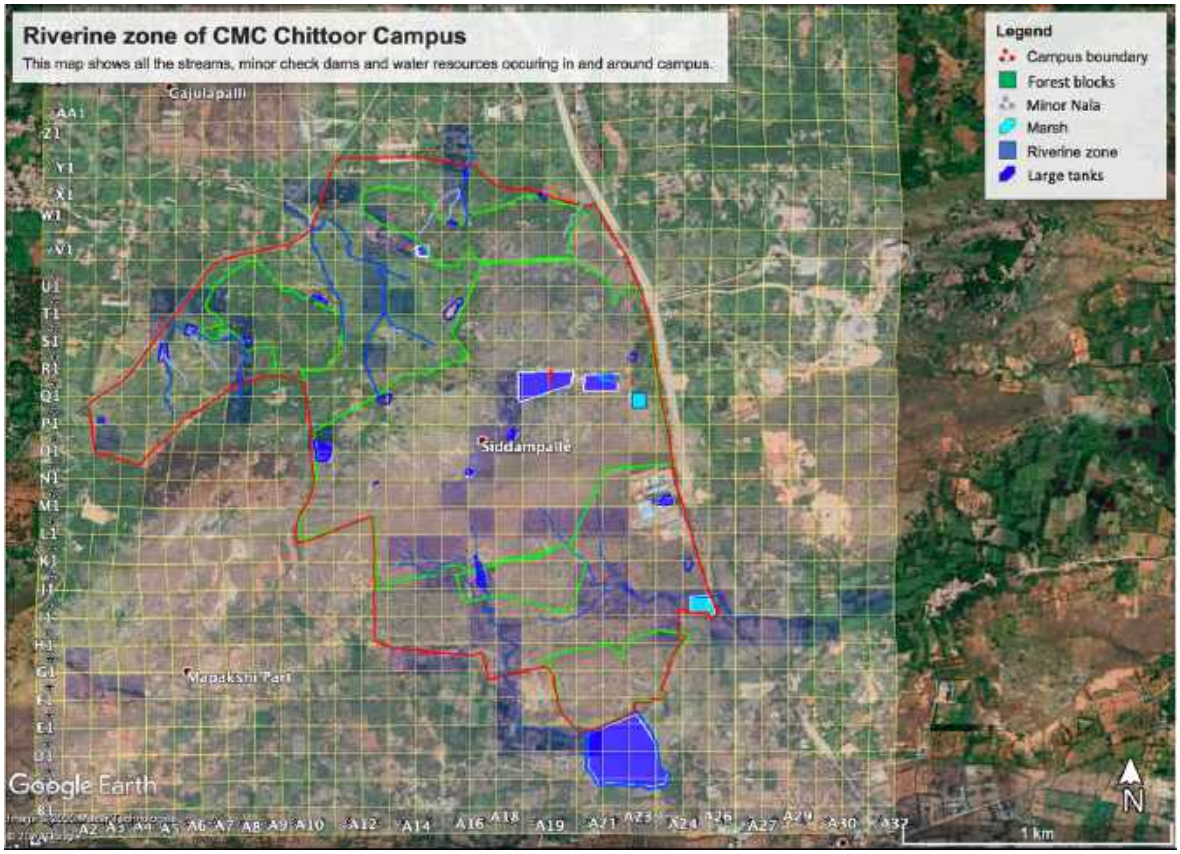
Dry grassland savanna – Champion and Seth describe this type as mostly consists of grasslands with widely scattered trees or in small groups of fire-resistant species which eventually allow taller trees to grow.

Dry, rocky areas - This is another unique micro-habitat in the campus usually occurring on the top of the hillocks associated with dry grassland savanna. This unique microhabitat holds rare and endemic species that are unique to this habitat. In addition, ephemeral pools in rocks hold water and moisture in the cavities and accommodate some hydrophytes (moisture loving species). These plants occur only in this habitat and nowhere else on the campus.

Agricultural land - Lands in the locality depend largely on rain-fed waterbodies based on the monsoon and additionally on wells for irrigation. Due to the dry nature of these areas, agriculture patterns are shifting. Groundnut was frequently preferred in past but is suggested to be on the decline leading to more preference of tree crops and poultry. Sericulture farms were also noted in the surrounding villages.

Mango orchards and custard apple were common within the campus. A common crop planted within the campus before CMC took over was groundnut. The palm, *Borasssus flabellifer* was noted to be common and used as bund trees within the campus.

Waterbodies - The CMC Chittoor campus is marked as one of the sources of the river Ponnai. Within the campus, it has riverine belts, 4 check dams, 2 marshes, 3 ponds that eventually flow into the River Ponnai. Riverine patches extend into the campus and outside. Waterbodies ranging in size from small to large are present in the vicinity of the campus. These aquatic systems support rich biological diversity including several species of algae, diatoms and many hydrophytes.



Map 7:Riverine zone of CMC Chittoor Campus

Habitats in the Study Area

Riparian habitat within the campus

Low altitude grassland within the campus

Fallow cultivated land within the campus

Tropical dry evergreen forest

Tropical Scrub Forest and Check Dam within the campus

Marsh/Swamp

Source: CMC Chittoor Campus during survey between 2018 & 2019.

4 METHODOLOGY:

4.1 FLORA

A combination of methods were used towards floristic analysis. An understanding of ecological characters like species associations like habitats and life forms/habits was gained through literature. Habitats and species were targeted based on seasons and known flowering phenology to both detect species occurrence and aid identification by phenology. Specifically monsoon was targeted for intense field survey when flowering was at peak for most species. It worked best for herbs that are seasonal and short-lived and are seen only during monsoon. Trees were targeted during post monsoon.

A stratified and opportunistic sampling method was followed where the whole campus was traversed with investigation focussed on various habitats present in primarily qualitative manner. Field notes and photographs were taken of all species observed. Plants were then identified based on the standard literatures[13,14,15,16,17] and herbarium specimens.

Data such as life form, habit, habitats they occur in, nativity , rarity status were assigned and analysed for landscape sensitivity. Since information and authority on assigning rarity status for flora is limited, rarity status was assigned based on qualitative assessment during the survey. A complete version of this data is provided in the appendix.

4.2 FAUNA

Qualitative surveys were conducted by surveying all habitats opportunistically taking cues from weather and habitat. Due to the weather extremes (aridity & heat)

[13] Gamble, J.S. 1916-1935. The flora of Madras Presidency. Govt. of India, Vol. 1-3, pp 1389
[14] Pullaiah, T. 1997. Flora of Andhra Pradesh, Vol. III. Scientific Publishers. Jodhpur, India.
[15] Pullaiah, T. and Alimoulali, D. 1997. Flora of Andhra Pradesh, Vol. II. Scientific Publishers. Jodhpur, India.
[16] Pullaiah, T. and Chennaiah, E. 1997. Flora of Andhra Pradesh, Vol. I. Scientific Publishers. Jodhpur, India.
[17] Rao, B.R.P., Sridhar, R.R.M, Pullaiah, T., 2008. Flora and vegetation of Andhra Pradesh. New Delhi Academy of Sciences 12, 1-13.

and unique habitat and floristic components of the campus, fauna were noted to behave highly adapted to the environment.

Dawn and dusk were optimised for bird surveys in varying habitats occurring on the campus. Signs of breeding like nests and young were noted along with respective locations. Feeding grounds, roosting grounds and large congregations were recorded.

Herpetofauna surveys were carried out primarily at night along roads, waterbodies within and around campus. They were also opportunistically surveyed at dawn and dusk based on habitat and weather cues.

Butterflies surveys were mostly carried out dawn and early noon when temperature was optimal for most species in this otherwise harsh environment where temperature sours. Larval host plants and nectar source plants were targeted for some known species to aid detection.

A combination of methods was used for mammal surveys. Methods included questionnaire surveys with photos of animals occurring in the region from published literature. These surveys were dependent on key informants like old people living in and around the campus, hunters and cattle herdsman who are constantly interacting with nature in the locality on a daily basis. The second part of the mammal survey involved looking for indirect signs such as scats, dens in potential habitats. It also involved nocturnal surveys with torches by looking for eyeshine and thus detecting species. Den locations of mammals and roost locations of bats identified were marked on a map.

Binoculars (Nikon 8*40) was used for scanning the landscape during surveys, spotting and effective identification. Photographs were taken using Nikon P900 and Canon 7D mark II, 100-400mm Telezoom lens and 100 mm macro lens to record and aid identification of all species whenever possible.

Field guides and fauna group specific research publications and authoritative documents[18,19,20,21,22,2324] were consulted for the identification and flora and fauna of the campus.

4.3 SENSITIVITY ASSESSMENT:

Sensitivity assessment was carried out at two levels. Method 1 was based on ecological scoring of physical characters and their role in long-term ecological sustenance. Method 2 was based on characters of species and ecological disruptors and guidelines by national and international authorities for species conservation such as International Union for Conservation of Nature - Red List, Indian Wildlife Protection Act 1972 and Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

4.3.1 Method 1:

Any successful long-term conservation strategy lies in maintaining habitat heterogeneity and structural complexity to provide diverse niche that can be occupied by species specialised to each niche. It must also ensure safe passage and connectivity to each species' required resources. This has been a backbone in conservation strategy aimed at by AICHI Biodiversity target 11. This has high relevance to CMC Campus as well. Thefore the goal has been to identify spaces(crucial habitats) and ensure they are connected. To achieve this a basic classification of existing habitats and forest types was done and geographically noted on a map along with habitats surrounding the campus. The entire campus was marked based on existing natural forest types. (see reference map below). Then a finer classification was undertaken where campus and its surrounding was split into

[18] S. M. Billerman, B. K. Keeney, P. G. Rodewald, and T. S. Schulenberg (Editors) (2020). Birds of the World. Cornell Laboratory of Ornithology, Ithaca, NY, USA. https://birdsoftheworld.org/bow/home
[19] Kunte, K. (2005) Butterflies of Peninsular India. Universities Press.
[20] Kunte, K., S. Sondhi, and P. Roy (Chief Editors) 2020. Butterflies of India, v. 3.10. Indian Foundation for Butterflies
[21] Malcolm A. Smith, 1935. The Fauna of British India, Vol II & Vol III.
[22] Prater. S. H. 2005. The Book of Indian Animals. Bombay Natural History Society and Oxford University press 12th Edn. pp. 316.
[23] IUCN 2020. The IUCN Red List of Threatened Species. Version 2020-2. https://www.iucnredlist.org
[24] https://checklist.cites.org/#/en

blocks of 100m. Each block was then classified for a land type based on its history of use dating back to early 2000 and assigned ecological value.

The ecological value for a block was assigned five priority levels based on its ability to support local ecology. They are

- Highest priority
- Very high priority
- High priority
- Medium priority
- Low priority

Highest priority blocks included

- Corridor contiguity
- Breeding and feeding resource utility areas

Very high priority blocks included

- Protected area
- Riverine habitat
- Catchment
- Waterbody

High priority blocks included

- Native scrub & TDEF.
- Native grassland

Medium priority blocks included

- Historical patches
- Old trees

Low priority blocks included

- Agriculture
- Agriculture fallow
- Groves

4.3.2 Method 2:

In this method, sensitivity of the landscape was assessed based on national and international guidelines for conservation priorities. It was set by undertaking the following.

- Identification of conservation status for species occurring in and around campus as assessed by International Union for Conservation of Nature - Red List and their local distribution.

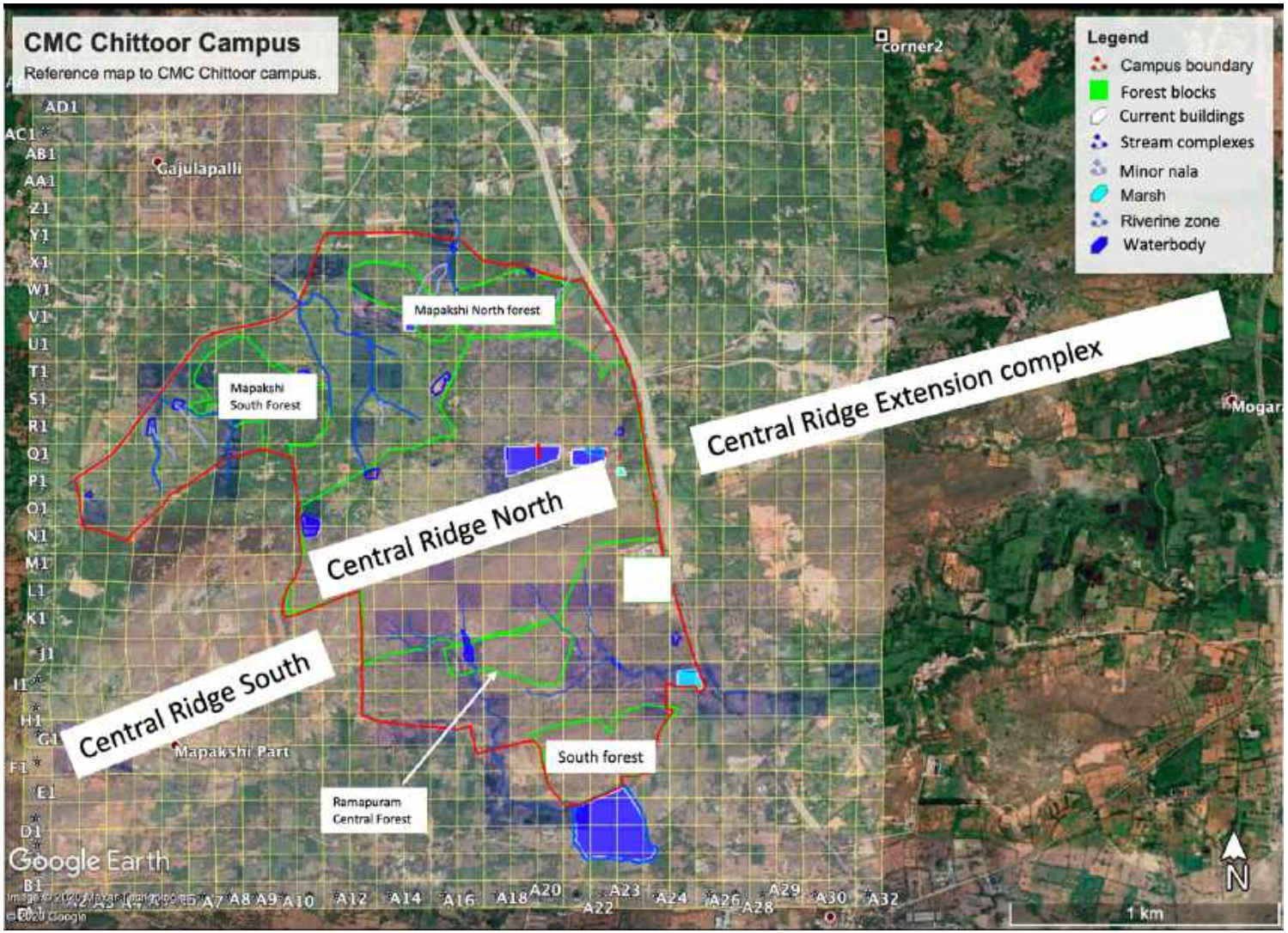
- Identification of protection status for species in and around campus as classified by Indian Wildlife Protection Act 1972 under Schedules I, Schedules II, Schedule III, Schedule IV.

- Identification of protection afforded for species listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) appendices.

- Identifying species of conservation value and their distribution in and around campus on grounds of endemicity, rarity of occurrence (generally and locally) and other threatened categories as per scientific studies and the field survey.

- Identification of local disruptors of biodiversity resilience and their locations.

- Integration and superimposition ecological and geographical layers assessed above on a map along with information species specific ecological data such as habit, feeding habits.



Map 8: Reference Map of Christian Medical College, Chittoor Campus

4.4 DEFINITIONS:

Some definitions are provided below to understand global and national norms for protection afforded to species under their respective provisions.

4.4.1 The IUCN Red List Categories and Criteria:

"The IUCN Red List Categories and Criteria[25] are intended to be an easily and widely understood system for classifying species at high risk of global extinction. It divides species into nine categories: Not Evaluated, Data Deficient, Least Concern, Near Threatened, Vulnerable, Endangered, Critically Endangered, Extinct in the Wild and Extinct."

Not Evaluated: Refers to a species that have not been evaluated by IUCN.

Data Deficient: Refers to a species that have "inadequate information to make direct or indirect assessment of its risk of extinction based on its distribution and/or population status."

Least Concern: Refers to a species that have been evaluated but do not qualify for higher conservation status such as Critically Endangered, Endangered, Vulnerable or Near Threatened.

Near Threatened: Refers to a species that is "close to qualifying or is likely to qualify for a threatened category in the near future."

Vulnerable: Refers to species " when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild."

[25] IUCN 2020. The IUCN Red List of Threatened Species. Version 2020-2. https://www.iucnredlist.org

Endangered: Refers to a species "when the best available evidence indicates that it meets any of the criteria A to E for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild."

Critically Endangered: Refers to a species "when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered, and it is therefore considered to be facing an extremely high risk of extinction in the wild."

4.4.2 The Indian Wildlife Protection Act, 1972

The Indian Wildlife Protection Act, 1972 is a provision in the Indian law that affords various levels of protection under its Schedules I – VI to various n native flora and fauna.

Schedule I: Refers to species provided highest level of protection to various flora and fauna.

Schedule II: Refers to species provided slightly lower protection status to various flora and fauna compared to Schedule I.

Schedules III: Refers to species provided slightly lower protection status to various flora and fauna compared to Schedule I and Schedule II

Schedules IV: Refers to species provided slightly lower protection status to various flora and fauna compared to Schedule I and Schedule II and Schedule III

Schedules V: Refers to species provided slightly lower protection status to various flora and fauna compared to Schedule I, Schedule II, Schedule III and Schedule IV

Schedules VI: Refers to species (mostly plants) that may not be planted or cultivated.

4.4.3 *Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)*

"The species are grouped in the Appendices according to how threatened they are by international trade."
Fundamental Principles as per '*Article II'* is provided below in quotes.

"**Appendix I** shall include all species threatened with extinction which are or may be affected by trade. Trade in specimens of these species must be subject to particularly strict regulation in order not to endanger further their survival and must only be authorized in exceptional circumstances.

Appendix II shall include:
(a) all species which although not necessarily now threatened with extinction may become so unless trade in specimens of such species is subject to strict regulation in order to avoid utilization incompatible with their survival; and

(b) other species which must be subject to regulation in order that trade in specimens of certain species referred to in sub-paragraph (a) of this paragraph may be brought under effective control.

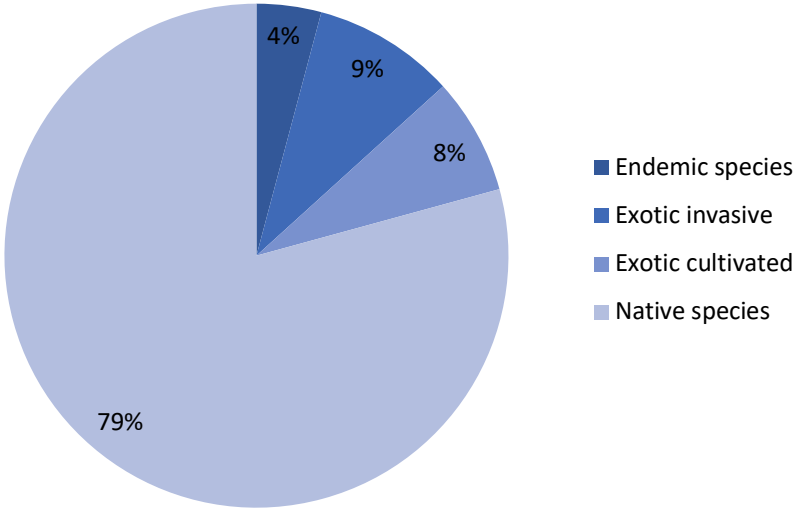
Appendix III shall include all species which any Party identifies as being subject to regulation within its jurisdiction for the purpose of preventing or restricting exploitation, and as needing the co-operation of other Parties in the control of trade.

The Parties shall not allow trade in specimens of species included in Appendices I, II and III except in accordance with the provisions of the present Convention."

FLORA

5 FLORA OF CMC CHITTOOR CAMPUS

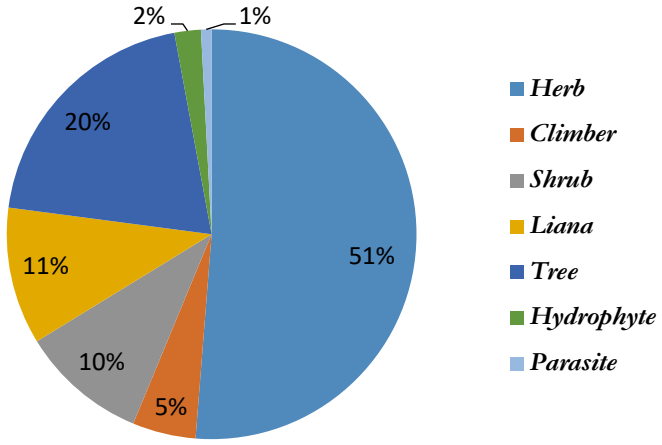
The Christian Medical College Main campus, Chittoor (the study area) supports at least 241 species of flora belongs to 201 genera and 68 families. This includes 1 species of Bryophyte (Riccia sp.), 3 species of Pteridophyte (Marsilea – Marsileaceae, Actinopteris and Adiantum – Pteridaceae) and 238 species of Angiosperms (flowering plants). There are 160 species occurring in Ramapuram area and 197 species are from Mapakshi area. Among these, 191 (79%) are native, 10 (4%) are endemic, 22 (9%) are exotic invasive plants and 18 (8%) are exotic cultivated species that include Indian natives from other regions and exotic ornamental species (see ***Text figure 1*** below). Earlier studies by Ranga[26] in the year 1991 recorded 995 species of flowering plants belonging to 568 genera and 128 families. Later, Madhava et al[27] in 2008 recorded 1756 flowering plants belonging to 879 genera and 176 families including the ornamentals and planted tree species from Chittoor District.



Text figure 1: Nativity of plants in CMC Chittoor campus

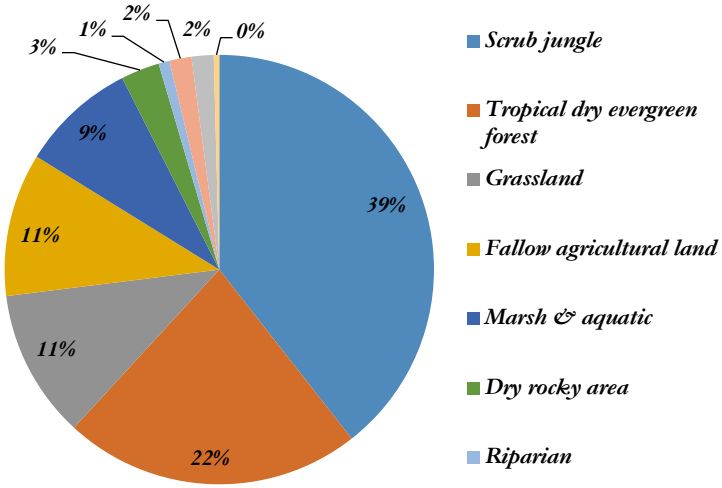
[26] Ranga, D. C., 1991. Floristic studies of Chittoor district of Andhra Pradesh. Ph. D. Thesis, Department of Botany, Sri Venkateswara University, Tirupati, Andhra Pradesh.
[27] Madhava, K. C, K. Sivaji and Rao, K. T. 2008. Flowering plants of Chittoor district, Andhra Pradesh, India. Students Offset Printers, Tirupati, Andhra Pradesh, India. 490pp.

Of the 241 species, 123 (51%) species are herbs, 24 (10%) species are shrubs, 12 (5%) are climbers, 26 (11%) are liana, 49 (20%) are trees, 5 (2%) hydrophytes and 2 (1%) are parasites (See **Text figure 2** below). A qualitative assessment of rarity suggests 37 species in the main campus are rare, 111 uncommon and 93 species are common.



Text figure 2: Habits of plants at CMC Chittoor campus

The species composition of major habitat and vegetation types were noted as follows- southern tropical thorn forest or scrub jungle (95 species), sparse patches of Tropical dry evergreen forest (54 species) and dry grassland savannah (27 species). Other habitats include fallow agricultural land (26 species), dry rocky area (7 species), marsh & aquatic (21 species), riparian (2 species) grove (1 species, i.e. *Mangifera indica*), garden (4 species) and avenue (4 species). See
Text figure *3* below.



Text figure 3: Species represented in habitats of CMC, Chittoor campus

Tropical dry evergreen forest (TDEF) - In this survey 54 species of plants are recorded from TDEF that includes 27 trees, 10 herbs, 10 liana (woody climbers), 1 climber, 5 shrubs, and 1 parasitic plant. The representation of woody species (tree) in TDEF is high when compared other life forms (Text figure 6). Some of the characteristic evergreen species of Tropical dry evergreen forest found in the main campus are *Tarenna asiatica, Drypetes sepiaria, Lepisanthes tetraphylla, Psydrax dicoccos* along with the deciduous components such as *Albizzia amara*, *Gyrocarpus americanus*, and *Strychnos nux-vomica*.

Southern tropical thorn scrub - This habitat mostly occurs on the plains as well as the foothills of the campus.It occurs both as continuous or in patches. This vegetation is characterised by species such as *Albizia amara, Carissa spinarum, Dichrostachys cinerea, Catunaregam spinosa, Pterolobium hexapetalum, Toddalia asiatica, Ziziphus oenoplia*. Most of these species are armed with spines or prickles. The proportion of herb (48 species), shrub (11 species), liana (15 species) and climber (11 species) are higher when compared to TDEF (See **Text figure 4** below).

Dry Savannah Forests - This habitat occurs in most of the elevated terrains in the campus. It is dominated by grass genera such as *Cymbopogon*, *Apluda*, *Aristida*, *Chrysopogon*, *Heteropogon, Setaria,* etc. This vegetation is unique and mostly dominated by herbaceous species and grasses. Some important tree species are *Phoenix sp, Wrightia tinctoria, Dolichandron falcata, Butea monosperma*; herbs such as *Pancratium triflorum*, *Striga asiatica*, *S. densiflora*, and wild peas such as *Cajanus scarabaeoides* and *Rhynchosia capitata* are usually found in this grassland vegetation.

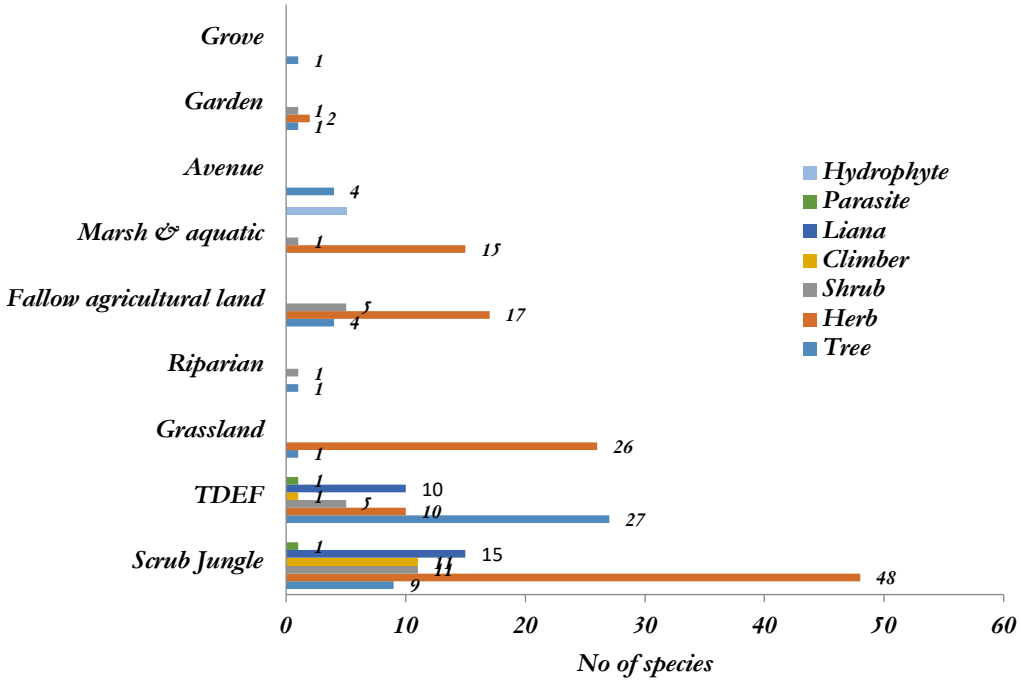
Dry & rocky areas - This habitat is created from physical elements such as rocks and boulders. Based on such characters habitat niches are created and occupied by habitat specialists. Such species seen in this habitat include *Anisochilus carnosus*, *Caralluma* spp., *Euphorbia deccanensis* var *nallamalayana*, *Ochna gamblei*. In addition, water and moisture in the cavities on the rocky slopes accommodates some

hydrophytes or moist loving species such as *Dopatrium junceum*, *Portulaca tuberosa, Rotala densiflora*. These plants occur only in this habitat and nowhere else in the campus.

Marsh and aquatic habitats – Such habitats were noted as suitable habitats for several species of hydrophytes- species specialised to a life in aquatic and moist habitats. Species such as *Hygrophilla auriculata, Schoenoplectiella articulata, Marselia quadriflolia* and *Typha angustifolia* were commonly associated with this habitat. Some of the notable aquatic or semi-aquatic plants of this habitat include *Ottelia alismoides, Limnophylla heterophylla, Lindernia oppositifolia*. Plants such as *Ludwigia perennis, Coldenia procumbens, Eriocaulon quinquangulare, Glinus oppositifolius* were commonly found in dried water bodies during the beginning of the dry season. *Phyllanthus reticulatus*, another indicator of water source was observed. It was noted along the edges of water bodies.

Agricultural Fallow fields – Many such habitats occur within campus. They currently show recolonisation of native species in such lands. Indian Palmyra *Borassus flabellifer* along the bunds of the paddy fields highlights the existence of land once under cultivation. *Gomphrena serrata, Epaltes divaricata* are some indicator species that highlight fallow cultivated lands indicating prior anthropogenic influence in such lands within campus. Such lands also showed good numbers of exotic invasive or exotic cultivated species.

Among garden and avenue plants- Several species were noted to be introduced in the main campus for aesthetic purpose. Plant species such as *Peltaphorum pterocarpum* (Copper pod), *Delonix regia* (Gulmohar), *Samanea saman* (Rain tree), *Pongamia pinnata* (Indian beech), *Tecoma stans* (Yellow bells), *Bougainvillea* sp are some of the notable species occupying the avenues and parking areas of the main campus. Flower bed and hedges are with *Wedelia chinensis* (Chinese wedelia), *Tridax procumbens* and *Catharanthus roseus* (Madagascar periwinkle). Many species in this category can turn invasive in the future causing ecological degradation of the landscape.



Text figure 4: Habit representation in diverse habitats of CMC Chittoor campus

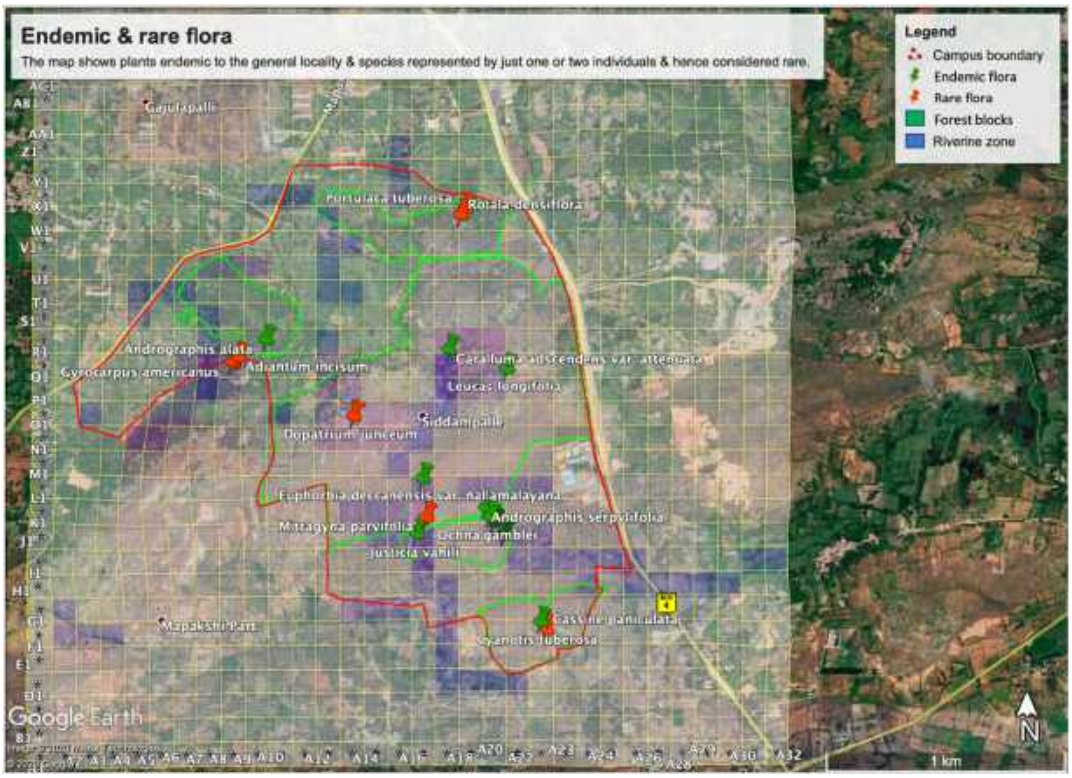
5.1 EXOTIC SPECIES

Atleast thirty six exotic species are recognised from the CMC main campus based on the online portal Tamil Nadu ENVIS[28] and by National Biodiversity Authority[29]. Among these 22 have naturalised or invasive and 14 species are planted in the campus for beautification purpose. Some notable invasive species of the main campus include *Croton bonplandianum*, *Catharanthus roseus*, *Parthenium hysterophorus*, *Chromolaena odorata*, *Tridax procumbens*, *Cleome viscosa*, *Lantana camara*, *Marsilea quadrifolia*, *Passiflora foetida*, *Dodonaea viscosa*, *Typha angustifolia*. Most of these species have naturalised in this region except *Chromolaena odorata*, *Lantana camara* amongst a few others. More details may be found in the invasive species section.

[28] http://tnenvis.nic.in/tnenvis_old/IASintamilnadu.htm
[29] http://nbaindia.org/uploaded/pdf/Iaslist.pdf

5.2 *ENDEMIC, RARE AND THREATENED FLORA:*

Sudhakar Reddy & Raju[30] in 2008 reported 400 plant species belonging to 75 families and 233 genera as endemics to Andhra Pradesh. These species are found nowhere else in the world except in this restricted geographical area. Such species face various threats due to various factors like habitat loss or habitat fragmentation, over exploitation, inability to compete with invasive species, less reproductive capacity etc. They require special attention to ensure their long-term survival. Ten species of such endemics have been currently recorded on campus. Further, species whose numbers are in single digits are also categorised as rare and are highlighted for additional consideration. Some of the rare and endemic species recorded from CMC main campus includes *Andrographis serpylifolia*, *Caralluma adscendens* var. *attenuata, Cyanotis tuberosa, Euphorbia deccanensis* var. *nallamalayana, Leucas longifolia* and *Ochna gamblei*. Some of the rare species includes *Cassine glauca, C. paniculata, Drypetes sepiaria, Ficus mollis, Pancratium triflorum*. A map of their occurrence within the campus is provided below.



Map 9: Endemic & rare flora

[30] Sudhakar Reddy, C. and Raju, V. S. 2008. Endemic spermatophytes of Andhra Pradesh, India. Proc. A. P. Akademi of Sciences, 12: 48 – 75.

5.3 OTHER INTERESTING FLORA:

CMC Chittoor campus holds many primitive groups of plants like many species of lichens, fungi, Bryophytes and Pteridophytes. Lichens are life forms that are composed of a fungal partner (mycobiont) and a cyanobacteria or alga (photobiont) living together in a symbiotic relationship. Both the entities rely on each other for their survival. Lichen usually grows on tree barks, twigs, leaf surface, wood, rock and boulder, soil etc. of less polluted areas. Lichens are also very good biological indicator for monitoring air pollution of a region[31]. Few lichen species were also observed in the western end of main campus.

A species of *Riccia* (Ricciaceae), commonly known as liverworts, a small thalloid species associated with moss belongs to primitive non-vascular plant group bryophytes. These mostly occur in the moist habitats and with shorter life span. Pteridophytic members are group of spore producing vascular plants little advance than the Bryophytes in the evolutionary sequence. Spore producing plants such as *Actinopteris radiata* and *Adiantum incisum* were recorded in the shady places of Tropical dry evergreen forests near Mapakshi area. These plant groups indicate that the habitat is 'pristine' with low anthropogenic influence[32,33,34]

5.4 PHOTOGRAPHS OF SOME OF THE PRIMITIVE GROUP OF PLANTS SEEN ON THE CAMPUS.

Corticolous lichen - *Lecanora sp*

Corticolous lichen - *Dirinaria sp*

Saxicolous lichen – *Caloplaca sp.*

[31] Kuldeep, S. and Prodyut, B. 2015. Lichen as a bio-indicator tool for assessment of climate and air pollution vulnerability: Review. International Research Journal of Environment Science, 4(12): 107 – 117.
[32] Bergeron, A. and Pellerin, S. 2014. Pteridophytes as indicator of urban forest integrity. *Ecological Indicators*, 38: 40 – 49.
[33] Della, A.P. & Falkenberg, D.B. 2019. Pteridophytes as ecological indicators: an overview. Hoehnea 46: e522018. http://dx.doi.org/10.1590/2236-8906-52/2018.
[34] Gignac, D. 2001. Bryophytes as indicator of climate change. *The Bryologist*, 104(3): 410 – 420.

Saxicolous lichen *Riccia* sp. from Main campus

Checklist of plants at CMC Chittoor campus.

S. No.	Common/Local Name	Family and Plant Name
		ACANTHACEAE
1	Peria nangai	*Andrographis alata* (Vahl.) Nees.
2.	Nilavembu	*Andrographis paniculata* Wall.
3.	Round-leaf kariyat	*Andrographis serpyllifolia* (Vahl.) Wight
4.	Chinese violet	*Asystasia gangetica* (L.) T. Anders.
5.	Mullu kankambaram	*Barleria prionitis* L.
6.	Narrow-leaf Blepharis	*Blepharis integrifolia* (L.fil.) E. Mey. & Drege
7.	Kooravaal chedi	*Blepharis maderaspatensis* (L.) B. Heyne ex Roth
8.	Bell weed	*Dipteracanthus prostratus* (Poir.) Nees.
9.	Pumbikatambam	*Elytraria acaulis* (L. Fil.) Lind.
10.	Neermulli	*Hygrophila auriculata* (Schumach.) Heine
11.	Prostrate Justicia	*Justicia prostrata* (Roxb. ex C. B. Clarke) Gamble
12.	Long-leaf Justicia	*Justicia vahlii* Roth.
13.	Karappan pundu	*Lepidagathis cristata* Willd.
14.	Panicled foldwing	*Peristrophebicalyculata* (Retz.) Nees
		AGAVACEAE
15.	American aloe	*Agave cantala* (Haw.) Roxb. ex Salm-Dyck
16.	Mauritius hemp	*Furcraea foetida* (L.) Haw.
		ALANGIACEAE
17.	Alinjil, Urgu	*Alangium salvifolium* (L.f.) Wang.
		AMARANTHACEAE
18.	Nayuruvi	*Achyranthes aspera* L.
19.	Kumattikeerai	*Allmania nodiflora* (L.) R. Br. ex Wight
20.	Silver Cockscomb	*Celosia argentia* L.

21.	Prostrate Gomphrena	*Gomphrena serrata* L.
		AMARYLLIDACEAE
22.	Kattuvengayam	*Pancratium triflorum* Roxb.
		ANACARDIACEAE
23.	Maamaram	*Mangifera indica* L.
		APOCYNACEAE
24.	Thathamudi, Erukkam chedi	*Calotropis gigantea* (L.) W.T. Aiton
25.	Kallimulayan, Muyal kombu	*Caralluma adscendens* var. *attenuata* (Wight) Grav. & Mayur.
26.	Sirukila	*Carrisa spinarum* L.
27.	Sudukattu Malli	*Catharanthus roseus* (L.) G. Don.
28.	Leafless Goglet flower	*Ceropegia juncea* Roxb.
29.	Large-flowered Cryptolepis	*Cryptolepis grandiflora* Wight
30.	Kodikalli/ Soman	*Cynanchum acidum* (Roxb.) Oken
31.	Sarkarai kolli	*Gymnema sylvestre* (Retz) R. Br. ex Sm.
32.	Nannaari	*Hemidesmus indicus* (L.) R. Br. ex Schult.
33.	Ankaravalli, siruanthankodi	*Secamone emetica* (Retz.) R. Br. ex Schult.
34.	Naaipalai	*Tylophora indica* (Burm.f.) Merr.
35.	Kodippalai	*Wattakaka volubilis* (L.f.) Stapf.
36.	Paalai	*Wrightia tinctoria* R. Br.
		ARECACEAE
37.	Panaimaram	*Borassus flabellifer* L.
38.	SitTrchumaram	*Phoenix loureiroi* Kunth
		ARISTOLOCHIACEAE
39.	Indian Birthwort	*Aristolochia indica* L.
		ASPARAGACEAE
40.	Neervittan kizhangu	*Asparagus racemosus* Willd.
41.	Narivengayam	*Ledebouria revoluta* (L.f.) Jessop.
42.	Spear Sansevieria	*Sansevieria cylindrica* Bojer ex Hook.
43.	Marul	*Sansevieria roxburghiana* Schult. & Schult. f.
		ASTERACEAE
44.		*Blumea axillaris* (Lam.) DC.

45.	Snehapullu	*Bridens biternata* (Lour.) Merr. & Sherff.
46.	Siam weed	*Chromolaena odorata* (L.) R.M.King & H.Rob.
47.	Little Ironweed, Poovangurunthal	*Cyanthillium cinereum* (L.) H. Rob.
48.	Tassel flower	*Emilia sonchifolia* (L.) DC. ex DC.
49.	Narrow-leaf Epaltes	*Epaltes divaricata* (L.) Cass.
50.	Parapalanum	*Glossocardia bosvallia* (L.f.) DC.
51.	Santa Maria feverfew	*Parthenium hysterophorus* L.
52.	Jimikipoo	*Pentanema indicum* (L.) Ling
53.	Tridax daisy	*Tridax procumbens* L.
54.	Chinese Wedelia	*Wedelia chinensis* (Osbeck) Merr.
		BIGNONIACEAE
55.	Kadalatti, Kattuvarucham	*Dolichandrone falcata* (Wall. ex DC.) Seem.
56.	Yellow bell	*Tecoma stans* (L.) Juss. ex Kunth.
		BORAGINACEAE
57.	Cherruppadai	*Coldenia procumbens* L.
58.	Kurangu vethilai	*Ehretia microphylla* Lam.
59.	Bristly heliotrope	*Heliotropium strigosum* Willd.
60.	Kalli Thumbai	*Trichodesma indicum* (L.) R. Br.
		CACTACEAE
61.	Naga-dali	*Opuntia dillenii* (Ker Gawl.) Haw.
		CAPPARACEAE
62.	Indian Cadaba	*Cadaba fruticosa* (L.) Druce
63.	Athondai	*Capparis zeylanica* L.
64.	Emmullu	*Maerua oblongifolia* (Forssk.) A. Rich.
		CARYOPHYLLACEAE
65.	Pallipundu	*Polycarpaea corymbosa* (L.) Lam.
		CELASTRACEAE
66.	Kannera maram	*Cassine glauca* (Rottb.) Kuntz.
67.	Kanneer maram	*Cassine paniculata* (Wight & Arn.) Lobreau-Callen
		CLEOMACEAE
68.		*Cleome tenella* L.f.
69.	Asian spider flower/ Naikadugu	*Cleome viscosa* L.

		COLCHICACEAE
70.	Kalapai or Kanneer kizhangu	*Gloriosa superba* L.
71.	Indian grass lily	*Iphigenia indica* (L.) A. Gary ex Kunth
		COMMELINACEAE
72.	Vazhukai pul	*Cyanotis axillaris* (L.) D. Don ex Sweet
73.	Shayadri-Dew grass	*Cyanotis tuberosa* (Roxb.) Schult. & Schult. f.
		CONVOLVULACEAE
74.	Vishnukranthi	*Evolvulus alsinoides* (L.) L.
75.	Bush morning glory	*Ipomoea carnea* Jacq.
76.	Chirutali	*Ipomoea obscura* (L.) Ker Gawl.
77.	Onan kodi	*Ipomoea staphylina* Roem. & Schult.
78.	Auvaiyar kundal	*Merremia tridentata* (L.) Hallier f.
		CUCURBITACEAE
79.	Kovai kai	*Coccinia grandis* (L.) J. Voigt.
80.	Mumusukai	*Mukia maderaspatana* (L.) M. Roem.
		CYPERACEAE
81.		*Carex sp.*
82.		*Fimbristylis argentea* (Rott.) Vahl.
83.	One-spike fimbry	*Fimbristylis ovata* (Burm.f.) J.Kern
84.	Velthaneer pasi	*Kyllinga nemoralis* (Forst.) Dandy ex Hutch. & Dalz.
85.		*Schoenoplectiella articulata* (L.) Lye
		ERIOCAULACEAE
86.	Five-angled pipewort	*Eriocaulon quinquangulare* L.
		EUPHORBIACEAE
87.	Copper-leaf	*Acalypha wilkesiana* J.J. Sm.
88.	Rail Poondu	*Croton bonplandianum* Bail.
89.	Kalvirai, Vellilumbu, Aadumilukan	*Drypetes sepiaria* (Wight & Arn.) Pax & K. Hoffm
90.		*Euphorbia deccanensis* var. *nallamalayana* (J. L. Ellis) V. S. Raju
91.	Amman pacharici	*Euphorbia hirta* L.
92.	Chinna amman pacharisi	*Euphorbia indica* Lam.
93.	Siria amanakku	*Jatropha gossypifolia* L.
94.	Amanakku	*Ricinus communis* L.

95.	Kanjchori/Poonai kanjaan	*Tragia involucrata* L.
		FABACEAE – CAESALPINIOIDEAE
96.	Sarakonrai	*Cassia fistula* L.
97.	Javan cassia	*Cassia javanica* L.
98.	Gulmohar	*Delonix regia* (Bojer ex Hook.f.) Raf.
99.	Copper-pod tree	*Peltophorum pterocarpum* (DC.) Baker ex K. Heyne
100.	Karu indu	*Pterolobium hexapetalum* (Roth) Santapau & Wagh
101.	Nelavakai	*Senna alexandrina* Mill.
102.	Avarambu	*Senna auriculata* (L.) Roxb.
		FABACEAE – FABOIDEAE
103.	Indian joint vetch	*Aeschynomene indica* L.
104.	Kacukodi	*Alysicarpus monilifer* DC.
105.	Aathi	*Bauhinia racemosa* Lam.
106.	Porasu	*Butea monosperma* (Lam.) Taub.
107.	Showy pigeonpea	*Cajanus scarabaeoides* (L.) DC.
108.	Velangu, East Indian Rose wood	*Dalbergia lanceolaria* L.f.
109.	Sirupulladi	*Desmodium triflorum* (L.) DC.
110.	Slender-flowered milkpea	*Galactia tenuiflora* (Klein ex Willd.) Wight & Arn.
111.	Mexican lilac	*Gliricidia sepium* (Jacq.) Walp.
112.	Narrow-leaf indigo	*Indigofera linifolia* (L.f.) Retz.
113.	Seppukurinji	*Indigofera linnaei* Ali
114.	Neelam	*Indigofera tinctoria* L.
115.	Pungai maram	*Pongamia pinnata* (L.) Pierre
116.	Moovilai	*Pseudarthria viscida* (L.)Wight & Arn.
117.	Grey snoutbean	*Rhynchosia cana* DC.
118.	Kattukollu	*Rhynchosia capitata* (Roth.)DC.
119.	Caribbean stylo	*Stylosanthes hamata* (L.) Taub.
120.	Shrubby stylo	*Stylosanthes scabra* Vogel
121.	Kavali	*Tephrosia purpurea* (L.) Pers.
		FABACEAE – MIMOSOIDEAE
122.	Babul	*Acacia nilotica* (L.) Delile
123.	Usil/ Arrapu/ Karuvagai	*Albizia amara* (Roxb.) B. Bovin
124.	Vagai	*Albizialebbeck* (L.) Benth.

125.	Vedathalam	*Dichrostachys cinerea* (L.) Wight & Arn.
126.	Velikathan	*Prosopis juliflora* (Sw.) DC.
127.	Thoongumoonji maram, Rain Tr	*Samanea saman* (Jacq.) Merr.
		FLACOURTIACEAE
128.	Cottaikala	*Flacourtia indica* (Bum. f.) Merr.
		GENTIANACEAE
129.	Stalkless canscora	*Canscora heteroclita* (L.) Gilg
130.	Vellarugu, Arukumuli	*Enicostema axillare* (Lam.) Raynal.
		HERNANDIACEAE
131.	Kathadi kai, vellai Tanakku	*Gyrocarpus americanus* Jacq.
		HYDROCHARITACEAE
132.	Neerkuliri	*Ottelia alismoides* (L.) Pers.
		HYPOXIDACEAE
133.	Nila panai	*Curculigo orchioides* Gaertn.
		LAMIACEAE
134.	Thick-leaf lavender	*Anisochilus carnosus* (L.f.) Wall.
135.	Karithumbai	*Anisomeles indica* (L.) Kuntze.
136.	Peymarutti	*Anisomeles malabarica* (L.) R. Br. ex Sims.
137.	Kumizh	*Gmelina asiatica* L.
138.	Common lantana, Unni chedi	*Lantana camara* L.
139.	Thumbai	*Leucas aspera* (Willd.) Link
140.	Chinese leucas	*Leucas chinensis* (Retz.) Sm.
141.	Long-leaf leucas	*Leucas longifolia* Benth.
142.	Naai Thulasi	*Ocimum americanum* L.
143.		*Orthosiphon* sp
144.	Seemai nayuruvi	*Stachytarpheta jamaicensis* (L.) Vahl.
		LAURACEAE
145.	Pasukotra, Akasavalli	*Cassytha filiformis* L.
		LINDERNIACEAE
146.	Lindernia	*Lindernia* sp.
		LOGANIACEAE
147.	Kanjaram, Yetti	*Strychnos nux-vomica* L.

		LORANTHACEAE
148.	Honey suckle mistletoe	*Dendrophthoe falcata* (L.f.) Ettingsh.
		LYTHERACEAE
149.	Dense-flowered rotala	*Rotala densiflora* (Roth ex Roem. & Schult.) Koehne
		MALVACEAE
150.		*Grewia orientalis* L.
151.	Tiny-flower hibiscus	*Hibiscus micranthus* L. f.
152.	Pinnaku keerai	*Melochia corchorifolia* L.
153.	Peramutti	*Pavonia odorata* Willd.
154.	Palambasi	*Sida acuta* Burm.f.
155.	Kurunthotti	*Sida cordata* (Burm. f.) Bross. Waalk.
156.	Arivalmukan, kurunthotti	*Sida cordifolia* L.
157.	Sengalipoondu	*Waltheria indica* L.
		MARSILEACEAE
158.	Four-leaved clover	*Marsilea quadrifolia* L.
		MELIACEAE
159.	Vembu	*Azadirachta indica* A.Juss.
		MENISPERMACEAE
160.	Kattu kodi	*Cocculus hirsutus* (L.) Diels
161.	Kattukodi	*Pachygone ovata* (Poir.) Diels
		MOLLUGINACEAE
162.	Thurampoondu	*Glinus oppositifolius* (L.) Aug. DC.
163.	Seeragapoondu, Thurapoondu	*Trigastrotheca pentaphylla* (L.) Thulin
		MORACEAE
164.	Aalamaram	*Ficus benghalensis* L.
165.	Peyathi	*Ficus hispida* L. f.
166.	Soft fig	*Ficus mollis* Vahl
167.	Arasamaram	*Ficus religiosa* L.
		MYRTACEAE
168.	Naval	*Syzygium cumini* (L.) Skeels
		NYCTAGINACEAE
169.	Mukkurattaikodi	*Boerhavia diffusa* L.
170.	Thaalpoo/ paper flower	*Bougainvillea* sp.

		OCHNACEAE
171.	Wild Ochna	*Ochna gamblei* King ex Brand.
		OLEACEAE
172.	Malabar jasmine	*Jasminum angustifolium* (L.) Willd.
173.	Kodimalli, Mullai	*Jasminum angustifolium* var. sessiliflorum
		ONAGRACEAE
174.	Perennial water primrose	*Ludwigia perennis* L.
		ORABANCHACEAE
175.	Tranquebar spur-anther flower	*Centranthera tranquebarica* (Spreng.) Merr.
176.	Common sopubia	*Sopubia delphinifolia* G.Don
177.	Chirakacitam poondu	*Striga asiatica* (L.) Kuntz.
178.	Cow pea witchweed	*Striga densiflora* (Benth.) Benth.
		PASSIFLORACEAE
179.	Wild Adenia	*Adenia wightiana* (Wall. ex Wight & Arn.) Engl.
180.	Sirupunnai kkali	*Passiflora foetida* L.
		PHYLLANTHACEAE
181.	Cup saucer plant	*Breynia retusa* (Dennst.) Alston
182.	Bushweed	*Flueggea leucopyrus* Willd.
183.	Sivappu pula	*Phyllanthus reticulatus* Poir.
184.	Kilanelli	*Phyllanthus virgatus* J. G. Forst.
		PLANTAGINACEAE
185.	Marshweed	*Limnophila heterophylla* (Roxb.) Benth.
186.	Sweet broom weed	*Scoparia dulcis* L.
		POACEAE
187.		*Apluda mutica* L.
188.	Common needle grass	*Aristida adscensionis* L.
189.		*Aristida hystrix* L.f.
190.	Broom grass	*Aristida setacea* Retz.
191.	Bamboo/ Moongil	*Bambusa bambos* (L.) Voss
192.	Sanampul	*Brachiaria ramosa* (L.) Stapf.
193.	Chevarakupul/ Mayilkondaipul	*Chloris barbata* Sw.
194.	Swollen finger grass	*Chrysopogon fulvus* (Spreng.) Chiov.
195.	Cochin grass	*Cymbopogon flexuosus* Wats.

196.	Arugampul	*Cynodon dactylon* Pers.
197.	Crowfoot grass	*Dactyloctenium aegyptium* (L.) Willd.
198.	Indian crabgrass	*Digitaria longiflora* (Retz.) Pers.
199.	Kevuru, Thippa ragi	*Eleusine indica* (L.) Gaertn.
200.	Double-row love grass	*Eragrostiella bifaria* (Vahl) Bor
201.	Sticky love grass	*Eragrostis viscosa* (Retz.) Trin.
202.	Oosipull	*Heteropogon contortus* (L.) P. Beauv. ex Roem. & Schult.
203.	Narival pul	*Perotis indica* (L.) Kuntze
204.	Nanal/ Pekkarumbu	*Saccharum spontaneum* L.
205.	Kambilipul	*Setaria pumila* (Poir.) Roem. & Schult.
		POLYGALACEAE
206.	Milakunankai	*Polygala arvensis* Willd.
		POLYGONACEAE
207.	Small knotweed	*Polygonum plebeium* R. Br.
		PORTULACACEAE
208.	Moss rose	*Portulaca grandiflora* Hook.f.
209.		*Portulaca tuberosa* Roxb.
		PTERIDACEAE
210.	Ray fern	*Actiniopteris radiata* (Sw.) Link
211.		*Adiantum incisum* Forssk.
		RHAMNACEAE
212.	Vembadam	*Ventilago maderaspatana* Gaertn.
213.	Illanthai maram	*Ziziphus mauritiana* Lam.
214.	Surailanthai	*Ziziphus oenoplia* (L.) Mill.
		RICCIACEAE
215.	Liverwort	*Riccia* sp
		RUBIACEAE
216.	Coromandel canthium	*Canthium coromandelicum* (Burm. f.) Alston.
217.	Madukarei	*Catunaregam spinosa* (Thunb.) Tirveng.
218.	Vellarai	*Enicostema axillare* (Poir. ex Lam.) A. Raynal
219.	Tropical girdle pod	*Mitracarpus villosus* (Sw.) DC.
220.	Kaim	*Mitragyna parvifolia* (Roxb.) Korth.
221.	Manjanathi	*Morinda coreia* Buch.-Ham.
222.	Chayaver, Imburaver	*Oldenlandia umbellata* L.

223.	Najool	*Psydrax dicoccos* Gaertn.
224.	Nathaichoori	*Spermacoce articularis* L. f.
225.	Nathaichoori	*Spermacoce hispida* L.
226.	Asiatic Tarenna	*Tarenna asiatica* (L.) Kuntze ex K.Schum.
		RUTACEAE
227.	Vilva maram	*Limonia acidissima* L.
228.	Orange climber	*Toddalia asiatica* (L.) Lam.
		SANTALACEAE
229.	Santhanamaram, Sandal wood	*Santalum album* L.
		SAPINDACEAE
230.	Small balloon vine	*Cardiospermum canescens* Wall.
231.	Velari	*Dodonaea viscosa* (L.) Jacq.
232.	Ponnankottai maram	*Sapindus emarginatus* Vahl.
		SCROPHULARIACEAE
233.	Rushlike Dopatrium	*Dopatrium junceum* (Roxb.) Buch.-Ham. ex Benth.
		SOLANACEAE
234.	Thoothuvalai	*Solanum trilobatum* L.
235.	Kandamkathiri	*Solanum virginianum* L.
		TYPHACEAE
236.	Narrow-leaf cattail	*Typha angustifolia* L.
		VIOLACEAE
237.	Orithazhal Thamarai	*Hybanthus enneaspermus* (L.) F. Muell.
		VITACEAE
238.	Pirandai	*Cissus quadrangularis* L.
239.	Pani Bel	*Cissus repanda* Vahl.
240.	South Indian Treebine	*Cissus vitiginea* L.
		ZYGOPHYLLACEAE
241.	Puncture vine	*Tribulus terrestris* Linn.

Plants photographed at CMC Chittoor Campus

Andrographis alata

Andrographis serpyllifolia

Asystasia gangetica

Barleria prionitis

Dipterocanthus prostratus

Elytraria acaulis

Hygrophila auriculata

Justicia prostrate

Justicia vahlii

Lepidagathis cristata

Peristrophe bicalyculata

Agave cantala

Furcraea foetida

Pancratium triflorum

Caralluma adscendens var. attenuate

Carissa spinarum

Ceropegia juncea

Cryptolepis grandiflora

Gymnema sylvestre

Hemidesmus indicus

Secamome enetica

Sarcostemma acidum

Tylophora indica

Wrightia tinctoria

Phoenix loureiroi

Aristolochia indica

Ledebouria revolute

Sanseviera roxburghiana

Blumea axillaris

Epaltes divaricate

Glossocardia bosvallia

Vernonia cinerea

Dolichondrone falcate

Coldenia procumbens

Ehretia microphylla

Trichodesma indicum

Cadaba fruticosa

Capparis zeylanica

Maerua oblongifolia

Polycarpaea corymbosa

Cassine glauca

Cleome tenella

Gloriossa superba

Iphigenia indica

Cyanotis axillaris

Cyanotis tuberosa

Evolvulus alsinoides

Ipomoea carnea

Ipomoea obscura

Ipomoea staphylina

Merremia tridentate

Rivea hypocrateriformis

Mukia maderaspatana

Carex sp

Fimbristylis argentea

Fimbristylis dichotoma

Fimbristylis ovate

Schoenoplectiella articulata

Eriocaulon quinquangulare

Drypetes sepiaria

Euphorbia deccanensis

Euphorbia hirta

Euphorbia indica

Tragia involucrate

Cassia javanica

Pterolobium hexapetalum

Senna auriculata

Aeschynomene indica

Alysicarpus monilifer

Desmodium triflorum

Galactia tenuiflora

Indigofera linifolia

Indigofera linnaei

Pseudarthria viscida

Rhyncosia cana

Stylosanthes hamata

Stylosanthes scabra

Tephrosia purpurea

Acacia nilotica

Albizia amara

Dichrostachys cinerea

Flacourtia indica

Canscora heteroclite

Ottelia alismoides

Curculigo orchioides

Anisochilus carnosus

Anisomeles indica

Anisomeles malabarica

Leucas aspera

Leucas chinensis

Gmelina asiatica

Orthosiphon sp.

Strychnos nux-vomica

Dendrophthe falcata

Rotala densiflora

Grewia orientalis

Hibiscus micranthus

Melochia corchorifolia

Sida acuta

Sida cordata

Sida cordifolia

Marsilea quadrifolia

Cocculus hirsutus

Glinus oppositifolius

Mollugo pentaphylla

Ficus benghalensis

Ficus hispida

Ficus mollis

Ficus religiosa

Boerhavia diffusa

Jasminum angustifolium

Jasminum angustifolium var. sessiliflorum

Centranthera tranquebarica

Ludwigia perennis

Sopubia delphinifolia

Striga asiatica

Striga densiflora

Adina wightiana

Passiflora foetida

Breynia retusa

Flueggea leucopyrus

Phyllanthus reticulatus

Phyllanthus virgatus

Limnophila heterophylla

Scoparia dulcis

Aristida hystrix

Bambusa bambos

Brachiaria ramosa

Chloris barbata

Chrysopogon fulvus

Cymbopogon flexuosus

Digitaria longiflora

Eragrostriella bifaria

Eragrostris viscosa

Perotis indica

Saccharum spontaneum

Setaria pumila

Polygala arvensis

Polygonum plebeium

Portulaca tuberosa

Adiantum incisum

Ziziphus mauritiana

Ziziphus oenoplea

Canthium coromandelicum

Catunaragam spinosa

Enecostemma axillare

Mitracarpus villosus

Mitragyna parvifolia

Morinda coreia

Oldenlandia umbellate

Psydrax dicoccos

Spermacoce articularis

Spermacoce hispida

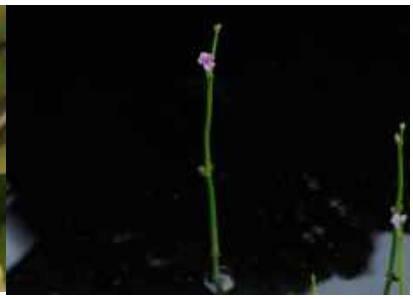
Tarenna asiatica

Limonia acidissima

Santalum album

Cardiospermum canescens

Sapindus emarginatus



Dopatrium junceum

Solanum virginianum

Typha angustifolia

Lantana camara

Hybanthus eneaspermus

Cissus quadrangularis

Cissus repanda

Abrus precatorius

Achyranthes aspera

Alangium salvifolium

Calotropis gigantean

Celosia argentia

Eucalyptus tereticornis

Rhyncosia sp

Tectona grandis

All plants were photographed at CMC Chittoor Campus during the survey in 2018 & 2029.

FAUNA

6 AVIFAUNA OF CMC CHITTOOR CAMPUS

A total of 118 species of birds were recorded at the CMC Chittoor Campus. Among these, 95 species were found to be residents and 23 were recognised as migrants. In habitat preference, 104 were noted to be terrestrial by habitat use while 14 were found to be aquatic habitat preferring. When birds were classified according to their dominant feeding habits, 68 species were noted to be predominantly insectivores, 15 were noted to be granivores, 13 were noted to be raptors (carnivore birds), 8 were frugivores, 5 were omnivores, 4 were aerial insectivores, 3 were nectarivores and two were piscivores (fish eating). Records from databases suggest up to 400 species occurring in the Chittoor district[35]. About 200 species are likely to be detected by extended surveys.

All species occurring on campus were noted to be protected by Indian Wildlife Protection Act, 1972 under Schedule I, Schedule II and Schedule IV. Species recognised in Schedule I category with highest protection included 10 species namely Black-winged Kite, Short-toed Snake Eagle, Indian Spotted Eagle, Tawny Eagle, Bonelli's Eagle, Shikra, Besra, Brahminy Kite, White-eyed Buzzard. Grey Jungle Fowl recognised as Schedule II species was also recorded. All species occurring on campus were classified as 'Least Concern' by International Union for Conservation except the Indian Spotted Eagle which is recognised as 'Vulnerable'. Thirteen species are recognised as protected in Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix II. They include Plum-headed Parakeet , Common Kestrel, Black-winged Kite, Short-toed Snake Eagle, Indian Spotted Eagle, Tawny Eagle, Bonelli's Eagle, Shikra, Besra, Brahminy Kite, White-eyed Buzzard and Grey Jungle Fowl.

A checklist of species seen and photographs of species taken on campus are provided below. A detailed version of the species table is provided in the appendix.

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[35] Lepage, D. 2020. Checklist of the birds of Chittoor. Avibase, the world bird database. Retrieved from. https://avibase.bsc- eoc.org/checklist.jsp?lang=EN&region=inseapch&list=clements&format=1 [20/03/2020].

Checklist of Avifauna – CMC, Chittoor campus

S. No.	English name	Scientific name
	Galliformes	
	Phasianidae (partridges, pheasants, grouse)	
1	Jungle Bush Quail	*Perdicula asiatica* (Latham, 1790)
2	Grey Francolin	*Francolinus pondicerianus* (J.F. Gmelin, 1789)
3	Grey Junglefowl	*Gallus sonneratii* Temminck, 1813
4	Painted Spurfowl	*Galloperdix lunulata* (Valenciennes, 1825)
	Podicipedidae (grebes)	
5	Little Grebe	*Tachybaptus ruficollis* (Pallas, 1764)
	Columbiformes	
	Columbidae (pigeons)	
6	Rock Pigeon	*Columba livia* J.F. Gmelin, 1789
7	Spotted Dove	*Streptopelia chinensis* (Scopoli, 1786)
8	Laughing Dove	*Streptopelia senegalensis* (Linnaeus, 1766)
	Caprimulgiformes	
	Caprimulgidae (nightjars)	
9	Indian Nightjar	*Caprimulgus asiaticus* Latham, 1790
	Apodidae (swifts)	
10	Asian Palm Swift	*Cypsiurus balasiensis* (J.E. Gray, 1829)
	Cuculiformes	
	Cuculidae (cuckoos)	
11	Greater Coucal	*Centropus sinensis* (Stephens, 1815)
12	Sirkeer Malkoha	*Taccocua leschenaultii* Lesson, 1830
13	Blue-faced Malkoha	*Phaenicophaeus viridirostris* (Jerdon, 1840)

14	Pied Cuckoo	*Clamator jacobinus* (Boddaert, 1783)
15	Asian Koel	*Eudynamys scolopaceus* (Linnaeus, 1758)
16	Grey-bellied Cuckoo	*Cacomantis passerinus* (Vahl, 1797)
17	Common Hawk Cuckoo	*Hierococcyx varius* (Vahl, 1797)
	Gruiformes	
	Rallidae (rails and coots)	
18	White-breasted Waterhen	*Amaurornis phoenicurus* (Pennant, 1769)
19	Common Coot	*Fulica atra* Linnaeus, 1758
	Ardeidae (herons)	
20	Indian Pond Heron	*Ardeola grayii* (Sykes, 1832)
21	Cattle Egret	*Bubulcus ibis* (Linnaeus, 1758)
22	Little Egret	*Egretta garzetta* (Linnaeus, 1766)
	Phalacrocoracidae (cormorants)	
23	Little Cormorant	*Microcarbo niger* (Vieillot, 1817)
	Charadriiformes	
	Charadriidae (plovers & lapwings)	
24	Red-wattled Lapwing	*Vanellus indicus* (Boddaert, 1783)
	Scolopacidae (sandpipers)	
25	Common Sandpiper	*Actitis hypoleucos* (Linnaeus, 1758)
26	Green Sandpiper	*Tringa ochropus* Linnaeus, 1758
27	Wood Sandpiper	*Tringa glareola* Linnaeus, 1758
	Turnicidae (buttonquails)	
28	Yellow-legged Buttonquail	*Turnix tanki* Blyth, 1843
29	Barred Buttonquail	*Turnix suscitator* (J.F. Gmelin, 1789)
	Accipitriformes	

	Accipitridae (kites, hawks and eagles)	
30	Black-winged Kite	*Elanus caeruleus* (Desfontaines, 1789)
31	Short-toed Snake Eagle	*Circaetus gallicus* (J.F. Gmelin, 1788)
32	Black Eagle	*Ictinaetus malaiensis* (Temminck, 1822)
33	Indian Spotted Eagle	*Clanga hastata* (Lesson, 1831)
34	Tawny Eagle	*Aquila rapax* (Temminck, 1828)
35	Bonelli's Eagle	*Aquila fasciata* Vieillot, 1822
36	Shikra	*Accipiter badius* (J.F. Gmelin, 1788)
37	Besra	*Accipiter virgatus* (Temminck, 1822)
38	Brahminy Kite	*Haliastur indus* (Boddaert, 1783)
39	White-eyed Buzzard	*Butastur teesa* (Franklin, 1831)
	Strigiformes	
	Strigidae (owls)	
40	Spotted Owlet	*Athene brama* (Temminck, 1821)
41	Indian Eagle Owl	*Bubo bengalensis* (Franklin, 1831)
	Upupidae (hoopoes)	
42	Common Hoopoe	*Upupa epops* Linnaeus, 1758
	Piciformes	
	Picidae (woodpeckers)	
43	Lesser Golden-backed Woodpecker	*Dinopium benghalense* (Linnaeus, 1758)
	Ramphastidae (toucans and barbets)	
44	Coppersmith Barbet	*Psilopogon haemacephalus* (Statius Muller, 1776)
	Coraciiformes	
	Meropidae (bee-eaters)	

45	Green Bee-eater	*Merops orientalis* Latham, 1801
46	Blue-tailed Bee-eater	*Merops philippinus* Linnaeus, 1767
	Coraciidae (rollers)	
47	Indian Roller	*Coracias benghalensis* (Linnaeus, 1758)
	Alcedinidae (kingfishers)	
48	Common Kingfisher	*Alcedo atthis* (Linnaeus, 1758)
49	White-throated Kingfisher	*Halcyon smyrnensis* (Linnaeus, 1758)
	Falconiformes	
	Falconidae (falcons and caracaras)	
50	Common Kestrel	*Falco tinnunculus* Linnaeus, 1758
	Psittaciformes	
	Psittaculidae (old world parrots)	
51	Plum-headed Parakeet	*Psittacula cyanocephala* (Linnaeus, 1766)
52	Rose-ringed Parakeet	*Psittacula krameri* (Scopoli, 1769)
	Passeriformes	
	Pittidae (pittas)	
53	Indian Pitta	*Pitta brachyura* (Linnaeus, 1766)
	Campephagidae (minivets and cuckooshrikes)	
54	Small Minivet	*Pericrocotus cinnamomeus* (Linnaeus, 1766)
55	Black-headed Cuckooshrike	*Lalage melanoptera* (Rüppell, 1839)
	Oriolidae (orioles, figbirds and allies)	
56	Indian Golden Oriole	*Oriolus kundoo* Sykes, 1832

	Artamidae (woodswallows)	
57	Ashy Woodswallow	*Artamus fuscus* Vieillot, 1817
	Vangidae (vangas and helmetshrikes)	
58	Common Woodshrike	*Tephrodornis pondicerianus* (J.F. Gmelin, 1789)
	Aegithinidae (ioras)	
59	Common Iora	*Aegithina tiphia* (Linnaeus, 1758)
	Dicruridae (drongos)	
60	Black Drongo	*Dicrurus macrocercus* Vieillot, 1817
	Rhipiduridae (fantails)	
61	White-throated Fantail	*Rhipidura albicollis* (Vieillot, 1818)
	Laniidae (shrikes)	
62	Brown Shrike	*Lanius cristatus* Linnaeus, 1758
63	Bay-backed Shrike	*Lanius vittatus* Valenciennes, 1826
64	Long-tailed Shrike	*Lanius schach* Linnaeus, 1758
	Corvidae (crows and jays)	
65	Rufous Treepie	*Dendrocitta vagabunda* (Latham, 1790)
66	House Crow	*Corvus splendens* Vieillot, 1817
67	Large-billed Crow	*Corvus macrorhynchos* Wagler, 1827
	Monarchidae (monarchs & paradise-flycatchers)	
68	Black-naped Monarch	*Hypothymis azurea* (Boddaert, 1783)
69	Indian Paradise-flycatcher	*Terpsiphone paradisi* (Linnaeus, 1758)
	Dicaeidae (flowerpeckers)	
70	Pale-billed Flowerpecker	*Dicaeum erythrorhynchos* (Latham, 1790)

	Nectariniidae (sunbirds)	
71	Purple-rumped Sunbird	*Leptocoma zeylonica* (Linnaeus, 1766)
72	Purple Sunbird	*Cinnyris asiaticus* (Latham, 1790)
73	Loten's Sunbird	*Cinnyris lotenius* (Linnaeus, 1766)
	Irenidae (fairy-bluebirds and leafbirds)	
74	Jerdon's Leafbird	*Chloropsis jerdoni* (Blyth, 1844)
	Ploceidae (weavers)	
75	Baya Weaver	*Ploceus philippinus* (Linnaeus, 1766)
	Estrildidae (waxbills)	
76	Red Munia	*Amandava amandava* (Linnaeus, 1758)
77	Indian Silverbill	*Euodice malabarica* (Linnaeus, 1758)
78	White-rumped Munia	*Lonchura striata* (Linnaeus, 1766)
79	Scaly-breasted Munia	*Lonchura punctulata* (Linnaeus, 1758)
80	Black-headed Munia	*Lonchura malacca* (Linnaeus, 1766)
	Motacillidae (wagtails and pipits)	
81	Tree Pipit	*Anthus trivialis* (Linnaeus, 1758)
82	Paddyfield Pipit	*Anthus rufulus* Vieillot, 1818
83	Blyth's Pipit	*Anthus godlewskii* (Taczanowski, 1876)
84	Grey Wagtail	*Motacilla cinerea* Tunstall, 1771
85	White-browed Wagtail	*Motacilla maderaspatensis* J.F. Gmelin, 1789
	Fringillidae (finches)	
86	Common Rosefinch	*Erythrina erythrina* (Pallas, 1770)
	Alaudidae (larks)	
87	Rufous-tailed Lark	*Ammomanes phoenicura* (Franklin, 1831)
88	Ashy-crowned Sparrow Lark	*Eremopterix griseus* (Scopoli, 1786)

89	Jerdon's Bushlark	*Mirafra affinis* Blyth, 1845
	Cisticolidae (cisticolas)	
90	Zitting Cisticola	*Cisticola juncidis* (Rafinesque, 1810)
91	Grey-breasted Prinia	*Prinia hodgsonii* Blyth, 1844
92	Jungle Prinia	*Prinia sylvatica* Jerdon, 1840
93	Ashy Prinia	*Prinia socialis* Sykes, 1832
94	Plain Prinia	*Prinia inornata* Sykes, 1832
95	Common Tailorbird	*Orthotomus sutorius* (Pennant, 1769)
	Locustellidae (bush warblers)	
	Acrocephalidae (brush, reed and swamp warblers)	
96	Booted Warbler	*Iduna caligata* (M.H.C. Lichtenstein, 1823)
97	Sykes's Warbler	*Iduna rama* (Sykes, 1832)
98	Blyth's Reed Warbler	*Acrocephalus dumetorum* Blyth, 1849
	Hirundinidae (swallows)	
99	Red-rumped Swallow	*Cecropis daurica* (Laxmann, 1769)
100	Barn Swallow	*Hirundo rustica* Linnaeus, 1758
101	Dusky Crag Martin	*Ptyonoprogne concolor* (Sykes, 1832)
	Pycnonotidae (bulbuls)	
102	Red-whiskered Bulbul	*Pycnonotus jocosus* (Linnaeus, 1758)
103	Red-vented Bulbul	*Pycnonotus cafer* (Linnaeus, 1766)
104	White-browed Bulbul	*Pycnonotus luteolus* (Lesson, 1841)
	90. Phylloscopidae (old world leaf warblers)	
105	Greenish Leaf Warbler	*Seicercus trochiloides* (Sundevall, 1837)
	Sylviidae (sylvia warblers, parrotbills and allies)	
106	Lesser Whitethroat	*Curruca curruca* (Linnaeus, 1758)

107	Yellow-eyed Babbler	*Chrysomma sinense* (J.F. Gmelin, 1789)
	Timaliidae (scimitar babblers and allies)	
108	Tawny-bellied Babbler	*Dumetia hyperythra* (Franklin, 1831)
	Leiothrichidae (babblers, laughingthrushes and allies)	
109	Common Babbler	*Argya caudata* (Dumont, 1823)
110	Yellow-billed Babbler	*Turdoides affinis* (Jerdon, 1845)
	Sturnidae (starlings)	
111	Rosy Starling	*Pastor roseus* (Linnaeus, 1758)
112	Brahminy Starling	*Sturnia pagodarum* (J.F. Gmelin, 1789)
113	Chestnut-tailed Starling	*Sturnia malabarica* (J.F. Gmelin, 1789)
114	Common Myna	*Acridotheres tristis* (Linnaeus, 1766)
	Muscicapidae (chats and flycatchers)	
115	Indian Robin	*Saxicoloides fulicatus* (Linnaeus, 1766)
116	Oriental Magpie Robin	*Copsychus saularis* (Linnaeus, 1758)
117	Blue Rock Thrush	*Monticola solitarius* (Linnaeus, 1758)
118	Pied Bushchat	*Saxicola caprata* (Linnaeus, 1766)

Avifauna photographed at CMC Chittoor Campus

Sirkeer Malkoha

Common Hawk Cuckoo

Pied Cuckoo

Green Bee-eater

Long-tailed Shrike

Paddyfield Pipit

Brown Shrike

Red-rumped Swallow

Red-vented Bulbul

Black Eagle

Black Drongo

Cattle Egret

Scaly-breasted Munia

Grey-bellied Cuckoo

Common Hoopoe

Common Rosefinch

Black-headed Cuckooshrike

Shikra

Blue-rock Thrush

Coppersmith barbet

Spotted owlet

Little Cormorant

Barred Buttonquail

Lesser Whitethroat

Common Iora

Purple Sunbird

Pied Bushchat

White-browed Wagtail

Laughing Dove

Indian Robin

Rosy Starling

Indian Silverbill

Blue-tailed Bee-eater

White-browed Bulbul

Brahminy Myna

Short-toed Snake Eagle

White-eyed Buzzard

Red-wattled Lapwing

Red Munia

Black- shouldered Kite

Rufous-winged Lark

Bonelli's Eagle

Besra

Plain Prinia

Booted Warbler

Asian Palm Swift

Magpie Robin

Brahminy Kite

Common Babbler

Blyth's Reed Warbler

Dusky-crag Martin

Small Minivet

White-headed babbler

White-rumped Munia

Blue-faced Malkoha

Common Indian Nightjar

Yellow-eyed Babbler

Baya Weaver

Long-tailed Shrike

Red-rumped Swallow

Coucal

Jungle Prinia

Barn Swallow

Plain Flowerpecker

Grey-breasted Prinia

Shikra

Common Myna

Blyth's Pipit

Great-horned Owl

Ashy Woodswallow

Oriental Tree Pipit

Chestnut-tailed Starling

Jerdon's Bushlark

Common Kestrel

Painted Spurfowl

Indian Roller

Purple-rumped Sunbird

Little Grebe

Grey Wagtail

Wood Sandpiper

Common Sandpiper

White-throated Kingfisher

Green Sandpiper

All Photographs were taken at the CMC Chittoor Campus during the survey in 2018 and 2019.

6.2 CONGREGATIONS, FEEDING, BREEDING AND ROOSTING RECORDED ON CAMPUS

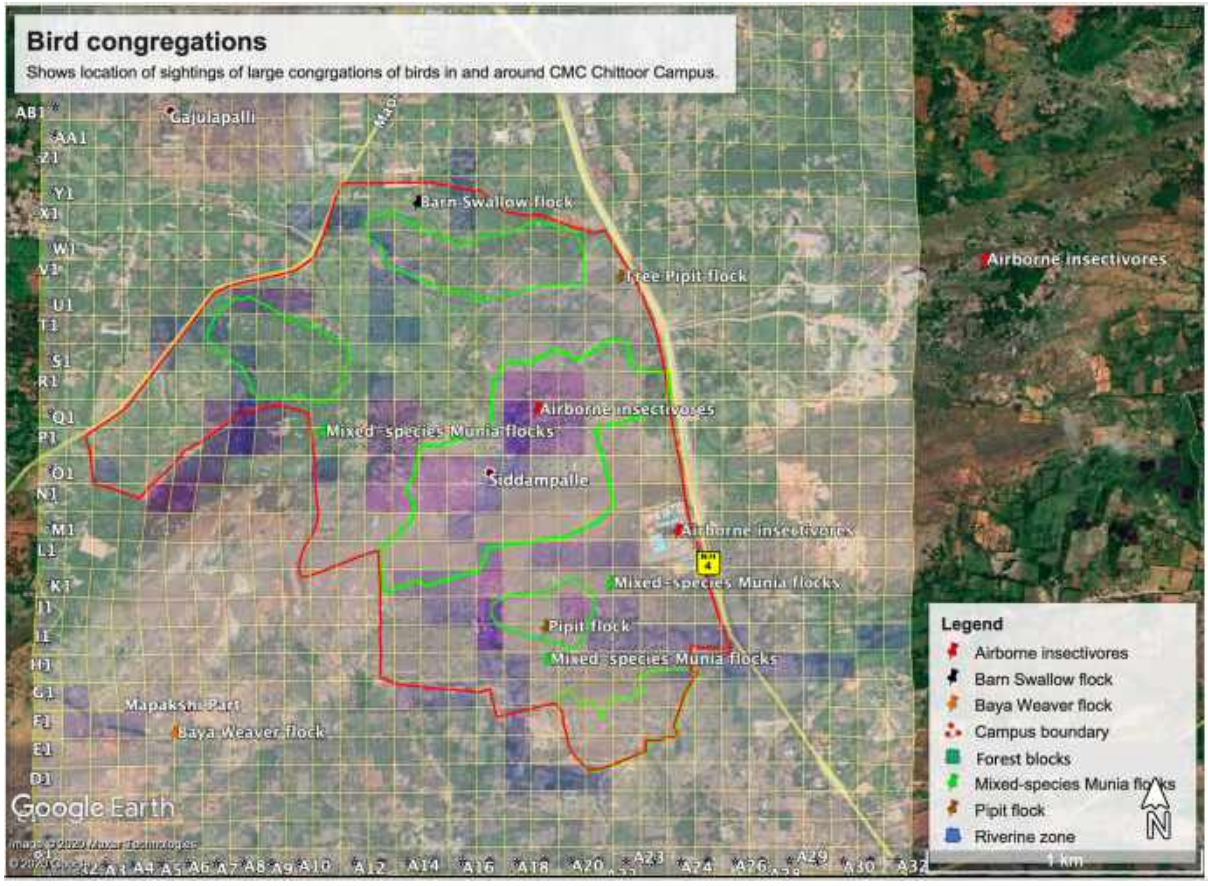
The campus is noted to be rich in activity, and provides habitat for feeding, roosting and breeding for birds. The campus acts as good feeding ground both during migratory and non-migratory seasons. Large bird congregations were noted to be spread out throughout the campus based on the habitat needs of the species. They were particularly noted during the late monsoon. Resident species particularly

Munias were noted in large congregations when tall grasslands were available. While the scrub dependent birds were recorded feeding, breeding and roosting near the main Check dam in the central eastern part of the campus or in dense scrub occurring in the central western part of the campus. Riverine patches were also noted to be highly favoured by scrub forest preferring species particularly for feeding. While the grassland dependent birds were recorded in large numbers in fallow land with tall primary successor species of grass or short native grassland.

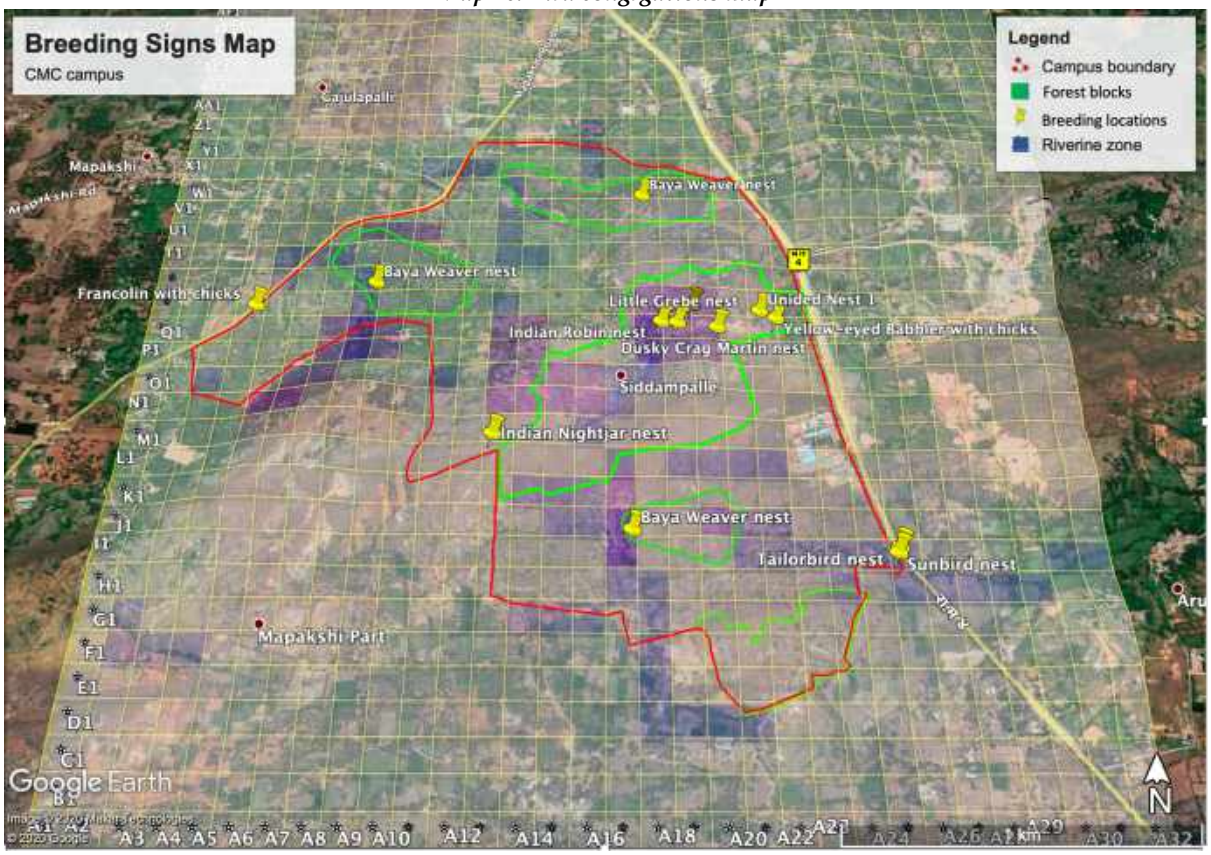
Some of the large counts of birds noted are provided here. They are mixed species hunting parties of 30-60 individuals of insectivore birds such as Palm Swifts, Red-rumped Swallows, Dusky Crag Martins, joined by the Barn Swallows during migratory period were noted at dawn and dusk everyday above the pond at the entrance of the hospital and main checkdam at the Central Ridge. Nearly 50 individuals of the Oriental Tree Pipit- a migratory bird were noted in the grassland area North of the Chatram. Mixed species flocks of Munias of about 50-100 individuals were frequently noted in the Ramapuram grasslands and fallow lands behind the admin blocks. Large flocks of over 200 indviduals of Baya weavers were noted in the agriculture fields outside the South Western Corner of the Campus. Large flocks of over 200 individuals were also noted in the Northern end of Mapakshi part of the campus.

The breeding peak of species in the region appears to be premonsoon. Over 20 breeding signs like nests or chicks were recorded. The largest number of breeding signs was in the main Check Dam area in the Central Ridge with the next being dense scrub in the western end of the Central ridge located centrally between Mapakshi and Ramapuram.

Some species were noted to be specifically using the boulder strewn patches and caves for breeding purposes like Red-rumped Swallow, Dusky Crag Martin and Painted Spurfowl. This unique habitat is important for many species that are habitat specialists and unique to the campus and region. Two maps are provided below showing bird congregations and breeding signs.



Map 10: Bird congrgations map



Map 11: Breeding signs map

Photographs of Bird Congregations, Breeding and Roosting recorded at the CMC, Chittoor campus

Scrape nest of Indian Nightjar

Gray Francolin chick

Dusky Crag Martin Nest in a Cave

Mud nest of Red-rumped Swallow

Little Grebe with chicks

Paddyfield Pipit

Baya Weaver nest in a Scrub Forest edge in Mapakshi Campus

Unidentified nest near Scrub forest in Mapakshi Campus

Sunbird nest in south-eastern pond/marsh

Unidentified nest near main Check Dam

Unidentified nest near main Check Dam

Flock of over 200 individuals of Baya Weaver

Barn Swallow(over 200 individuals)

Pin-tailed Duck (42 individuals)

Glossy Ibis(30 individuals)

All photographs were taken at the CMC Chittoor campus during survey in 2018 &2019.

7 BUTTERFLIES OF CMC, CHITTOOR CAMPUS:

A total of 62 species were recorded in the main campus of CMC Chittoor campus. It was represented by 5 species of the skipper family (Hesperiidae), 19 species of blue family (Lycaenidae), 21 species of brush-footed butterflies' family (Nymphalidae), 4 species of swallowtail butterfly family (Papilionidae), 13 species of white and yellows family (Pieridae).

Some of the species that occurred on campus are protected species under the Indian Wildlife Protection Act 1972. Two species are listed as Schedule I species with highest protection status, three are listed as Schedule II species while the rest are 'not assessed'. Species listed as 'Schedule I' are Danaid Eggfly and Crimson Rose. Species listed as Schedule II are Gram Blue, Indian Peacock Royal and the Pea Blue.

Many species were also noted to have strict habitat choices. Members of the Lycaenidae (blue family) were generally associated with high herbaceous species noted on campus. Member of Pierids (white and yellows family) was largely associated with scrub forest elements.

The diversity of species detected currently maybe considered as disproportionately low. At least 150 species are suspected to occur in this locality. The disproportionate detection maybe attributed to the drought year of 2018 when most surveys were conducted for butterflies. It may also be based on poor habitat quality or pollution in the locality. There remains a scope to look at reasons for low number of species. This requires more attention. Choice of species in landscape and gardening may have further role in long-term negative impact of butterflies if its not carried out with caution.

A checklist of species seen and photographs of species taken on campus are provided below. A detailed version of the species table is provided in the appendix.

Checklist of butterflies- CMC, Chittoor Campus

S.NO	Family	Common Name	Scientific Name
1	Hesperiidae	Common Banded Awl	*Hasora chromus chromus* (Cramer, [1780])
2	Hesperiidae	Dart spp	*Potanthus spp.*
3	Hesperiidae	Grey-veined Grass Dart	*Taractrocera maevius* (Fabricius, 1793)
4	Hesperiidae	Indian Bush Hopper	*Ampittia dioscorides dioscorides* (Fabricius, 1793)
5	Hesperiidae	Indian Common Small Flat.	*Sarangesa dasahara dasahara* (Moore, [1866])
6	Lycaenidae	Continental Common Pierrot	*Castalius rosimon rosimon* (Fabricius, 1775)
7	Lycaenidae	Bengal Slate Flash	*Rapala manea schistacea* (Moore, 1879)
8	Lycaenidae	Indian Common Silverline	*Spindasis vulcanus vulcanus* (Fabricius, 1775)
9	Lycaenidae	Asian Zebra Blue	*Leptotes plinius plinius* (Fabricius, 1793)
10	Lycaenidae	Black-spotted Grass Jewel	*Freyeria putli* (Kollar, [1844])
11	Lycaenidae	Common Guava Blue	*Virachola isocrates* (Fabricius, 1793)
12	Lycaenidae	Dark Grass Blue	*Zizeeria karsandra* (Moore, 1865)
13	Lycaenidae	Gram Blue	*Euchrysops cnejus* (Fabricius, 1798)
14	Lycaenidae	Indian Common Lineblue	*Prosotas nora ardates* (Moore, [1875])
15	Lycaenidae	Indian Common Shot Silverline	*Spindasis ictis ictis* (Hewitson, 1865)
16	Lycaenidae	Indian Lesser Grass Blue	*Zizina otis indica* (Murray, 1874)
17	Lycaenidae	Indian Lime Blue	*Chilades lajus lajus* (Stoll, [1780])
18	Lycaenidae	Indian Peacock Royal	*Tajuria cippus cippus* (Fabricius, 1798)
19	Lycaenidae	Indian Tailless Lineblue	*Prosotas dubiosa indica* (Evans, [1925])
20	Lycaenidae	Indian Tiny Grass Blue	*Zizula hylax hylax* (Fabricius, 1775)
21	Lycaenidae	Monkey Puzzle	*Rathinda amor* (Fabricius, 1775)
22	Lycaenidae	Oriental Forget-me-not	*Catochrysops strabo strabo* (Fabricius, 1793)
23	Lycaenidae	Pea Blue	*Lampides boeticus* (Linnaeus, 1767)
24	Lycaenidae	Syrian Babul Blue	*Azanus jesous gamra* (Lederer, 1855)
25	Nymphalidae	Indian Angled Castor	*Ariadne ariadne indica* (Moore, 1884)
26	Nymphalidae	Indian Common Crow	*Euploea core core* (Cramer, [1780])
27	Nymphalidae	Indian Common Three-ring	*Ypthima asterope mahratta* Moore, 1884
28	Nymphalidae	Anomalous Nawab	*Charaxes agrarius* Swinhoe, [1887]
29	Nymphalidae	Chinese Lemon Pansy	*Junonia lemonias lemonias* (Linnaeus, 1758)
30	Nymphalidae	Dakhan Common Baron	*Euthalia aconthea meridionalis* Fruhstorfer, 1906
31	Nymphalidae	Dakhan Common Bushbrown	*Mycalesis perseus tabitha* (Fabricius, 1793)
32	Nymphalidae	Danaid Eggfly	*Hypolimnas misippus* (Linnaeus, 1764)
33	Nymphalidae	Double-branded Black Crow	*Euploea sylvester coreta* (Godart, 1819)
34	Nymphalidae	Indian Common Sailer	*Neptis hylas varmona* Moore, 1872
35	Nymphalidae	Oriental Blue Tiger	*Tirumala limniace exoticus* (Gmélin, 1790)
36	Nymphalidae	Oriental Chocolate Pansy	*Junonia iphita iphita* (Cramer, [1779])
37	Nymphalidae	Oriental Common Leopard	*Phalanta phalantha phalantha* (Drury, [1773])
38	Nymphalidae	Oriental Great Eggfly	*Hypolimnas bolina jacintha* (Drury, 1773)
39	Nymphalidae	Oriental Grey Pansy	*Junonia atlites atlites* (Linnaeus, 1763)

40	Nymphalidae	Oriental Peacock Pansy	*Junonia almana almana* (Linnaeus, 1758)
41	Nymphalidae	Oriental Plain Tiger	*Danaus chrysippus chrysippus* (Linnaeus, 1758)
42	Nymphalidae	Pale Blue Pansy	*Junonia orithya swinhoei* Butler, 1885
43	Nymphalidae	Tamil Bushbrown	*Mycalesis subdita* (Moore, [1890])
44	Nymphalidae	Tawny Coster	*Acraea terpsicore* (Linnaeus, 1758)
45	Nymphalidae	Yellow Pansy	*Junonia hierta* (Fabricius, 1798)
46	Papilionidae	Northern Lime Swallowtail.	*Papilio demoleus demoleus* Linnaeus, 1758
47	Papilionidae	Indian Common Mormon	*Papilio polytes romulus* Cramer, [1775]
48	Papilionidae	Crimson Rose	*Pachliopta hector* (Linnaeus, 1758)
49	Papilionidae	Indian Common Rose	*Pachliopta aristolochiae aristolochiae* (Fabricius, 1775)
50	Pieridae	Oriental Lemon Emigrant.	*Catopsilia pomona pomona* (Fabricius, 1775)
51	Pieridae	Indian Crimson-tip	*Colotis danae danae* (Fabricius, 1775)
52	Pieridae	Dakhan Common Gull	*Cepora nerissa phryne* (Fabricius, 1775)
53	Pieridae	Dakhan Large Salmon Arab	*Colotis fausta fulvia* (Wallace, 1867)
54	Pieridae	Dakhan Yellow Orange-tip	*Ixias pyrene sesia* (Fabricius, 1777)
55	Pieridae	Indian Jezebel	*Delias eucharis* (Drury, 1773)
56	Pieridae	Indian Pioneer	*Belenois aurota aurota* (Fabricius, 1793)
57	Pieridae	Indian Wanderer	*Pareronia hippia* (Fabricius, 1787)
58	Pieridae	Oriental Common Grass Yellow	*Eurema hecabe hecabe* (Linnaeus, 1758)
59	Pieridae	Oriental Mottled Emigrant	*Catopsilia pyranthe pyranthe* (Linnaeus, 1758)
60	Pieridae	Oriental Psyche	*Leptosia nina nina* (Fabricius, 1793)
61	Pieridae	Plain Orange-tip	*Colotis aurora* (Cramer, [1780])
62	Pieridae	Red-line Small Grass Yellow	*Eurema brigitta rubella* (Wallace, 1867)

Butterflies photographed from the Christian Medical College, Chittoor Campus

Common Sailor

Psyche

Pioneer

Mottled Emigrant

Yellow Orange-tip

Danaid Eggfly

Grey-veined Grass Dart

Common Silverline

Great Eggfly

Peacock Royal

Common Pierrot

Angled Castor

Slate Flash

Plain Orange-Tip

Dart sp.

Oriental Lemon Emigrant

Common Banded Awl

Lemon Pansy

Common Baron

Monkey Puzzle

Spotted small Flat

Bushbrown spp.

Common Three-ring

Tawny Coster

Common Rose

Crimson Rose

Peacock Pansy

Anomalous Nawab

Common Jezebel

Common Grass Yellow

Common Leopard

Indian Bush Hopper

Double-branded Crow

Blue Pansy

Common Guava Blue

Yellow Pansy

Small Grass Yellow

Crimson Tip

Pea blue

Black-spotted Grass Jewel

Zebra Blue

Tiny Grass Blue

Indian Tailless Lineblue

Gram Blue

African Babul Blue

Oriental Forget Me Not

Dark Grass Blue

Common Lineblue

Lesser Grass Blue

All photos were taken at CMC Chittoor Campus during survey carried out in 2018 & 2019.

8 HERPETOFAUNA

8.1 REPTILES

A total of 29 reptile species were recorded from the campus. They were represented by 3 species of the Garden lizard family (agamidae), eight species of the house lizards family (geckkonidae), three species of the skink family (scincidae) and by one species each of Chamaeleonidae- Indian chameleon, Lacertidae – the Leschenault's lacerta and Varanidae – the Indian monitor lizard respectively. They also included 10 species of snakes including two venomous species such as Indian Cobra and Saw-scaled viper and two chelonians – the Indian star tortoise and the Indian flapshell turtle. Occurrence of species like the Cobra may be partly attributed to high habitat modification. Occurrence of nearly all species was strongly associated with rocky areas with the exception of Spotted House Gecko (*Hemidactylus parvimaculatus*) and Common House Gecko *Hemidactylus frenatus* which were predominantly found only in human habited areas.

Among the species recorded four species are recognised as Schedule I species with highest protection in Indian Wildlife Protection Act, 1972. They are the Indian Golden Gecko, the Indian Monitor, the Indian Rock Python and the Indian Flap-shelled Turtle. Four are listed as Schedule II species. They are the Indian Chameleon, Oriental Ratsnake, the Indian Cobra and Olive Keelback. Seven are listed as Schedule IV species. They are the Common Sand Boa, Common Bronzeback Snake, Streaked Kukri Snake, Common Cat Snake, Brahminy Blindsnake, Saw-scaled Viper and the Indian Star Tortoise. Two species are assessed as 'Vulnerable' by the International Union for Conservation of Nature (IUCN). They are Otai's Day gecko and the Indian Star Tortoise. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) recognises the Indian Star Tortoise, Indian Monitor Lizard and Indian Rock Python in Appendix I as species threatened with extinction. It also recognises the Indian Chameleon, the Indian Flapshell Turtle, the Indian Sand boa, the Indian Cobra in Appendix II as protected and likely threatened with extinction in the future. It also lists Olive Keelback in Appendix III as a species that is Vulnerable. Further, four species are noted to be highly geographically

restricted and are recognised as endemic to the region. They include the Indian golden gecko, the Otai's day gecko, the Treutler's gecko, and the Giant leaf-toed gecko.

A checklist of species seen and photographs of species taken on campus are provided below. A detailed version of the species table is provided in the appendix.

Checklist of reptiles- CMC, Chittoor campus

S. No	Family	Common Name	Scientific Name
1	Agamidae	Oriental Garden Lizard, Bloodsucker	*Calotes versicolor* (DAUDIN 1802)
2	Agamidae	Indian Rock Agama	*Psammophilus sp.* (GRAY 1831)
3	Agamidae	Pondichéry Fan Throated Lizard	*Sitana ponticeriana* CUVIER 1829
4	Chamaeleonidae	Indian chameleon	*Chamaeleo zeylanicus* LAURENTI 1768
5	Gekkonidae	Common House Gecko	*Hemidactylus frenatus* DUMÉRIL & BIBRON 1836
6	Gekkonidae	Indian golden gecko	*Calodactylodes aureus* (BEDDOME 1870)
7	Gekkonidae	Otai's Day Gecko	*Cnemaspis otai* DAS & BAUER 2000
8	Gekkonidae	Spotted house gecko	*Hemidactylus parvimaculatus* DERANIYAGALA 1953
9	Gekkonidae	Reticulate Leaf-toed Gecko	*Hemidactylus reticulatus* BEDDOME 1870
10	Gekkonidae	Treutler's gecko	*Hemidactylus treutleri* MAHONY 2009
11	Gekkonidae	Termite Hill Gecko	*Hemidactylus triedrus (*DAUDIN 1802)
12	Gekkonidae	Giant Leaf-toed Gecko, Giant Southern Tree Gecko	*Hemidactylus giganteus* STOLICZKA 1871
13	Scincidae	Beddome's Mabuya	*Eutropis beddomei* (JERDON 1870)
14	Scincidae	Keeled Indian Mabuya, Common skink	*Eutropis carinata* (SCHNEIDER 1801)
15	Scincidae	Bronze Mabuya, Bronze Skink, Grass Sun Skink	*Eutropis macularia* (BLYTH 1853)
16	Lacertidae	Leschenault's Snake-eyed Lizard, Leschenault's Lacerta	*Ophisops leschenaultii* (MILNE-EDWARDS 1829)
17	Varanidae	Bengal Monitor, Indian Monitor	*Varanus bengalensis* (DAUDIN 1802)
18	Boidae	Common Sand Boa	*Eryx conicus* (SCHNEIDER 1801)
19	Colubridae	Dhaman, Oriental Ratsnake	*Ptyas mucosa* (LINNAEUS 1758)
20	Colubridae	Common Bronzeback Tree Snake	*Dendrelaphis tristis* (DAUDIN 1803)
21	Colubridae	Streaked Kukuri Snake	*Oligodon taeniolatus* (JERDON 1853)

22	Colubridae	Indian Gamma Snake, Common Cat Snake	*Boiga trigonata* (SCHNEIDER 1802)
23	Colubridae	Olive keelback	*Atretium schistosum* (DAUDIN 1803)
24	Elapidae	Cobra	*Naja naja* (LINNAEUS 1758)
25	Pythonidae	Indian Rock Python	*Python molurus* (LINNAEUS 1758)
26	Typhlopidae	Brahminy blindsnake	*Indotyphlops braminus* (DAUDIN 1803)
27	Viperidae	Saw-scaled Viper, Phoorsa	*Echis carinatus* (SCHNEIDER 1801)
28	Testudinidae	(Indian) Star Tortoise	*Geochelone elegans* (SCHOEPFF 1795)
29	Trionychidae	Indian Flap-shelled Turtle	*Lissemys punctata* (BONNATERRE 1789)

Reptiles photographed at the CMC Chittoor Campus

Fan Throated Lizard

Rock Agama sp.

Leschenault's Lacerta

Beddome's Skink

Keeled Indian Skink

Indian Golden Gecko

Otai's Day Gecko

Common House Gecko

Giant Leaf-toed Gecko

Reticulated Gecko

Treutler's Gecko

Termite Hill Gecko

Spotted House Gecko

Olive Keelback

Common Sand Boa

Common Cobra

Saw-scaled Viper

All photographs were taken at CMC Chittoor campus during the survey in 2018 & 2019.

8.2 AMPHIBIANS

A total of 17 amphibian species were observed in and around the CMC Chittoor main campus. The anuran population in the study area were primarily from 4 different families. More species are suspected to be occurring on campus including undescribed species. The amphibian diversity and abundance is noted to be healthy. It also further suggests healthy and high invertebrate diversity as other taxa groups have shown. Species such as Schenider's Toad, Indian six-toed frog, Marbled balloon frog and Painted Balloon frog were detected only once during the entire survey. However, the reasons behind such low detections is unclear. Structural complexity of the campus and presence of ephemeral rock pools, temporary springs on rock surfaces are noted to be strong factors responsible for the healthy populations of species present. They were specifically noted to support populations of species such as the Gunther's Toad and Burrowing frog sp. (*Sphaerotheca pluvialis*) which are both endemic and significant species.

Among species recorded, five species have been listed in Schedule IV of the Indian Wildlife Protection Act. They include the Common Skittering Frog, Indian Six-toed Frog, Jerdon's Bullfrog, Indian Bullfrog and Marbled Balloon Frog. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

recognises Indian six-toed frog and Indian Bullfrog Appendix II as species likely to be threatened with extinction in the future. All amphibian species recorded are recognised as Least Concern by IUCN except the Gunther's Toad which is recognised as Data Deficient. The Gunther's Toad and Burrowing Frog sp. (*Sphaerotheca pluvialis*) are currently identified as endemic to the region. A checklist of species seen and photographs of species taken on campus are provided below. A detailed version of the species table is provided in the appendix.

CHECKLIST OF AMPHIBIANS- CMC, CHITTOOR CAMPUS

S. No	Family	Common Name	Scientific Name
1	Bufonidae Gray, 1825	Günther's toad or rock toad	*Duttaphrynus hololius* (Günther, 1876)
2	Bufonidae	Southeast Asian Toad	*Duttaphrynus melanostictus* (Schneider, 1799)
3	Bufonidae	Schneider's Toad	*Duttaphrynus scaber* (Schneider, 1799)
4	Dicroglossidae Anderson, 1871	Common skittering frog	*Euphlyctis cyanophlyctis* (Schneider, 1799)
5	Dicroglossidae	Indian six-toed Frog	*Euphlyctis hexadactylus (Lesson, 1834)*
6	Dicroglossidae	Jerdon`s Bullfrog	*Hoplobatrachus crassus (Jerdon, 1853)*
7	Dicroglossidae	Indian Bullfrog	*Hoplobatrachus tigerinus (Daudin, 1802)*
8	Dicroglossidae	Indian Cricket Frog	*Minervarya agricola (Jerdon, 1853)*
9	Dicroglossidae	Indian Burrowing frog	*Sphaerotheca breviceps (Schneider, 1799)*
10	Dicroglossidae	Burrowing Frog sp.	*Sphaerotheca pluvialis (Jerdon, 1853)*
11	Dicroglossidae	Marbled Sand Frog	*Sphaerotheca rolandae (Dubois, 1983)*
12	Microhylidae Günther, 1858 (1843)	Ornate narrow-mouthed Frog	*Microhyla ornata (Duméril and Bibron, 1841)*
13	Microhylidae	Red narrow-mouthed frog	*Microhyla rubra (Jerdon, 1853)*
14	Microhylidae	Marbled balloon frog	*Uperodon systoma (Schneider, 1799)*
15	Microhylidae	Painted Baloon Frog/Sri Lankan Bullfrog	*Uperodon taprobanicus (Parker, 1934)*
16	Microhylidae	Variegated Balloon Frog/White-bellied Pug-snout Frog	*Uperodon variegatus (Stoliczka, 1872)*
17	Rhacophoridae	Common Tree Frog/Chunam Tree Frog	*Polypedates maculatus (Gray, 1830)*

Amphibians photographed at the CMC Chittoor Campus

Marbled Balloon Frog

Ornate narrow-mouthed Frog

Gunther's Toad

Common Cricket Frog

Indian Burrowing Frog

Jerdon's Bullfrog

Burrowing Frog sp.

Minervarya sp.

Marbled Sand Frog

Variegated Balloon Frog

Common Indian Toad

Indian Bull Frog

Skittering Frog

Common Tree Frog

Six toed pond frog

Schneider's Toad

Painted Balloon Frog

Red narrow-mouthed frog

All photographs were taken at CMC Chittoor Campus during survey in 2018 & 2019.

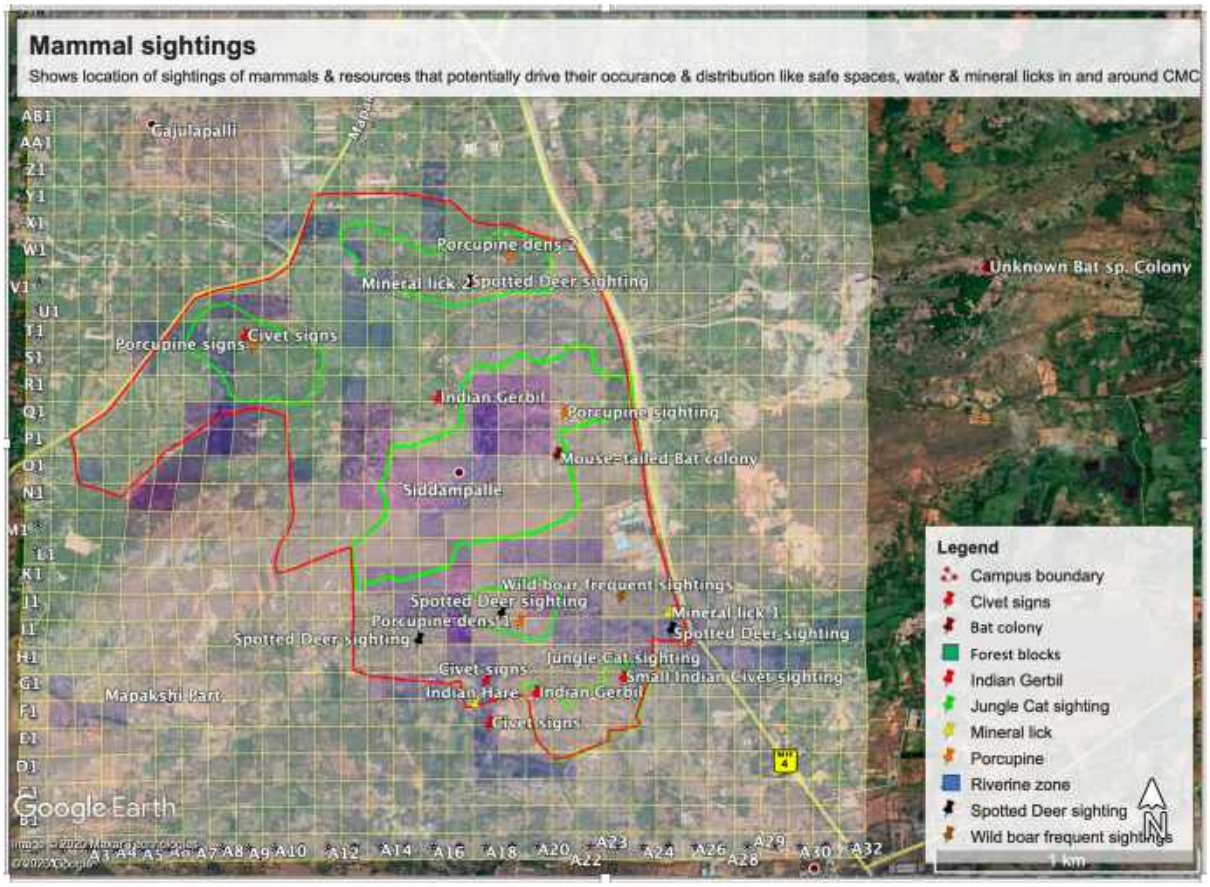
9 MAMMALS:

A total of 15 mammal species were recorded on the campus based on direct sightings. A few additional bat species were also recorded but could not be identified since identification of bats requires methods beyond the scope of the current study. Interviews revealed historic presence of several mammals reported from the general locality with potential likelihood of occurrence sporadically in time. Such species not included in the list include species such as Leopard, Wild dog, Sloth Bear, Golden Jackal, the Indian Fox among others. There is a well-known and possibly established source population at the Kaundinya Wildlife Sanctuary and the network of protected areas and forests of these animals.

Presence of some mammal species can partly be attributed to the structural complexity of the campus. Structural complexity was noted to be crucial for some species. Species such as Porcupine were noted frequently to have dens in rock caves and hillocks. Bats were also noted to choose such caves and rock crevices as roosts. Riverine areas were frequently noted to be used by civets and boar. Grasslands(particularly) and scrub were noted to be crucial for Jungle Cats.

Among the species recorded, twelve species are protected under the various Schedules of Indian Wildlife Act, 1972. Five species are listed as Schedule II. They are Jungle Cat, Common Indian Mongoose, Ruddy Mongoose, Small Indian Civet and Bonnet Macaque. Two species are listed as Schedule III species. They are the Indian Spotted Deer, Indian Wild Pig. Four species are listed Schedule IV species. They are the Indian Flying Fox, Indian Hare, the Indian Palm Squirrel and the Indian Crested Porcupine. The Indian Gerbil is listed in Schedule V of the Indian Wildlife Protection Act, 1972. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) recognised Jungle Cat, Indian Flying Fox and Bonnet Macaque as protected in Appendix II. It also recognised Indian Grey Mongoose, Ruddy Mongoose and Small Indian Civet as protected in Appendix III.

A checklist of species seen and photographs of species taken on campus are provided below. A detailed version of the species table is provided in the appendix.



Map 12: Mammal sightings map

Checklist of Mammals, CMC Chittoor campus

S. No	Order	Common Name	Species
1	ARTIODACTYLA	Indian Spotted Deer	*Axis axis* Erxleben 1777
2	ARTIODACTYLA	Indian Wild Pig	*Sus scrofa* Linnaeus 1758
3	CARNIVORA	Jungle Cat	*Felis chaus* Schreber 1777
4	CARNIVORA	Indian Gray Mongoose	*Herpestes edwardsi E.* Geoffroy Saint-Hilaire 1818
5	CARNIVORA	Ruddy Mongoose	*Herpestes smithii* Gray 1837
6	CARNIVORA	Small Indian Civet	*Viverricula indica* E. Geoffroy Saint-Hilaire 1803
7	CHIROPTERA	Pipistrelle	*Pipistrellus sp.* Kaup 1829
8	CHIROPTERA	Indian Flying Fox	*Pteropus giganteus* Brünnich 1782
9	CHIROPTERA	Lesser Mouse-tailed Bat	*Rhinopoma hardwickii* Gray 1831
10	LAGOMORPHA	Indian Hare	*Lepus nigricollis* F. Cuvier 1823

11	PRIMATES	Bonnet Macaque	*Macaca radiata* É. Geoffroy 1812
12	RODENTIA	Indian Palm Squirrel	*Funambulus palmarum* Linnaeus 1766
13	RODENTIA	Indian Crested Porcupine	*Hystrix indica* Kerr 1792
14	RODENTIA	Indian Gerbil	*Tatera indica* Hardwicke 1807
15	SORICOMORPHA	Asian House Shrew	*Suncus murinus* Linnaeus 1766

Mammals photographed at the CMC Chittoor Campus

Bonnet Macaque

Three-striped Palm Squirell

Indian Grey Mongoose

Indian Crested Porcupine

Indian Jungle Cat

Ruddy Mongoose

Pipistrelle sp.

Lesser Mouse-tailed Bat

Small Indian Civet

All photographs were taken at the CMC Chittoor Campus during survey in 2018 & 2019.

9.1.1 Endemic, rare and threatened fauna:

A few rare species were recorded in and around the campus. They include the Gunther's frog, a burrowing frog species (*Sphaerotheca pluvialis*) and the Golden Gecko. More details along with a threatened species map and plate is provided below.

Gunther's Frog - The Gunther's frog is endemic to the Eastern Ghats. It is also a habitat specialist breeding only in the rock pools surrounded by scrub forests. A healthy breeding population of the species is currently known both inside and around the campus. A breeding population was first noticed on 23rd October 2018 at the opposite campus in the Central Ridge Extension. A healthy population of several froglets including a few adults were recorded on 31st October 2019 within the campus in the Central ridge very close to the current nurses hostel. A very healthy population is expected to be occurring across the campus. Details on their currently observed location is provided in the map below.

Indian Golden Gecko - The Golden Gecko is an endemic to the Eastern Ghats, rediscovered in Chittoor District in 1986 after a gap of 100 years. It lives in colonies in well shaded parts of large rocky boulders. A single colony of about 20-30 individuals has currently been detected on campus. Another nesting site with remains of the egg was spotted at the Central ridge very close to the construction of current nurses hostel at the same site as Mouse-tailed bat colony. This suggests more colonies may be present. It also suggests the need for a proactive role that needs to be taken to conserve these threatened endemic species and their prey specifically insects which might be frequently dismissed in conservation planning.

Photographs of Gunther's Toad and Golden Gecko taken on campus:

Gunther's Frog (adult)

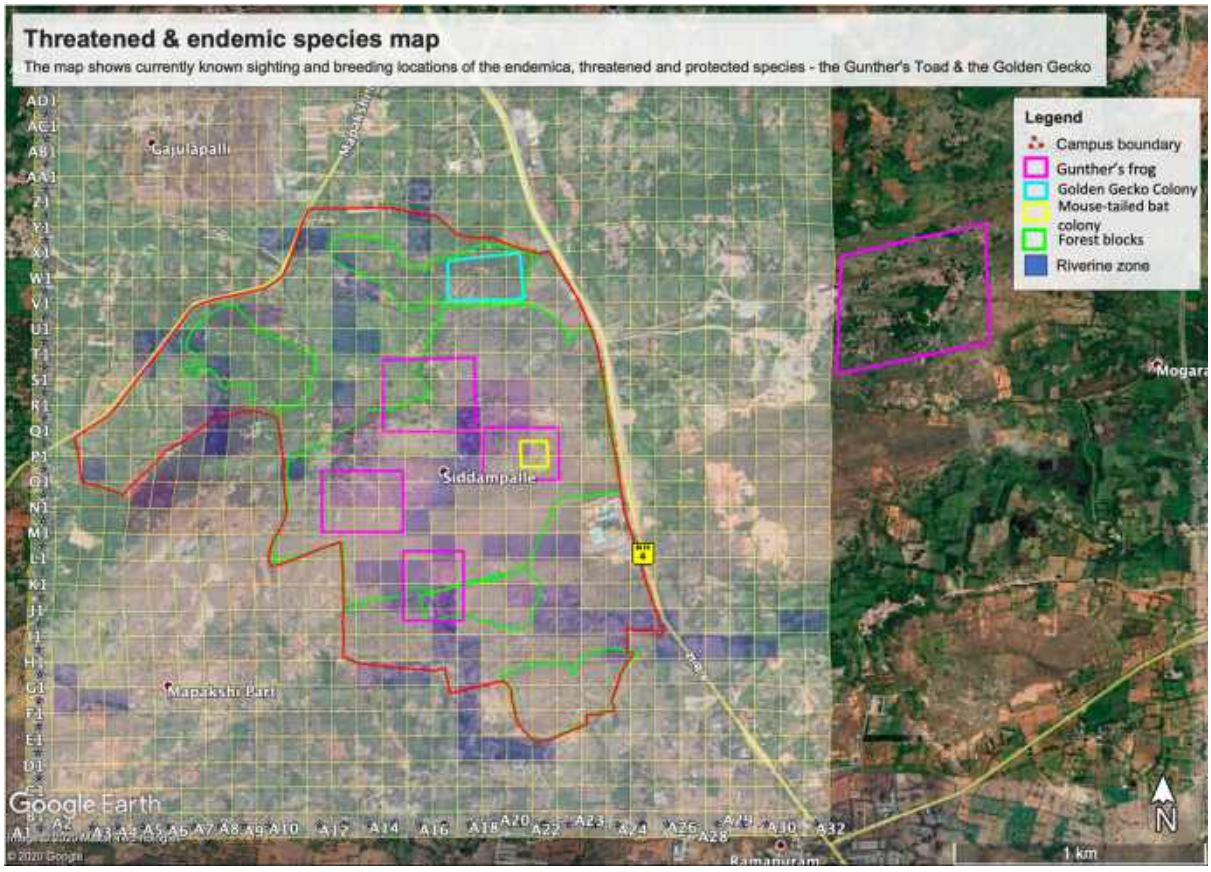
Gunther's Frog (imago)

Gunther's Frog(devoloping tadpole)

Golden Gecko (male)

Golden Gecko (female)

Golden Gecko (nest site)



Map 13: Threatened & endemic fauna map

10 OTHER INTERESTING FAUNA:

Many interesting fauna of non-target taxa groups like invertebrates (various insect groups, snails etc.) were noted during the survey and are noted to be highly diverse. Their occurrence and population is crucial to the long-term ecological resilience and sustenance of the campus as they are prey to several species. Observations include several grasshopper species, assassin bug species, praying mantis species, dragonfly and damselfly species among several others. Diversity of many predatory invertebrate species was also noted. Diversity and presence of such predatory insect species such as odonates (dragonflies and damselflies) praying mantis and assassin bugs can help indicate a healthy ecosystem since these species are highly predatory in the insect world and help keep other insect numbers in check.

Photographs of other interesting fauna – CMC Chittoor campus

Trumpet tail

Yellow-tailed Ashy Skimmer

Crimson Dropwing

Flower Assasin Bug *Rhyncosis sp.*

Assasin Bug *Linshcosteus sp.*

Wasp sp.

Crambid Moth sp.

Grammodes geometrica

Tiger beetle *Jansenia rugosiceps*

Ground Beetle sp.
Dorysthenes rostratus

Snail sp.

Freshwater crab sp.

Brown-spotted Locust

Slant-faced Grasshopper *Acrida sp.*

Grasshopper sp. 1

Chafer beetle sp.

Razor-jaw ant *Leptogenys sp.*

Grasshopper sp. 2

10.1 OTHER INTERESTING ECOLOGY NOTES:

Rock boulders and pools - The boulder and rocky areas are a unique feature to these parts and are important feature that hosts many habitat specialists. They range across all taxa groups from birds to mammals and insects.

The rock pools are a unique feature that host species of both flora and fauna that occur nowhere else on the campus. Some amphibian species like Gunther's toad and burrowing frog sp. (*Sphaerotheca pluvialis*) have been noted to breed exclusively in such rock pools. Some odonata species (dragonflies and damselflies) were also noted to breed in such rock pools during the survey. Our study of such rock pools had only one detection of mosquito larva presence during the two year study period. It was in a single overnight shallow pool (2mm depth) that lasted for less than 12

hours. Further, atleast 5 amphibian species were recorded in such rock pools. This suggests their effective role in control of unfavourable species like the mosquitoes that take advantage of human-driven habitat change. Their presence and role in this manner can help indicate health of the ecosystem.

Photographs displaying elements of ephemeral rock pool ecology

Ephemeral rock pool

Rock pool with Hydrophytes unique to the niche

Rock pool with foam nest of anamphibian

Rock pool with naiad(dragonfly larva)

Burrowing Frog sp. *Sphaerotheca pluvialis.*

Unidentified Burrowing Frog *Sphaerotheca sp.*

Unidentified tadpole in a rock pool

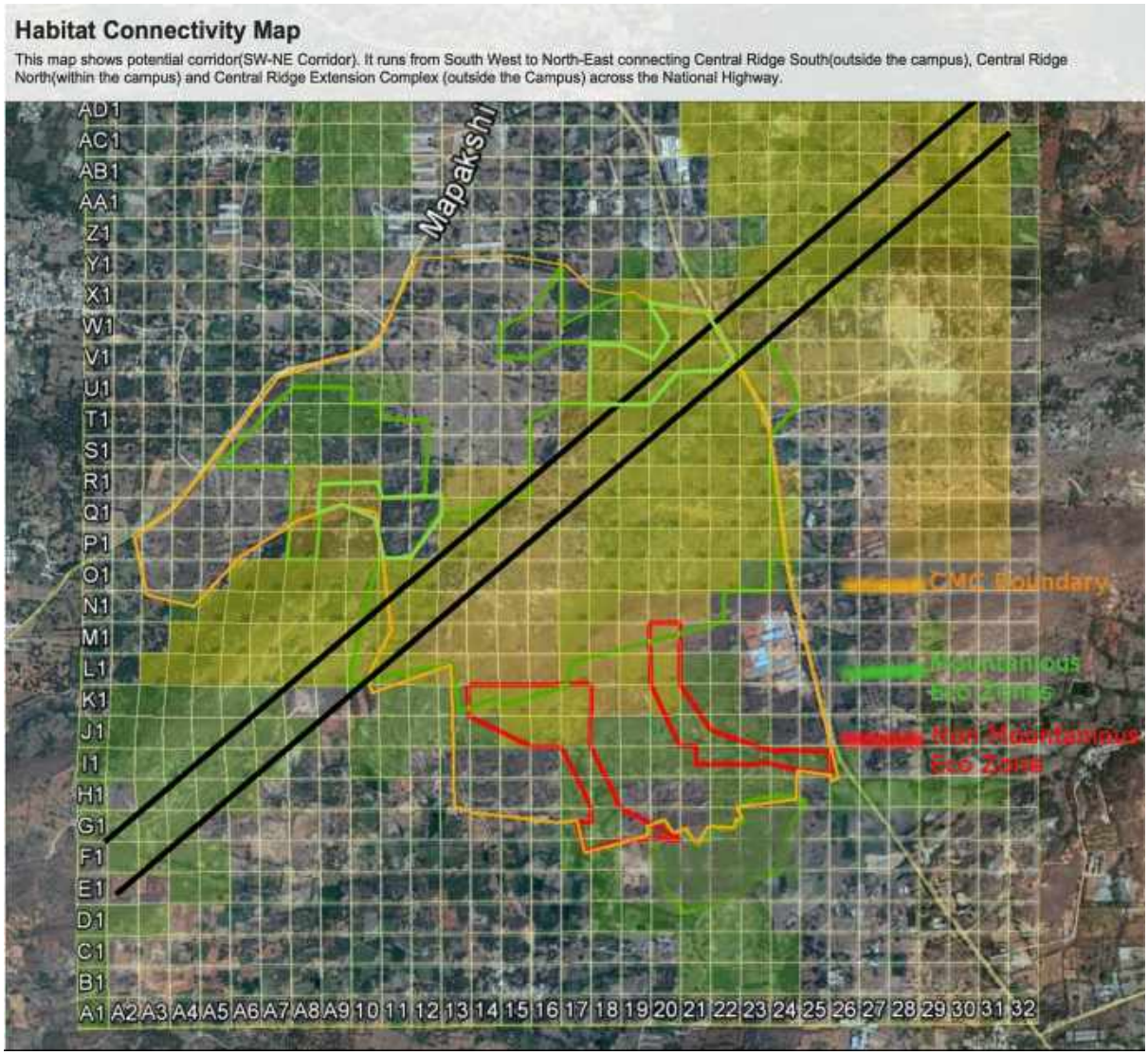
Juvenile Gunther's Frog in a rock pool

11 SENSITIVITY:

The following are the findings and suggestions based on the study of CMC Chittoor campus. Refer 'Methodology' section for the process. The main findings are as follows

The structural complexity and landscape heterogenity of the campus is one of the primary reasons for the wide range of habitats and biodiversity that occur on campus. These habitats provide unique niche to various flora and fauna including rare and endemic fauna. Further, critical habitats were identifed based on ecological value assigned. The social forests, protected areas and suitable habitats within and outside the campus were identified as factors that ensure long-term ecological sustenance. The long-term ecological resilience and integrity of these habitats is based on habitat contiguity. In this context, habitats referred to as 'ecozones' have been identified both within and outside the campus. These include existing natural habitats along with functional elements such as corridors that aid in long-term ecological resilience. It also included functional components that aid in natural regeneration of habitat and keep ecological maintanence and restoration at low cost such as riverine corridors that are critical to various flora and fauna. Despite the absence of habitat conversion in some areas these riverine corridors were noted to act as safe refuges and food resource to various fauna. This suggests their critical role on campus. Such habitats are placed with a buffer of 100m to help keep disturbance low and increase resilience.

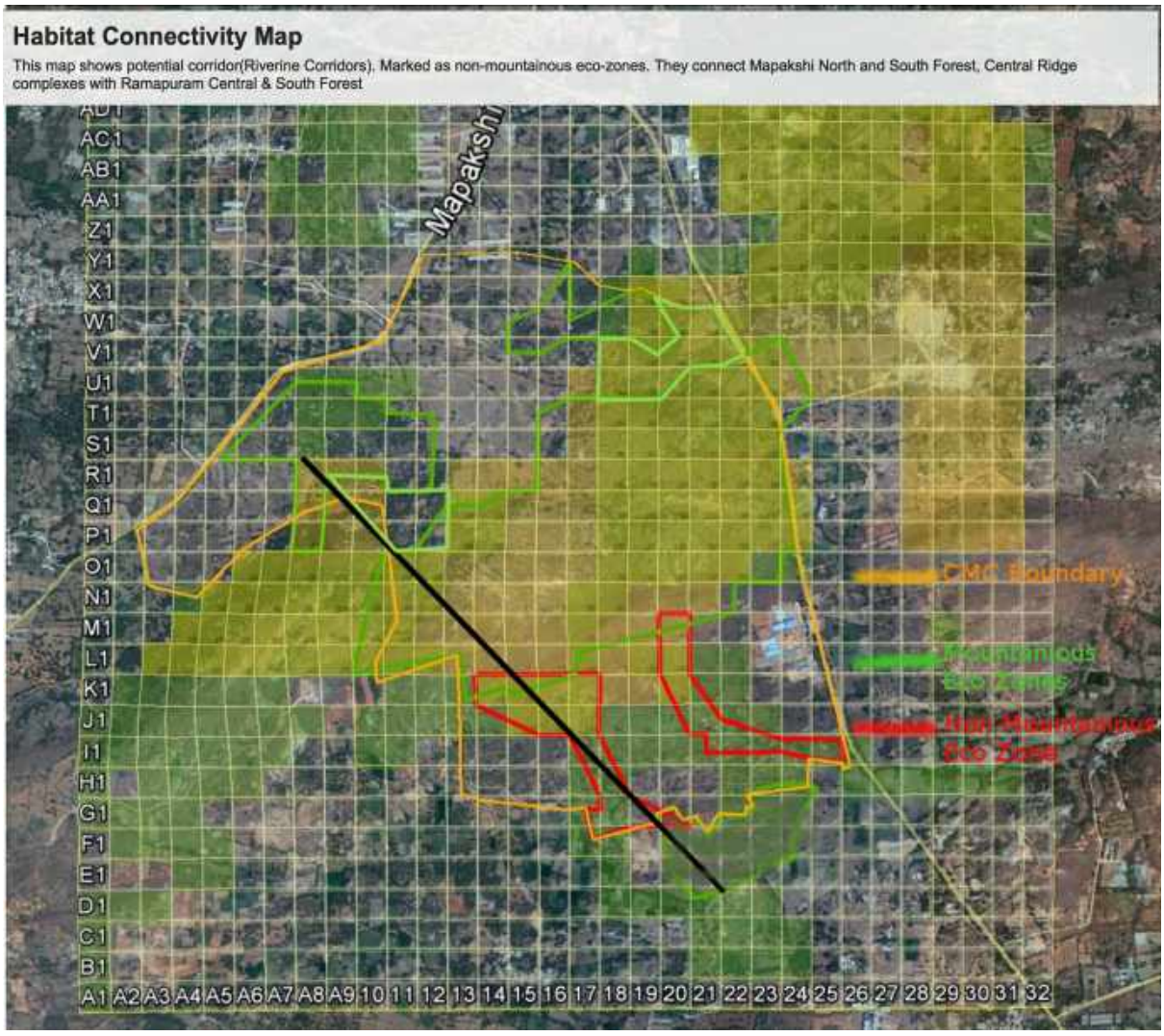
The study resulted in identification of 5 corridors. It includes one primary corridor (SW-NE) and two riverine corridors. It also included two tertiary corridors that are marked within existing eco-zones. The primary corridor (SW-NE) helps connect the main and large contiguous habitat both within and outside campus. See map below.



Map 14: Habitat connectivity map (SW- NE Corridor)

Six riverine habitats were identified within the campus. Three riverine habitats in Mapakshi were considered highly degraded and minor. Three were identified in Ramapuram. They were noted as functional and highly used. One lies within the core habitat and is therefore ignored. Two were identified in the Ramapuram 'contruction zone' and are noted as 'non-mountainous ecozones'(see map below). The riverine corridor connects habitats both within and outside the campus. It also acts as a feeding habitat and breeding habitat drawing species. Any obstruction by construction will cause an 'ecological trap' where fauna are drawn to but die due to their inability to cross such sections of intrusions. Many animals are already noticed to be using the corridors as refuges despite the absence of construction of buildings near such areas yet. This highlights the importance of riverine corridor and their

non-compromisable attributes. Caution must be exercised while setting up of linear intrusions (if unavoidable) such as roads ensuring they provide safe passage of animals. Any disturbances or obstructions of this kind will leave the corridor both defunct and ecologically irretrievable. These functional characters including passive regeneration capacity of such riverine corridors which are highly sensitive and are ecologically non-neogotiable and contribute to long-term ecological resilience.



Map 15: Habitat connectivity map (Riverine Corridor)

This basic sensitivity assessment has currently been captured reasonably well in the Master Plan of CMC Chittoor Campus. An overlay of ecological layers, primarily 'ecozones' on a Master plan draft is provided below for sample. Elaborate road networks such as indicated in the map below are noted as elements that disallow long-term ecological resilience and are strongly discouraged.

Map 16: Ecological planning of CMC Chittoor Campus.

Map source: Master plan provided by STUP consultants to CMC Chittoor.

12 ECOLOGICAL DISRUPTORS AND RECOMMENDATIONS:

Impacts on biodiversity and habitats are likely to occur when caution is not exercised in certain regards. Currently known and expected ecological disruptors can be directly anthropogenic and sometimes indirectly anthropogenic driven. Some general project activities and mitigation are suggested to exercise caution which otherwise may result in adverse impacts. Ecological disruptors and recommendations are provided below.

12.1 POLLUTION:

There are currently no known direct impacts of pollution at the local level. However caution needs to be exercised through periodic monitoring. Particularly since at least 6 streams to River Ponnai start from CMC Chittoor campus. Some expected modes of pollution include

- Improper storage and disposal of hazardous/medical wastes
- Release of untreated hospital process effluents or residual sludge that have direct impact on biology of fauna.
- Discharge of domestic waste water and sewage.
- Presence of antibiotics, hormones and disinfectants is generally known to be present in aquatic environments around hospitals and can affect biodiversity.
- Usage of safe pest repellents or control measures are suggested due to high sensitivity in this regard on the immediate environment.
- Light pollution – occurring from increased usage of powerful lights, street lights and buildings particularly white light can have long-term impact on fauna particularly insect fauna.
- Monitoring and trials of insect friendly light be installed to reduce impact on fauna.

12.2 FOREST FIRE:

Forest fires evoke a series of contrasting responses. Some fear effects of fire to be negative simply because forest fires ''consumes'' nature. Traditionally, setting fire to grasslands has been a common practice to cause early sprouting of grass for cattle grazing. This is a globally wide spread phenomena. Since CMC Chittoor Campus falls in a dry landscape with grasslands, it is fire prone. Cattle herders and unintentional fires seem to compound the issue. This continues to have effects on the Chittoor CMC Campus due to external factors beyond the campus as the mega fire that occurred in April 2019.

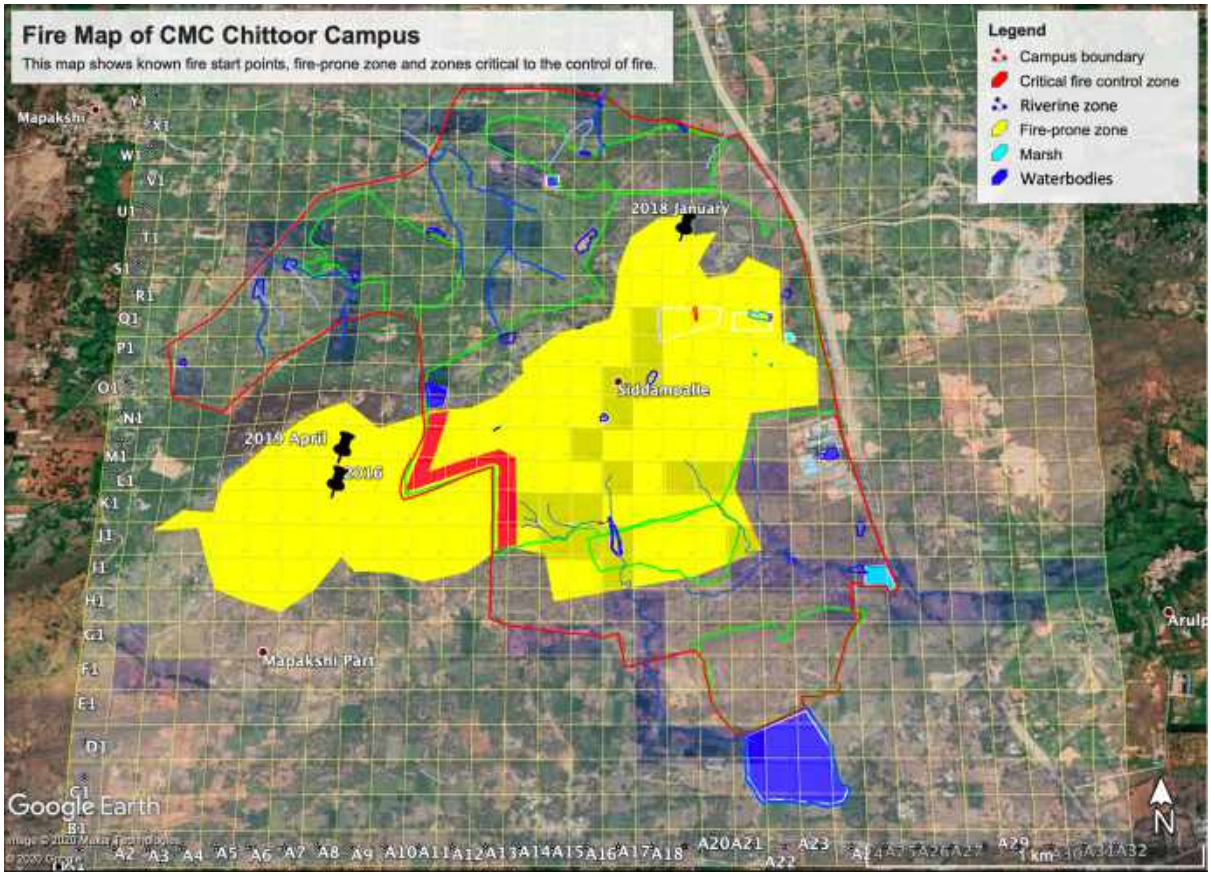
Ariel footage of Ramapuram campus showing the extent of forest fire

Fire generally has a range of effects. They include change in geochemical cycles having a role in global warming issues by causing disruptions in carbon dioxide, sulphur cycles, nitrogen cycles. Their effect on flora and fauna include change in tree demography by reducing sapling recruitment. They can also cause change in faunal diversity, faunal composition and habitat use. These effects however are complex. Studies also suggest that fires also help rejuvenate the landscape depending on the location and temporal and spatial factors.

In this section we investigate with a primarily ecological perspective of implications and roles of fires for the CMC Chittoor campus. In nature, wild fires are caused by lightening, rubbing of branches. However, currently it is feared that most are man-made fires. This raises concern over its ecological implications, human and non-human safety. Fire has major implications at the CMC Chittoor Campus since it is a fire-prone dry landscape that sees annual fires. Local anecdotal enquiry reveals that fire occurs annually with a large fire occurring once in seven years roughly. This is the average pattern that fire-prone landscapes reveal across the world.

Studies also suggest that high intensity fires result in high mortality of flora and fauna and has larger negative impact. Such high intensity fires can be caused as a result of large scale habitat modification for development including 'green' activities like tree planting are likely to intensify fires and reduce ecological resilience in the long run in this landscape. This is because habitat modification reduces landscape complexity by homogenising the structure and function of ecology locally. This influences habitat resilience and habitat heterogeneity which supports diverse flora and fauna during a fire. For instance, streams and ridges help stop fire and provide refuge to both flora and fauna. It can also be caused by controlling fires over extended period of time leading to high biomass that is combustible and fire prone. Similarly, tree planting can also act as additional fuel resulting in high fires with high intensity causing highest levels of damage to the fauna and flora and possibly human lives. Therefore tree planting can reduce resilience to fire and overall ecological resilience including making the campus more fire prone.

Solutions to fire management on campus are complex. There are no quick-fix and easy solutions. Primary solution lies in increasing vigilance and reducing fuel load. At CMC Chittoor campus, fires are predominantly caused by external anthropogenic factors, possibly cattle herders. Sources of fires are primarily two. They are external fires making their way into the campus through the Western boundary and fires started by cattle herders within the campus. Handling these two by sources are the best ways to control fires in a long-term manner.



Map 17: Fire map of CMC, Chittoor campus

Some guidelines are provided below towards effective

- Effective barricading to prevent intrusion of outsiders into the campus.
- Establishing fire watch towers at one or two most elevated points of the campus to increase vigilance.
- High vigilance at the critical fire control/cross over zone (see map) during high fire incidence months (March to early June).
- Effective clearing and removal of flammable fuel load at critical fire control/cross over zone using a backpack grass cutter. (See fire map).
- Effective ground patrolling, communication system along with and a small fire control station may be established for early response and alert.
- Annual community planning and preparatory meeting with members of staff, security and nature enthusiasts every October/November is advised.

- Annual review and identification of vulnerable zones in community planning and preparatory meeting and reduction of flammable biomass fuel by trimming of plants.
- Removal of dry leaves and litter along the roads running near the campus boundaries to reduce fuel load during drier months. Sweeping is an effective method.
- Invasive species and non-native species increase fuel load and need to be controlled periodically. Removal of invasive species also boosts native biodiversity and can supress flammability by increasing the diversity of species in the long-term.
- Use of heavy mechanised removal like JCB must be avoided in natural areas and eco-zones. Heavy mechanised removal can cause more damage leading to growth of more invasive or generalists thereby increasing fuel load. Alternatively, mechanised backpack cutter may be employed.
- Choice of shade trees close to buildings and roads should be done cautiously to ensure they are not fire prone or flammable species.
- Clearing of litter for a distance (6ft minimum) on either side or maintained as garden to help prevent entry of fire into building areas. Litter can be periodically used as vermicompost.
- Given the ecological and physical characters of the campus, solutions like firelines may not work and are subjective to application areas. It is therefore suggested that roads be used as effective 'firelines'.
- Presence of effective fire hydrant around buildings to ensure human safety.
- Intensive grazing is a method used to rejuvenate land and ground growth of flora and can be used as an alternate to using fire to rejuvenate the land.
- Fire retardants may not be used in natural areas except near buildings to control fire. Use of fire retardants may be detrimental to soil health, flora and fauna.
- Annual review of drills to control/ put off fire need to be conducted with a fire expert.

In conclusion, effective ground patrolling, communication system along with increased vigilance is the single biggest significant and impactful task in the solution towards the fire issue. Higher vigilance may be undertaken later in the fire-prone time of the year (late February to late May or June) since dry conditions can lead to high intense fires. Such late fires are also noted to be more intense fires and are not desirable. Structural heterogeneity of campus should not be compromised and considered as significant asset in long-term ecological resilience in the context of both fire incidence and in general. Landscape and habitat restoration practises like systematic removal of invasive and non-native species can go a long way in decreasing flammable fuel load during fire including its intensity. In this context, activities like tree plantation that reduce resilience are suggested to not be undertaken. Roughly 50% of unburnt area of natural vegetation within the campus at any given time is a good statistics to aim for in maintaining the ecological conditions and resilience of the campus. Cycles of roughly 5 years of no-fire events tend to provide better seedling recruitment and support fauna. This biodiversity is generally considered comparable to unburnt sites. CMC Chittoor campus may strive to keep a trend and timeline of a minimum of 5 years of no fire incidence towards better ecological resilience.

12.3 INVASIVE SPECIES (PART 1- FLORA):

At least 23 flora species are currently recognised as invasive among those occurring on campus. More are suspected to occur. Top invasive flora include *Chromolaena odorata*, *Lantana camara, Parthenium hysterophorus, Croton bonplandianum, Tridax procumbens. Chromolaena odorata* introduced from America as an ornamental plant is one of the worst weeds that affect the native biodiversity of the old world[36]. A small population on top of the hillock with water tank was observed during the survey. *Lantana camara* was another species seen in many parts of the campus. *Tridax procumbens*- another invasive was mostly abundant in and around the Main

[36] Mondal, J. and Ray, A.S. 2017. A review on biology of *Chromolaena odorata*. *International Journal of Bio-resource, Environment and Agriculture Sciences*, 3(1): 470 – 476.

building. *Marsilea* and *Typha* are mostly confined to the water bodies particularly in the Main building area and Main check dam. The status of these exotic species in the campus needs to be monitored at regular intervals. These species can have impact on both native biodiversity and humans. Pollen allergies is a case in point. Regular monitoring and systematic removal of these exotic species in the campus will keep their spread under control. Removal of these species may be placed at very high priority to ensure ecological resilience and human well-being on campus.

12.3.1 Table: ***Exotic species recorded from CMC, Chittoor campus***

Family	**Plant name**	**Nativity**	**Degrees of aggressiveness**
Agavaceae	*Agave cantala*	Tropical America	+
Agavaceae	*Furcraea foetida*	S. America	+
Amaranthaceae	*Gomphrena serrata*	Tropical America	++
Apocynaceae	*Catharanthus roseus*	Madagascar	++
Asparagaceae	*Sansevieria cylindrica*	Tropical Africa, Asia	+
Asteraceae	*Bridens biternata*	S. Africa	+
Asteraceae	*Chromolaena odorata*	Tropical America	+++
Asteraceae	*Parthenium hysterophorus*	Tropical America	+++
Asteraceae	*Tridax procumbens*	Tropical America	++
Bignoniaceae	*Tecoma stans*	North America	++
Cactaceae	*Opuntia dillenii*	Central America	++
Cleomaceae	*Cleome viscosa* L.	Tropical America	++
Convolvulaceae	*Evolvulus alsinoides*	S. America	+
Convolvulaceae	*Ipomoea carnea*	Tropical America	+++
Convolvulaceae	*Ipomoea obscura*	Malaysia, Australia	++
Euphorbiaceae	*Acalypha wilkesiana*	Fiji, S. Pacific Islands	+
Euphorbiaceae	*Croton bonplandianum*	Tropical America	+++
Euphorbiaceae	*Euphorbia hirta*	Tropical America	+
Euphorbiaceae	*Ricinus communis*	NE Africa	++
Euphorbiaceae	*Jatropha gossypifolia*	S. America	+
Fabaceae - Caesalpiniodeae	*Delonix regia*	Madagascar	++

Fabaceae - Caesalpiniodeae	*Peltophorum pterocarpum*	Tropical SE Asia	++
Fabaceae - Caesalpiniodeae	*Senna alexandrina*	Upper Egypt	++
Fabaceae - Faboideae	*Gliricidia sepium*	Mexico	+++
Fabaceae – Faboideae	*Stylosanthes scabra*	Caribbean, S. America	+
Fabaceae - Faboideae	*Stylosanthes hamata*	Caribbean, S. America	+
Fabaceae - Mimosoideae	*Prosopis juliflora*	Tropical America	+++
Fabaceae - Mimosoideae	*Samanea saman*	Central America	+
Hernandiaceae	*Gyrocarpus americanus*	Pantropical	++
Lamiaceae	*Lantana camara*	Tropical America	+++
Lamiaceae	*Stachytarpheta jamaicensis*	Tropical America	++
Marsileaceae	*Marsilea quadrifolia*	Europe	++
Nyctaginaceae	*Bougainvillea* sp.	S. America	++
Passifloraceae	*Passiflora foetida*	Tropical America	+++
Plantaginaceae	*Scoparia dulcis*	Tropical America	+
Poaceae	*Chloris barbata*	Tropical America	++
Portulacaceae	*Portulaca grandiflora*	Tropical America	+
Sapindaceae	*Dodonaea viscosa*	Tropical America	+++
Typhaceae	*Typha angustifolia*	Northern hemisphere	+++

+ - not aggressive, ++ - moderately aggressive, +++ - highly aggressive

12.3.2 Invasive species (Part II - fauna):

Many sensitive and habitat specialist species currently occur on the campus. However, high habitat modification and human interference can sometimes provide disproportionate support to some species causing their numbers to expand but cause ecological distress by affecting other species particularly habitat specialist species and cause ecological collapse in the long run. In some cases, such species can draw untoward interactions with humans. Such interactions and ecological distress can

often be irreversible. Among fauna, species of primary concern includes no wild species but cats and dogs.

Dogs and cats are a known threat to wildlife all around the world. A wide range of species across all taxa groups are known to be impacted by their presence. Cats specifically can have an impact on much wider spectrum of species by their presence and predation behaviours. On campus many species particularly cursorial and ground dwelling species across all taxa groups are highly prone to impact and predation by cats and dogs. It includes twelve of the fifteen currently known mammals occurring on campus. It also includes many birds like the Grey Francolin, Grey Jungle Fowl, Red Spurfowl, Barred-buttonquail, Yellow-legged buttonquail, Jungle Bush quail and aquatic birds among others. Predation by cats could also include other taxa groups like reptiles among many other taxa groups. It can also include nest raids causing a long term decline of biodiversity resulting in low breeding success. Cats are also known to hybridise with wild cat species causing loss of species.

The campus has over the years had a moving population of dogs. However, in recent times there is a small breeding resident population of dogs since the construction of buildings has started. Its population is estimated at 20-30 individuals. Population of cats is currently estimated at about 10 individuals.

In some cases, the ecosystem can act as an 'island' leading to disproportionate rise of some native species that show 'invasive' behaviours such as Spotted Deer, Wild Boar, Bonnet Macaques, Common Crow, Jungle Crow, Common Myna, rodents, mosquitoes among others. Such species can reduce ecological resilience. Populations of such species need to be monitored to ensure long-term ecological resilience.

Currently population of Spotted Deer on campus is estimated at 20-30 individuals. Largest herd noted till date was at about 7 individuals. Population of Wild Boar is estimated at about 30-50 individuals. Population of Bonnet Macaque is estimated at about 30 individuals. Largest troop was noted to have about 15 -20 individuals.

Current presence and population of all animals may be considered natural with the exception of Wild Boar, cats and dogs. Their populations particularly of cats and dogs are strictly associated with human presence, unnatural feeding and food resources from human-use areas. Therefore strict measures need to be undertaken to avoid feeding of cats and dogs.

Following recommendations are suggested to reduce their impact of all species of concern mentioned above.

- Dogs and cats be periodically removed by local municipality.
- In the absence of local municipality removing animals, animals be set up for adoption.
- In the event of inadequacy in the first two methods, annual vaccination, neuter and release may be followed. Vaccination maybe administered for rabies, canine distemper primarily and others based on locally driven outbreaks.
- No poisoning of animals should be undertaken to cull populations.
- No animals may be fed on campus by residents.
- Food waste and garbage maybe handled in an animal proof manner.

Mosquitoes and other insect control - The team conducted a qualitative study and noted the following. Over (72 bird species) 61 % of birds that occur on campus are insectivores. Large congregations of birds are noted every morning and evening keeping mosquitoes and insects in check. This is complemented by bats in the night. At least two colonies were detected during the survey. More colonies of insectivorous bats are likely occurring on campus. This is further complemented by 33 species of herpetofauna that are effective insect controllers. Our study also noted the effective role of odonates (dragonflies and damselflies) which were seen in healthy numbers across the campus in all waterbodies including temporary rock pools. The study had only one detection of mosquito larva presence during the two year study period. It was in a single overnight pool that lasted for less than 12 hours

suggesting the role of effective mosquito and insect control provided by fauna of the locality.

It is also to be noted that periodic spraying of mosquito repellent would affect more than 60% of species currently known from the campus. This would cause ecological cascade by death or migration of majority of the species present. If done, it can be ineffective since spraying is supposed to specifically target larva or young mosquitoes. Periodic spraying if practised would not only hurt the vibrant ecosystem on campus but also result in creation of a single dominant species that develops resistance and cannot be controlled easily.

Release of fishes must not be undertaken in ponds and streams to control mosquitoes. It was noted that previous release of such fishes included invasive species such as African Catfish which are invasive. Such fishes are likely to have long-term negative impact on the aquatic ecosystem both inside and outside the campus including the larger aquatic systems like River Ponnai.

Below are a few recommendations that might aid in combatting the issue.

- Systematic and curated choice of flora for gardening and shade. (some plants can attract mosquitoes or insects).
- Systematic curation and trimming of species chosen for gardening.
- Periodical check-up of stagnation of water on campus.
- Setting of mesh for all buildings.
- Watering plants may be undertaken only in the morning to avoid extended dampness that attract mosquitoes.

12.4 TREE PLANTING ON CAMPUS:

Tree planting can be beneficial and act as a step towards sustainability by means of reducing carbon footprint in many ways. However, if not done properly it can have impact on the local ecology and even act as a counterfeit measure towards

sustainability, climate change and biodiversity. It is therefore important to undertake the process in a systematic and scientific manner.

In this context, tree planting may not be undertaken as a 'green activity' on campus. Trees may be planted only along the National highway to reduce air pollution from the road. Trees may be planted around buildings and roads to reduce surface temperature of buildings and to encourage walking etc. Planting of trees in the campus underscores the complex existance of biodiversity. For example, over 50% of floral diversity are represented by herbs while only 20% are represented by trees. The diversity of herbs and other life forms are considered crucial to the biodiversity that currently exists. Therefore planting of trees can skew the ecological complexity leading to more ecological degradation. This only gets further compounded by planting of trees other than those already occurring on campus and considered native especially when planted in any of the eco-zones. This will lead to certain loss of biodiversity and ecological degradation due to the delicate nature of biodiversity in the area. Therefore tree planting should not be undertaken on campus otherwise. Undertaking tree planting while keeping in mind these temporal, spatial and ecological contexts will go a long way in long term ecological resilience of the campus.

Many of the species currently planted are likely to have negative effects on the environment. The effects of such species along with invasive species can be manifold including reduced ecological resilience, negative effects on biodiversity and undesirable effects to human residents. It is therefore important to systematically replace such species. Tree planting also has specific implications for the vast insect diversity and insectivores species currently known from the campus including the endemic flora and fauna. Therefore not undertaking tree planting exercises is crucial to CMC Chittoor Campus' Commitment to biodiversity, ecology and sustainability.

Based on current knowledge species suggested below may be planted. This list may be considered dynamic and subject to change. Species currently not occurring on campus may be given lower preference in planting.

12.4.1 Tree species suitable for planting

S. No.	Tree name	Nature & significance	Suitability
1.	*Adenanthera pavonina**	Fast growing, tall tree, with red seeds	Avenue, parking area
2.	*Alangium salvifolium*	Small deciduous tree with soft wood and pale white flower, attract birds and butterflies	Along the water bodies
3.	*Buchanania lanzan**	Medium-sized (about 8m) evergreen tree with dense foliage, wild mango	Parking area, garden, avenue
4.	*Butea monosperma*	Medium-sized deciduous species with orange flower, profuse branching	Avenue and Parking area
5.	*Cassia fistula*	Brevi-deciduous tree, with dense yellow flowers	Avenue
6.	*Cassine glauca*	Medium-sized evergreen species, with denticulate leaves and small pale flowers, flexible wood	Boundaries between the forest and building areas, parking
7.	*Cassine paniculata*	Medium-sized evergreen species, with denticulate leaves and small pale flowers, flexible wood	Boundaries between the forest and building areas, parking
8.	*Cycas circinalis**	Native species with aesthetic value	Gardens and centre of the lawn as trophy
9.	*Dalbergia lanceolaria*	Medium-sized deciduous tree, produce dense flower during February	Avenue, Gardens, Parking area
10.	*Dalbergia sisoo**	Medium-sized deciduous tree, produce dense flower during February	Avenue, Gardens, Parking area
11.	*Delonix alata**	Native yellow coloured flower, locally known as Vathanarayanan – leaves are excellent medicine for knee pain, fast growing	Avenue, Parking area, Farm area, Gardens
12.	*Diospyros chloroxylon**	Green ebony persimmon, slow growing evergreen tree, tolerant to drought	Avenue, field/forest border
13.	*Diospyros ebenum**	Ceylon ebony, slow growing evergreen tree, tolerant to drought, possess timber value	Avenue, parking, field/forest border

14.	*Drypetes sepiaria*	Indian boxwood, native small evergreen tree	Bio-fence, parking area
15.	*Gyrocarpus americanus*	Deciduous tree commonly known as helicopter tree, with white silvery bark, dense small flowers, fruits are dry winged, grow at 200 or 300 m elevation	fallow land
16.	*Hardiwickia binata**	Indian blackwood, medium-sized deciduous tree with drooping braches and camel foot shaped leaves, timber value	Avenue, field/ forest border, fallow land
17.	*Ixora parviflora**	Small native evergreen tree, with dense scented bloom.	Garden, as trophy (centre point of a lawn or garden) or hedge
18.	*Lepisanthes tetraphylla**	Small evergreen tree commonly known as torchwood or Poovanthi, moderate drought tolerant	Forest boundaries, fallow land
19.	*Limonia acidissima*	Wood apple, medium sized evergreen tree, fruit is edible	Farm/ forest boundary, fallow land
20.	*Madhuca longifolia**	Indian butter tree/ Illupai, moderate sized tree with dense foliage, flowers and fruits are preferred by bats, seeds are good oil source	Avenue
21.	*Manilkara hexandra**	Ceylon iron wood, moderate sized evergreen tree with dense dark green foliage, slow growing, drought tolerant	Forest boundary
22.	*Memecylon umbellatum**	Small native tree, with beautiful brush shaped blue flowers, drought tolerant	Hedge, Garden, fallow land
23.	*Mimusops elengi**	Medium sized evergreen tree with dense foliage and fragrant flowers, commonly known as bullet wood, provide good shade, timber value	Avenue, parking area
24.	*Mitragyna parviflora*	True Kandamba, Medium sized tree, with ball-like inflorescence, stem erect and branched, timber value	Forest boundary, parking, avenue
25.	*Morinda tinctoria*	Indian mulberry, small sized tree, with yellow wood, medicinally importance	Parking, avenue, forest boundary
26.	*Pterocarpus marsupium**	Bastard Teak/ Indian Kino, Medium size	Avenue

		deciduous tree with straight trunk and profuse branches, timber value	
27.	*Psydrax dicoccos*	Small sized evergreen tree, with dense canopy and small white flowers that attract many butterflies	Forest boundary, fallow land
28.	*Sapindus emarginatus*	Soap nut, small deciduous tree with profuse branches, fruits are medicinally important	Forest boundary, parking, fallow land
29.	*Strebles asper**	Commonly known as Siamese rough bush, small tree with rough leaf similar to the texture of sand paper.	Hedge, other alternatives are *Glycosmis*, *Suregada*, *Atalantia, Murraya*
30.	*Strychnos nux-vomica*	Small brevi-deciduous tree with dense foliage, stem straight and braches out terminally, seeds are highly poisonous, fruits are eaten by birds	Forest boundaries, fallow land
31.	*Wrightia tinctoria*	Medium sized tree with straight bark, when blooms it shed leaves, seeds boiled with coconut oil possess high anti-fungal property	Avenue, forest boundaries

***** Species not present in the campus

12.5 DESIGN, OPERATION, CONSTRUCTION AND DECOMMISIONING

The campus is noted to be highly diverse and abundant in biodiversity. Human interference in a landscape can often lead to severe decline of biodiversity and ecological degradation. At CMC Chittoor campus the dominance of insectivores species suggest the highly diverse and abundant insects currently present on campus. Globally there is currently a widespread decline known as the 'insect apocalypse'. In this context, CMC Chittoor campus has an opportunity to play an important role in the conservation of diverse insect species currently noted on campus and the various species that depend on them. Many recommendations have already been provided to the Master planning team. Some are provided below to place on record their importance and relevance on the campus.

In order to reduce impact on biodiversity the following may be undertaken.

- Landscape complexity is a key element that allows the landscape to support high diversity and unique species. Therefore, landscape modification be avoided as much as possible.
- Commissioning of construction needs to be done cautiously reducing footprint of ground area used. Temporary structures for construction may be placed strategically away from eco-zones and natural habitats in locations. Alternatively, they shall be placed where future permanent structures are planned.
- No alteration of terrain may be done in and around riverine areas.
- Demarcation of a core 'ecozone' that occurs as a large contiguous stretch. Since only large contiguous stretch are ecologically functional and viable. (see reference map)
- Effective maintenance of ecological corridors which have been identified by the study.
- Roads shall not bifurcate such ecozones since they reduce the efficiency of ecozones leading to road kills among many other negative effects.
- Since biodiversity on campus is leaning towards high insect diversity. It is suggested that major causes of insect declines be reviewed periodically.
- Light pollution (a major threat to insects) sources to be periodically reviewed on campus since the campus has high insect diversity and as 70% of species recorded were noted to be insectivores.
- Choice of colour of light be reviewed to avoid attraction by insects. Colours like yellow light tend to have low impact on insects and fauna.
- Glass-paned buildings in biodiverse areas can cause very high bird mortality and should be avoided.
- Glass windows when in use be opaque, and bird-friendly.

12.6 OTHER RECOMMENDATIONS:

- A long-term biodiversity system shall be considered, designed and put in place.
- CMC Chittoor campus shall participate in setting up an automated weather station in collaboration with state meteorological department for long-term monitoring.
- CMC Chittoor campus shall participate voluntarily in setting up automated air quality monitoring system in collaboration with state authorities or national monitoring agencies towards long-term monitoring and control.
- Monthly testing of water quality shall be undertaken and systematically logged.
- Bi-annual testing of soil and hospital campus for toxic chemical and bio-medical components shall be undertaken and systematically logged.
- An independent Environmental Committee shall be set up to ensure biodiversity and sustainability goals are met by action and implementation. It may work in tandem with the administrative department to ensure its goals are met.

13 CONCLUSION:

The CMC Chittoor campus (Ramapuram, Mapakshi) are highly biodiverse and host several flora and fauna. With further support and ecologically conscious decisions the campus is capable of doing better and maintain its ecological resilience and integrity. The structural complexity in terms of habitats, micro-habitats and weather provides unique niches for various species including the endemic and rare species. This structural complexity may be considered as a big asset. Biodiversity and populations are regarded currently as healthy. Invertebrate diversity is recognised to be very high and directly linked to presence of over 70% fauna that directly depend on them like insectivore birds, frogs, lizards among others. The presence of protected areas of varying categories located in and in the vicinity of the campus and connectivity to Eastern Ghats imply the role of CMC Chittoor campus as a part of larger corridor for various species of fauna. This has to be maintained for the campus' long term ecological resilience. Habitat modification in any form may be perceived as a big destabiliser of long-term biodiversity resilience. It includes the choice of species to be used in landscaping and gardening. Any tree planting practises be strictly restricted to areas of human intervened areas like around buildings and along roads with direct benefits to its human residents. Treeplanting/afforestation has strong negative implications to herbs, grasses and insect diversity and therefore shall not be undertaken in any other parts of the campus, particularly eco-zones. Intervention is advised to be kept to the minimum. It is imperative that conservation measures adhered by CMC integrate measures based on the findings of the study for better ecological resilience. In order to ensure action and implementation on the ground an independent Environmental Committee may be set up and convened on a monthly basis to ensure goals are met. It may work in tandem with the administrative department of CMC. Such a combination of ecological planning and on ground implementation may benefit CMC and help benefit and retain long-term ecosystem resilience and benefit most from natural ecosystem functioning and services in the years to come.

CHECKLIST OF FLORA - CMC, CHITTOOR CAMPUS (FULL VERSION)

[1] **Life forms:** Climber – Cl, Herb – H, Hydrophyte – Hy, Liana – L, Parasite – P, Shrub – S, Tree – Tr; **Habitat**: Avenue – Ave; Dry rocky area – DRA, Fallow agricultural land – FAL, Garden – Gard, Grassland – Gr, Grove – Gr, Riparian – Rip, Scrub jungle – SJ, Tropical dry evergreen forest – TDEF, Marsh – Mar; **Nativity status**: Endemic – E, Exotic cultivated – EC, Exotic invasive – EI, Native – N; **Rarity status**: Common – C, Uncommon – UC, Rare – R

S.No.	Common/ Local Name	Family and Plant Name	Ramap	Mapak	Life forms	Habitat	Nativity status	Native range & Distribution	Rarity Status	Remarks
		ACANTHACEAE								
1	Peria nangai	*Andrographis alata* (Vahl.) Nees.		*	H	SJ	E	India, Sri Lanka	UC	under the thickets of tropical dry evergreen forest
2.	Nilavembu	*Andrographis paniculata* Wall.	*	*	H	TDEF	N	Tropical Asia	UC	in the shade places of scrub jungle
3.	Round-leaf kariyat	*Andrographis serpyllifolia* (Vahl.) Wight	*	*	H	Gr	E	Peninsular India	UC	On dry ground along with grasses
4.	Chinese violet	*Asystasia gangetica* (L.) T. Anders.	*	*	S	TDEF	N	Old world tropics	UC	in the shade places of scrub jungle
5.	Mullu kankambaram	*Barleria prionitis* L.		*	S	SJ	N	India, SE Asia, E Africa	UC	dense forest near water bodies
6.	Narrow-leaf Blepharis	*Blepharis integrifolia* (L.fil.) E. Mey. & Drege		*	H	TDEF	N	India, Sri Lanka	UC	On the open ground along with grasses
7.	Kooravaal chedi	*Blepharis maderaspatensis* (L.) B. Heyne ex Roth		*	H	TDEF	N	Tropical Africa, India	C	in the shade places of TDEF
8.	Bell weed	*Dipteracanthus prostratus* (Poir.) Nees.		*	S	SJ	N	India, Africa, Sri Lanka, Pakistan	UC	in the degraded areas and waste lands
9.	Pumbikatamb am	*Elytraria acaulis* (L. Fil.) Lind.	*	*	H	SJ	N	Tropical Africa, India	UC	moist habitat near the lake

S.No.	Common/ Local Name	Family and Plant Name	Ramap	Mapak	Life forms	Habitat	Nativity status	Native range & Distribution	Rarity Status	Remarks
10.	Neermulli	*Hygrophila auriculata* (Schumach.) Heine		*	Hy	Mar	N	Tropical Asia, Africa	C	in marsh land and water bodies, agricultural fields
11.	Prostrate Justicia	*Justicia prostrata* (Roxb. ex C. B. Clarke) Gamble	*	*	H	TDEF	N	Peninsular India, Sri Lanka	C	prostrate herb, pollinated by small butterflies and bees
12.	Long-leaf Justicia	*Justicia vahlii* Roth.	*		H	Gr	E	Peninsular India, Sri Lanka	C	exposed areas of grassland
13.	Karappan pundu	*Lepidagathis cristata* Willd.	*	*	H	Gr	N	India	C	prostrate herb with pale pink bell-shaped flowers in the grassland
14.	Panicled foldwing	*Peristrophebicalyculata* (Retz.) Nees		*	H	SJ	N	Tropical Africa, India, Burma, Thailand	UC	moist area
		AGAVACEAE								
15.	American aloe	*Agave cantala* (Haw.) Roxb. ex Salm-Dyck		*	S	SJ	EC	Tropical America	UC	in the degraded areas and waste lands
16.	Mauritius hemp	*Furcraea foetida* (L.) Haw.		*	S	TDEF	EC	S America, Malaysia, Thailand	C	on the open areas and waste lands
		ALANGIACEAE								
17.	Alinjil, Urgu	*Alangium salvifolium* (L.f.) Wang.		*	Tr	TDEF	N	Peninsular India	UC	Evergreen species, on the hillocks and along the water bodies

S.No.	Common/ Local Name	Family and Plant Name	Ramap	Mapak	Life forms	Habitat	Nativity status	Native range & Distribution	Rarity Status	Remarks
		AMARANTHACEAE								
18.	Nayuruvi	*Achyranthes aspera* L.		*	H	SJ	N	Pantropical	C	medicinal herb with spike inflorescence, dried fruits will stick on to the animals
19.	Kumattikeerai	*Allmania nodiflora* (L.) R. Br. ex Wight	*		H	SJ	N	India	UC	moist areas on the grassland behind the main lake
20.	Silver Cockscomb	*Celosia argentia* L.	*		S	FAL	EC	Africa	C	in the fallow agricultural fields as weed
21.	Prostrate Gomphrena	*Gomphrena serrata* L.		*	H	FAL	EI	Tropical America	UC	near water tank
		AMARYLLIDACEAE								
22.	Kattuvengaya m	*Pancratium triflorum* Roxb.	*		H	Gr	N	India, Sri Lanka	R	dry grass lands
		ANACARDIACEAE								
23.	Maamaram	*Mangifera indica* L.	*	*	Tr	Grov	N	SE Asia	C	planted in the southern end of main campus and south campus
		APOCYNACEAE								
24.	Thathamudi, Erukkam chedi	*Calotropis gigantea* (L.) W.T. Aiton	*	*	S	FAL	N	Palaeotropics	C	Open fallow land and road sides
25.	Kallimulayan, Muyal kombu	*Caralluma adscendens* var. *attenuata* (Wight) Grav. & Mayur.		*	H	SJ	E	Peninsular India	R	Endemic to Eastern Ghats especially AP
26.	Sirukila	*Carrisa spinarum* L.	*		L	SJ	N	Africa, southern Asia, Australia	R	Evergreen species, behind the hospital buildings

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27.	Sudukattu Malli	*Catharanthus roseus* (L.) G. Don.	*	*	H	FAL	EI	Madagascar	C	as ornamentals around hospital blocks
28.	Leafless Goglet flower	*Ceropegia juncea* Roxb.	*	*	L	SJ	N	Peninsular India, Sri Lanka	R	Evergreen species, in forest behind the hospital buildings
29.	Large-flowered Cryptolepis	*Cryptolepis grandiflora* Wight	*	*	L	TDEF	E	Peninsular India, Andaman	UC	Evergreen species, on areas behind main hospital blocks
30.	Kodikalli/ Soman	*Cynanchum acidum* (Roxb.) Oken		*	L	SJ	N	India	UC	Evergreen species, in the forests behind the hospital buildings
31.	Sarkarai kolli	*Gymnema sylvestre* (Retz) R. Br. ex Sm.		*	L	SJ	N	Palaeotropics	R	Evergreen species, for diabetes, malaria and snake bites
32.	Nannaari	*Hemidesmus indicus* (L.) R. Br. ex Schult.	*	*	Cl	SJ	N	India	C	forest behind the hospital buildings
33.	ankaravalli, siruanthankodi	*Secamone emetica* (Retz.) R. Br. ex Schult.	*	*	L	TDEF	N	Peninsular India, Sri Lanka	UC	Evergreen species, on the dry forest of the rocky hillocks
34.	Naaipalai	*Tylophora indica* (Burm.f.) Merr.		*	L	SJ	N	India	R	rare in the rocky and exposed areas of scrub jungle
35.	Kodippalai	*Wattakaka volubilis* (L.f.) Stapf.		*	Cl	SJ	N	Indo-Malesia, China	UC	forest behind the hospital buildings
36.	Paalai	*Wrightia tinctoria* R. Br.		*	Tr	TDEF	N	India, SE Asia, Australia	UC	Deciduous species, on the hillocks and plains
		ARECACEAE								
37.	Panaimaram	*Borassus flabellifer* L.	*	*	Tr	FAL	N	India, SE Asia, Australia	C	Evergreen species, in the open fields around hospital

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38.	SitTrchumaram	*Phoenix loureiroi* Kunth		*	Tr	TDEF	N	India	UC	Evergreen species, on the slopes of the Hillocks
		ARISTOLOCHIACEAE								
39.	Indian Birthwort	*Aristolochia indica* L.	*		Cl	TDEF	N	Peninsular India, Sri Lanka	UC	forest behind the hospital buildings
		ASPARAGACEAE								
40.	Neervittan kizhangu	*Asparagus racemosus* Willd.	*	*	L	TDEF	N	Palaeotropics	UC	Deciduous species in dry evergreen forests
41.	Narivengayam	*Ledebouria revoluta* (L.f.) Jessop.	*	*	H	SJ	N	Peninsular India, Sri Lanka	R	under the thickets of tropical dry evergreen forest
42.	Spear Sansevieria	*Sansevieria cylindrica* Bojer ex Hook.		*	H	TDEF	EC	Tropical Africa & Asia	UC	under the thickets of tropical dry evergreen forest
43.	Marul	*Sansevieria roxburghiana* Schult. & Schult. f.		*	H	TDEF	N	India, Sri Lanka	UC	under the thickets of tropical dry evergreen forest
		ASTERACEAE								
44.		*Blumea axillaris* (Lam.) DC.	*	*	H	SJ	N	Indo-Malesia to Australia, Africa	UC	open forests and moist area – Mapakshi
45.	Snehapullu	*Bridens biternata* (Lour.) Merr. & Sherff.	*		H	Gr	EI	S. Africa	UC	on the dry habitat
46.	Siam weed	*Chromolaena odorata* (L.) R.M. King & H. Rob.	*		S	SJ	EI	Tropical America	C	Behind the hospital buildings
47.	Little Ironweed, Poovangurunthal	*Cyanthillium cinereum* (L.) H. Rob.	*		H	Gr	N	Tropical Asia, Tropical Africa	C	on the grasslands

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48.	Tassel flower	*Emilia sonchifolia* (L.) DC. ex DC.		*	H	Gr	N	India, SE Asia, Malesia	UC	Open forest and moist area
49.	Narrow-leaf Epaltes	*Epaltes divaricata* (L.) Cass.		*	H	Mar	N	SE Asia	UC	Open forest and moist area
50.	Parapalanum	*Glossocardia bosvallia* (L.f.) DC.		*	H	SJ	N	India to Myanmar, Sahara, E. Indies	UC	Occasional in the dry areas of waste land, medicinal
51.	Santa Maria feverfew	*Parthenium hysterophorus* L.	*	*	H	FAL	EI	Tropical America	C	along the roadsides
52.	Jimikipoo	*Pentanema indicum* (L.) Ling	*	*	H	Gr	N	India, China, Thailand, W Africa	C	Open areas, behind the hospital buildings
53.	Tridax daisy	*Tridax procumbens* L.	*	*	H	FAL	EI	Tropical America	C	open areas, waste land and road sides
54.	Chinese Wedelia	*Wedelia chinensis* (Osbeck) Merr.	*		H	Gard	N	Tropical Asia	C	in the flower beds along the hedges in main building
		BIGNONIACEAE								
55.	Kadalatti, Kattuvarucham	*Dolichandrone falcata* (Wall. ex DC.) Seem.	*		Tr	TDEF	E	India	UC	On the hillock
56.	Yellow bell	*Tecoma stans* (L.) Juss. ex Kunth.	*		Tr	Gard	EC	N America	C	in the main hospital blocks
		BORAGINACEAE								
57.	Cherruppadai	*Coldenia procumbens* L.		*	H	Mar	N	Tropical Africa, Asia	C	Edges of the water bodies and fallow lands

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58.	Kurangu vethilai	*Ehretia microphylla* Lam.	*	*	Tr	SJ	N	Malesia, China, India, Philippines	UC	Evergreen species in the dry evergreen forests around the hospital
59.	Bristly heliotrope	*Heliotropium strigosum* Willd.	*		H	Gr	N	India, Pakistan, China	UC	occasionally found on the exposed areas of grassland
60.	Kalli Thumbai	*Trichodesma indicum* (L.) R. Br.	*		H	FAL	N	SE Asia	C	found in the dry waste lands and open area, behind the hospital block
		CACTACEAE								
61.	Naga-dali	*Opuntia dillenii* (Ker Gawl.) Haw.	*	*	S	SJ	EC	Central America	UC	hillock behind the hospital buildings
		CAPPARACEAE								
62.	Indian Cadaba	*Cadaba fruticosa* (L.) Druce	*		L	SJ	N	Indo-China, Pakistan, Sri Lanka	R	Brevi-deciduous species, near the lake area
63.	Athondai	*Capparis zeylanica* L.	*		L	SJ	N	India, China, Malaysia	C	Evergreen species, on the way to the water tank behind the hospital block
64.	Emmullu	*Maerua oblongifolia* (Forssk.) A. Rich.		*	L	SJ	N	Tropical Africa, India	UC	scrub jungle around the dam area and the hillocks
		CARYOPHYLLACEAE								
65.	Pallipundu	*Polycarpaea corymbosa* (L.) Lam.	*	*	H	Gr	N	Pantropical	R	in plains, grasslands, laterite hillocks and moist area

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		CELASTRACEAE								
66.	Kannera maram	*Cassine glauca* (Rottb.) Kuntz.	*		Tr	TDEF	N	India	R	Evergreen species, south forest on the rocky patch
67.	Kanneer maram	*Cassine paniculata* (Wight & Arn.) Lobreau-Callen		*	Tr	TDEF	N	India, Sri Lanka	R	Evergreen species, found in the forest areas behind the dam
		CLEOMACEAE								
68.		*Cleome tenella* L.f.		*	H	SJ	N	Tropical Africa, Madagascar, India	R	rare in the rocky and exposed areas of scrub jungle
69.	Asian spider flower/ Naikadugu	*Cleome viscosa* L.	*	*	H	FAL	EI	Tropical America, Africa, Asia	C	Behind the hospital buildings
		COLCHICACEAE								
70.	Kalapai or Kanneer kizhangu	*Gloriosa superba* L.		*	Cl	SJ	N	Palaeotropics	R	under the thickets of tropical dry evergreen forest
71.	Indian grass lily	*Iphigenia indica* (L.) A. Gary ex Kunth	*		H	Gr	N	India	UC	on the grasslands near south forest
		COMMELINACEAE								
72.	Vazhukai pul	*Cyanotis axillaris* (L.) D. Don ex Sweet		*	H	Gr	N	India, Thailand	UC	moist areas of tropical dry evergreen forest
73.	Shayadri-Dew grass	*Cyanotis tuberosa* (Roxb.) Schult. & Schult. f.	*	*	H	Gr	E	Peninsular India	R	dry grass lands

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		CONVOLVULACEAE								
74.	Vishnukranthi	*Evolvulus alsinoides* (L.) L.	*	*	H	SJ	EI	S. America	C	on the open lands
75.	Bush morning glory	*Ipomoea carnea* Jacq.		*	S	Mar	EI	Tropical America	C	around the water bodies
76.	Chirutali	*Ipomoea obscura* (L.) Ker Gawl.	*		Cl	SJ	EI	Malaysia, Australia	UC	straggling on the Trees
77.	Onan kodi	*Ipomoea staphylina* Roem. & Schult.	*		L	TDEF	N	India, Sri Lanka, China	C	Deciduous species, straggling on the Trees
78.	Auvaiyar kundal	*Merremia tridentata* (L.) Hallier f.	*	*	H	SJ	N	Tropical Africa, Asia	UC	On dry ground along with grasses
		CUCURBITACEAE								
79.	Kovai kai	*Coccinia grandis* (L.) J. Voigt.	*	*	L	SJ	N	Asia, Africa, Pacific Islands	UC	Deciduous species of medicinal importance occur in scrub jungle
80.	Mumusukai	*Mukia maderaspatana* (L.) M. Roem.		*	Cl	SJ	N	Indomalaya	UC	under the thickets of tropical dry evergreen forest
		CYPERACEAE								
81.		*Carex sp.*	*	*	H	Mar	N		UC	around the water bodies
82.		*Fimbristylis argentea* (Rott.) Vahl.	*		H	Mar	N	SE Asia	R	on the rocky habitat
83.	One-spike fimbry	*Fimbristylis ovata* (Burm.f.) J. Kern	*	*	H	Mar	N	Pantropical	C	moist areas, wet grasslands and edges of the water bodies
84.	Velthaneer pasi	*Kyllinga nemoralis* (Forst.) Dandy ex Hutch. & Dalz.		*	H	SJ	N	Cosmopolitan	C	Along the streams and moist habitat
85.		*Schoenoplectiella articulata* (L.) Lye	*	*	H	Mar	N	India, Sri Lanka, Africa	C	marshy and wet areas near the school and dam

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		ERIOCAULACEAE								
86.	Five-angled pipewort	*Eriocaulon quinquangulare* L.	*	*	H	Mar	N	S Asia	C	small herb with white button-like inflorescence on long stalk around water bodies
		EUPHORBIACEAE								
87.	Copper-leaf	*Acalypha wilkesiana* J.J. Sm.	*		S	Gard	EC	Fiji, S Pacific Islands	C	around the main blocks
88.	Rail Poondu	*Croton bonplandianum* Bail.		*	H	FAL	EI	Tropical America	C	fallow agricultural fields
89.	Kalvirai, Vellilumbu, Aadumilukan	*Drypetes sepiaria* (Wight & Arn.) Pax & K. Hoffm	*	*	Tr	TDEF	N	India, Sri Lanka	R	Evergreen species used in folk medicine for inflammation and pain
90.		*Euphorbia deccanensis* var. *nallamalayana* (J. L. Ellis) V. S. Raju	*		H	DRA	E	Eastern Ghats	R	Endemic to Eastern Ghats especially AP
91.	Amman pacharici	*Euphorbia hirta* L.	*	*	H	SJ	EI	Tropical America	C	dry open land
92.	Chinna amman pacharisi	*Euphorbia indica* Lam.	*		H	TDEF	N	S. Iran to S. China, Indo-china	UC	near the water tank on the hillock
93.	Siria amanakku	*Jatropha gossypifolia* L.	*	*	S	FAL	EC	S. America	C	Near Mapakshi and South campus
94.	Amanakku	*Ricinus communis* L.	*	*	S	FAL	EC	NE Africa, naturalises in tropics	C	Behind the hospital buildings
95.	Kanjchori/Po	*Tragia involucrata* L.	*	*	Cl	SJ	N	India, Sri Lanka	UC	on the hillocks

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	onai kanjaan									
		FABACEAE – CAESALPINIOIDEAE								
96.	Sarakonrai	*Cassia fistula* L.	*	*	Tr	SJ	N	Tropical Asia	UC	Deciduous species on the hillocks and plains
97.	Javan cassia	*Cassia javanica* L.	*	*	Tr	Gr	N	SE Asia	UC	Near the Mapakshi area
98.	Gulmohar	*Delonix regia* (Bojer ex Hook.f.) Raf.	*		Tr	Ave	EC	Madagascar	C	along the roadsides of the hospital blocks
99.	Copper-pod tree	*Peltophorum pterocarpum* (DC.) Baker ex K. Heyne	*		Tr	Ave	EC	Indo-china to N Australia	C	along the roadsides of the hospital blocks
100.	Karu indu	*Pterolobium hexapetalum* (Roth) Santapau & Wagh	*	*	L	SJ	N	Peninsular India	UC	Brevi-deciduous species with prickles occur near check dam area
101.	Nelavakai	*Senna alexandrina* Mill.		*	S	SJ	EC	N America	UC	On the slopes of the Hillocks
102.	Avarambu	*Senna auriculata* (L.) Roxb.	*	*	S	TDEF	N	India, Sri Lanka, Myanmar	C	Deciduous species occur in the open scrub
		FABACEAE – FABOIDEAE								
103.	Indian joint vetch	*Aeschynomene indica* L.		*	H	FAL	N	Old world tropics	UC	Open fields and cultivation area
104.	Kacukodi	*Alysicarpus monilifer* DC.		*	H	SJ	N	India, Pakistan, Ethiopia	C	grows on the moist areas of dry evergreen forests
105.	Aathi	*Bauhinia racemosa* Lam.		*	Tr	TDEF	N	India, Sri Lanka	UC	Deciduous species, in dry evergreen forest on the hillocks
106.	Porasu	*Butea monosperma* (Lam.) Taub.	*		Tr	TDEF	N	India	R	Deciduous species, on the way to southern end of the campus

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107.	Showy pigeonpea	*Cajanus scarabaeoides* (L.) DC.		*	Cl	SJ	N	Tropical Asia	R	wild relative of pigeon pea, found on the rocky areas of the hillocks
108.	Velangu, East Indian Rose wood	*Dalbergia lanceolaria* L.f.		*	Tr	TDEF	N	India, Nepal, Myanmar, Sri Lanka	R	Brevi-deciduous species, on the western side of the hillocks in the thickets
109.	Sirupulladi	*Desmodium triflorum* (L.) DC.	*	*	H	SJ	N	Indo-Malesia, Australia	C	small prostrate herb with trifoliate leaves and small purplish flowers in open scrub
110.	Slender-flowered milkpea	*Galactia tenuiflora* (Klein ex Willd.) Wight & Arn.	*	*	Cl	SJ	N	SE Asia, Australia, Africa	UC	forest behind the hospital buildings
111.	Mexican lilac	*Gliricidia sepium* (Jacq.) Walp.		*	Tr	FAL	EC	Mexico, pantropical	C	near the school area at Mapakshi, highly invasive
112.	Narrow-leaf indigo	*Indigofera linifolia* (L.f.) Retz.	*	*	H	SJ	N	India	C	pasture land in scrub jungle
113.	Seppukurinji	*Indigofera linnaei* Ali	*	*	H	SJ	N	India, Sri Lanka, Thailand, Australia	C	pasture land in scrub jungle
114.	Neelam	*Indigofera tinctoria* L.	*	*	S	SJ	N	India	UC	in plains and open grasslands, cultivated in many countries
115.	Pungai maram	*Pongamia pinnata* (L.) Pierre	*	*	Tr	TDEF	N	Malesia, India	C	Brevi-deciduous species planted around the main blocks
116.	Moovilai	*Pseudarthria viscida* (L.) Wight & Arn.		*	H	SJ	N	Peninsular India, Sri Lanka	UC	shade preferring species in dry evergreen forest

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117.	Grey snoutbean	*Rhynchosia cana* DC.	*	*	S	SJ	N	Peninsular India, Sri Lanka	UC	Dry forests
118.	Kattukollu	*Rhynchosia capitata* (Roth.) DC.	*	*	H	SJ	N	India, Sri Lanka	UC	hillock behind the hospital buildings
119.	Caribbean stylo	*Stylosanthes hamata* (L.) Taub.		*	H	FAL	EI	Neotropics	C	common in the wastelands and forest fringes
120.	Shrubby stylo	*Stylosanthes scabra* Vogel	*	*	H	FAL	EI	Neotropics	C	common in the wastelands and forest fringes
121.	Kavali	*Tephrosia purpurea* (L.) Pers.	*	*	H	SJ	N	Indomalaya	C	near the check dam and around the lake
		FABACEAE – MIMOSOIDEAE								
122.	Babul	*Acacia nilotica* (L.) Delile		*	Tr	SJ	N	Tropical Africa, Asia, Australia, America	UC	Behind the hospital buildings
123.	Usil/ Arrapu/ Karuvagai	*Albizia amara* (Roxb.) B. Bovin	*	*	Tr	TDEF	N	India, Sri Lanka, E Africa	UC	Deciduous species, on the hillocks
124.	Vagai	*Albizialebbeck* (L.) Benth.	*	*	Tr	TDEF	N	India, Tropical Africa, Asia, Myanmar	UC	Brevi-deciduous species, on the hillocks and plains
125.	Vedathalam	*Dichrostachys cinerea* (L.) Wight & Arn.	*	*	Tr	TDEF	N	Africa, India, Australia	C	Deciduous species, near the hillocks behind hospital blocks
126.	Velikathan	*Prosopis juliflora* (Sw.) DC.		*	Tr	FAL	EC	Tropical America	UC	Deciduous species in fallow agricultural fields

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127.	Thoongumoonji maram, Rain Tr	*Samanea saman* (Jacq.) Merr.		*	Tr	Ave	EC	Central America	UC	Brevi-deciduous species, growing in school premises, Mapakshi
		FLACOURTIACEAE								
128.	Cottaikala	*Flacourtia indica* (Bum. f.) Merr.		*	Tr	SJ	N	Palaeotropics	UC	tropical dry evergreen forest
		GENTIANACEAE								
129.	Stalkless canscora	*Canscora heteroclita* (L.) Gilg		*	H	Mar	N	Peninsular India, Sri Lanka	C	in moist places especially along the stream and water bodies
130.	Vellarugu, Arukumuli	*Enicostema axillare* (Lam.) Raynal.		*	H	SJ	N	Tropical Africa, India, Sri Lanka, W. Indies	R	in moist places especially along the stream and water bodies
		HERNANDIACEAE								
131.	Kathadi kai, vellai Tanakku	*Gyrocarpus americanus* Jacq.		*	Tr	TDEF	EC	Pantropical	R	on the hillocks
		HYDROCHARITACEAE								
132.	Neerkuliri	*Ottelia alismoides* (L.) Pers.		*	Hy	Aquatic	N	India, SE. Asia, N. Australia	UC	in water bodies
		HYPOXIDACEAE								
133.	Nila panai	*Curculigo orchioides* Gaertn.	*	*	H	TDEF	N	SE Asia	UC	on the forest floor of dry evergreen forest
		LAMIACEAE								
134.	Thick-leaf lavender	*Anisochilus carnosus* (L.f.) Wall.		*	H	DRA	N	Peninsular India, Sri Lanka, Myanmar	R	On Rocky hills

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135.	Karithumbai	*Anisomeles indica* (L.) Kuntze.	*	*	H	FAL	N	Tropical & Subtropical Asia	C	along the path sides
136.	Peymarutti	*Anisomeles malabarica* (L.) R. Br. ex Sims.	*	*	H	DRA	N	Indo-Malesia to Australia	C	around the hospital buildings
137.	Kumizh	*Gmelina asiatica* L.		*	Tr	TDEF	N	Indo-Malesia	C	Deciduous species in the forest behind hospital buildings
138.	Common lantana, Unni chedi	*Lantana camara* L.	*	*	S	FAL	EI	Tropical America	C	Everywhere in the campus
139.	Thumbai	*Leucas aspera* (Willd.) Link	*	*	H	FAL	N	India, Sri Lanka	C	on the open land and near the hillocks
140.	Chinese leucas	*Leucas chinensis* (Retz.) Sm.		*	H	SJ	N	India, China	R	in the scrubs over the hillock
141.	Long-leaf leucas	*Leucas longifolia* Benth.		*	H	DRA	E	Peninsular India	R	On Rocky hills
142.	Naai Thulasi	*Ocimum americanum* L.	*	*	S	SJ	N	Palaeotropics	UC	in plains and open lands
143.		*Orthosiphon* sp		*	H	SJ	N		R	on the fringes of scrub jungle
144.	Seemai nayuruvi	*Stachytarpheta jamaicensis* (L.) Vahl.	*	*	H	FAL	EI	Tropical America	UC	along the streams
		LAURACEAE								
145.	Pasukotra, Akasavalli	*Cassytha filiformis* L.		*	P	SJ	N	Pantropical	UC	On the trees and shrubs as obligate parasite
		LINDERNIACEAE								
146.	Lindernia	*Lindernia* sp.	*	*	H	Mar	N		C	Common around the moist habitat and water bodies

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		LOGANIACEAE								
147.	Kanjaram, Yetti	*Strychnos nux-vomica* L.		*	Tr	TDEF	N	Indo-Malesia	UC	deciduous tree, occasionally found in the dry forest, used in traditional medicine
		LORANTHACEAE								
148.	Honey suckle mistletoe	*Dendrophthoe falcata* (L.f.) Ettingsh.	*	*	P	TDEF	N	India, extended to Australia	UC	partial parasite naturalised in southern India
		LYTHERACEAE								
149.	Dense-flowered rotala	*Rotala densiflora* (Roth ex Roem. & Schult.) Koehne		*	H	DRA	N	Indomalaya to Australia	UC	along the water streams and moist habitats
		MALVACEAE								
150.		*Grewia orientalis* L.		*	L	TDEF	N	Indomalaya, tropical Africa	C	Brevi-deciduous species, occur in the dry evergreen forest
151.	Tiny-flower hibiscus	*Hibiscus micranthus* L. f.	*	*	H	SJ	N	Africa to Arabian Peninsula, S. Asia	UC	on the rocky hillocks and forest fringes
152.	Pinnaku keerai	*Melochia corchorifolia* L.	*	*	H	Mar	N	Tropical & Subtropical Asia	C	around the water bodies
153.	Peramutti	*Pavonia odorata* Willd.	*	*	H	SJ	N	Palaeotropics	C	fringes and open areas of scrub forest
154.	Palambasi	*Sida acuta* Burm.f.		*	H	SJ	N	Pantropical	C	Fallow land and open areas
155.	Kurunthotti	*Sida cordata* (Burm. f.) Bross. Waalk.		*	H	SJ	N	Pantropical	C	slender prostrate herb, found in fallow land and open forest areas
156.	Arivalmukan,	*Sida cordifolia* L.	*	*	H	SJ	N	Tropical &	C	open forest and waste land

S.No.	Common/ Local Name	Family and Plant Name	Ramap	Mapak	Life forms	Habitat	Nativity status	Native range & Distribution	Rarity Status	Remarks
	kurunthotti							Subtropical Asia, Australia		around the hospital
157.	Sengalipoondu	*Waltheria indica* L.	*	*	H	SJ	N	India	C	on the dry forest and fallow lands
		MARSILEACEAE								
158.	Four-leaved clover	*Marsilea quadrifolia* L.	*	*	Hy	Mar	EI	Europe, much naturalised	UC	marshy and wet areas near the school and dam
		MELIACEAE								
159.	Vembu	*Azadirachta indica* A. Juss.	*	*	Tr	FAL	N	India	C	Brevi-deciduous species, around the hospital buildings
		MENISPERMACEAE								
160.	Kattu kodi	*Cocculus hirsutus* (L.) Diels	*	*	L	SJ	N	India, Pakistan, Tropical Africa	UC	scrub jungle around the dam area and the hillocks
161.	Kattukodi	*Pachygone ovata* (Poir.) Diels	*		L	TDEF	N	Peninsular India to Australia	UC	Deciduous species, on the rocky hillocks and dry forests
		MOLLUGINACEAE								
162.	Thurampoondu	*Glinus oppositifolius* (L.) Aug. DC.	*	*	H	Mar	N	Asia, Africa	C	in the dried lake and water bodies
163.	Seeragapoondu, Thurapoondu	*Trigastrotheca pentaphylla* (L.) Thulin		*	H	SJ	N	Peninsular India, Sri Lanka	C	along the streams and open areas of the forest
		MORACEAE								
164.	Aalamaram	*Ficus benghalensis* L.	*	*	Tr	TDEF	N	SE Asia	UC	Brevi-deciduous species, near the wells and old buildings
165.	Peyathi	*Ficus hispida* L. f.	*		Tr	TDEF	N	SE Asia, Australia	UC	Evergreen species, in the forest

S.No.	Common/ Local Name	Family and Plant Name	Ramap	Mapak	Life forms	Habitat	Nativity status	Native range & Distribution	Rarity Status	Remarks
										behind the hospital buildings
166.	Soft fig	*Ficus mollis* Vahl	*	*	Tr	DRA	N	India, Bangladesh, Sri Lanka	UC	on the rocky hillocks
167.	Arasamaram	*Ficus religiosa* L.	*	*	Tr	TDEF	N	SE Asia	C	Brevi-deciduous species, on the walls of abandoned buildings and wells
		MYRTACEAE								
168.	Naval	*Syzygium cumini* (L.) Skeels		*	Tr	SJ	N	Tropical & Subtropical Asia	UC	Brevi-deciduous species, in the edges of the forests
		NYCTAGINACEAE								
169.	Mukkurattaikodi	*Boerhavia diffusa* L.		*	H	SJ	N	Pantropical	C	small prostrate herb with pink flowers on long stalk
170.	Thaalpoo/ paper flower	*Bougainvillea* sp.	*	*	L	Ave	EC	Tropical America	C	around the main blocks
		OCHNACEAE								
171.		*Ochna gamblei* King ex Brand.	*		Tr	DRA	E	Peninsular India	R	Deciduous species, dry rocky areas behind main hospital blocks
		OLEACEAE								
172.	Malabar jasmine	*Jasminum angustifolium* (L.) Willd.	*	*	L	TDEF	N	India, Sri Lanka	UC	Evergreen species, forest behind the hospital buildings
173.	Kodimalli, Mullai	*Jasminum angustifolium* var. sessiliflorum	*	*	L	TDEF	N	India, Sri Lanka Thailand	UC	Evergreen species, forest around the dam area and the hillocks
		ONAGRACEAE								

S.No.	Common/ Local Name	Family and Plant Name	Ramap	Mapak	Life forms	Habitat	Nativity status	Native range & Distribution	Rarity Status	Remarks
174.	Perennial water primrose	*Ludwigia perennis* L.		*	H	Mar	N	Tropical & Subtropical Old world	UC	around the water bodies
		ORABANCHACEAE								
175.	Tranquebar spur-anther flower	*Centranthera tranquebarica* (Spreng.) Merr.	*	*	H	Mar	N	Tropical China, SE Asia	R	around the water bodies in the old check dam behind old hospital block
176.	Common sopubia	*Sopubia delphinifolia* G. Don	*	*	H	Gr	N	India, Sri Lanka	R	in grasslands, laterite hillocks and moist area
177.	Chirakacitam poondu	*Striga asiatica* (L.) Kuntz.	*	*	H	Gr	N	South East Asia, Africa	C	all over the grass land, Partial parasite
178.	Cow pea witchweed	*Striga densiflora* (Benth.) Benth.	*	*	H	Gr	N	India, China	C	on the dry ground
		PASSIFLORACEAE								
179.		*Adenia wightiana* (Wall. ex Wight & Arn.) Engl.	*		Cl	SJ	N	India, Sri Lanka	UC	in the scrubs over the hillock
180.	Sirupunnai kkali	*Passiflora foetida* L.	*		Cl	SJ	EI	Tropical America	UC	along the forest boundaries
		PHYLLANTHACEAE								
181.	Cup saucer plant	*Breynia retusa* (Dennst.) Alston		*	S	TDEF	N	Palaeotropics	UC	Deciduous species in dry evergreen forest around the main check dam
182.	Bushweed	*Flueggea leucopyrus* Willd.	*		Tr	TDEF	N	Palaeotropics	UC	Deciduous species, in forest behind the hospital buildings

S.No.	Common/ Local Name	Family and Plant Name	Ramap	Mapak	Life forms	Habitat	Nativity status	Native range & Distribution	Rarity Status	Remarks
183.	Sivappu pula	*Phyllanthus reticulatus* Poir.		*	S	SJ	N	Tropical & Subtropical Asia, N. Australia	UC	species usually found along the water bodies
184.	Kilanelli	*Phyllanthus virgatus* J. G. Forst.		*	H	FAL	N	Tropical & Subtropical Asia	UC	commonly occurring in the moist areas
		PLANTAGINACEAE								
185.	Marshweed	*Limnophila heterophylla* (Roxb.) Benth.	*	*	H	Mar	N	India, SE China, Philippines	C	near the water bodies
186.	Sweet broom weed	*Scoparia dulcis* L.	*	*	H	SJ	EI	Tropical America	UC	near the water bodies
		POACEAE								
187.		*Apluda mutica* L.	*	*	H	Gr	N	Tropical Asia, Australia	C	On the hillocks and plains
188.	Common needle grass	*Aristida adscensionis* L.	*	*	H	SJ	N	Tropics & subtropics	UC	Small broom grass in the open areas of scrub
189.		*Aristida hystrix* L.f.	*	*	H	SJ	N	India, Myanmar	UC	Another species of broom grass with wider inflorescence in the open scrub
190.	Thudappam pull	*Aristida setacea* Retz.	*	*	H	Gr	N	India, Indo-china	C	all over the campus
191.	Moongil	*Bambusa bambos* (L.) Voss	*		Tr	Riparian	N	India, Indo-china	UC	Along the stream on the southern end of the campus
192.	Sanampul	*Brachiaria ramosa* (L.) Stapf.	*	*	H	SJ	N	Africa, Tropical Asia	UC	open dry areas
193.	Chevarakupul	*Chloris barbata* Sw.	*	*	H	FAL	EI	Tropical Africa	C	small grass with 4 spikes on the

S.No.	Common/ Local Name	Family and Plant Name	Ramap	Mapak	Life forms	Habitat	Nativity status	Native range & Distribution	Rarity Status	Remarks
	/ Mayilkondaipul									inflorescence
194.	Swollen finger grass	*Chrysopogon fulvus* (Spreng.) Chiov.	*	*	H	Gr	N	India to Peninsula Malaysia	C	dry grassland
195.	Cochin grass	*Cymbopogon flexuosus* Wats.	*	*	H	Gr	N	India	C	dry grassland
196.	Arugampul	*Cynodon dactylon* Pers.	*	*	H	SJ	N	Cosmopolitan	C	on the open areas
197.	Crowfoot grass	*Dactyloctenium aegyptium* (L.) Willd.	*	*	H	FAL	N	Tropical & Subtropical Old world	C	near check dam and fallow agricultural fields
198.	Indian crabgrass	*Digitaria longiflora* (Retz.) Pers.	*	*	H	SJ	N	Palaeotropics	UC	open dry areas
199.	Kevuru, Thippa ragi	*Eleusine indica* (L.) Gaertn.	*	*	H	FAL	N	Tropical & Subtropical Old world	C	open areas and road sides
200.	Double-row love grass	*Eragrostiella bifaria* (Vahl) Bor	*	*	H	Gr	N	Ethiopia - Tanzania, India, Indo-china	UC	On the slopes of the Hillocks particularly on the rocks
201.	Sticky love grass	*Eragrostis viscosa* (Retz.) Trin.	*	*	H	Gr	N	Tropical Africa, Tropical Asia	C	in plans, hillocks and waster land
202.	Oosipull	*Heteropogon contortus* (L.) P. Beauv. ex Roem. & Schult.	*	*	H	Gr	N	Tropics & Subtropics to Central Europe	C	around the hospital buildings
203.	Narival pul	*Perotis indica* (L.) Kuntze	*	*	H	SJ	N	Indomalaya	UC	dry grassland

S.No.	Common/ Local Name	Family and Plant Name	Ramap	Mapak	Life forms	Habitat	Nativity status	Native range & Distribution	Rarity Status	Remarks
204.	Nanal/ Pekkarumbu	*Saccharum spontaneum* L.	*		S	Rip	N	Africa, Asia, Australia	UC	Along the streams
205.	Kambilipul	*Setaria pumila* (Poir.) Roem. & Schult.	*	*	H	Gr	N	Palaeotropics	C	around the dry area of the check dam
		POLYGALACEAE								
206.	Milakunankai	*Polygala arvensis* Willd.	*	*	H	SJ	N	India, Sri Lanka, Vietnam	C	in plains and open grasslands
		POLYGONACEAE								
207.	Small knotweed	*Polygonum plebeium* R. Br.	*		H	SJ	N	Palaeotropics	R	moist habitat near the lake
		PORTULACACEAE								
208.	Moss rose	*Portulaca grandiflora* Hook.f.	*		H	Gard	EC	Tropical America	C	in the flower beds along the hedges in main building
209.		*Portulaca tuberosa* Roxb.		*	H	SJ	N	India to N Australia	R	rare in the rocky and exposed areas of scrub jungle
		PTERIDACEAE								
210.	Ray fern	*Actiniopteris radiata* (Sw.) Link	*		H	TDEF	N	India, Sri Lanka, Africa, Pak.	R	grow on rocky terrains and cliff edges
211.		*Adiantum incisum* Forssk.	*	*	H	TDEF	N	SE Asia	UC	moist area, damp soil and rock crevices
		RHAMNACEAE								
212.	Vembadam	*Ventilago maderaspatana* Gaertn.		*	L	SJ	N	India, Myanmar	C	Deciduous species, on dry evergreen forest
213.	Illanthai maram	*Ziziphus mauritiana* Lam.		*	Tr	SJ	N	India, S. Iran, China, Tropics	UC	scrub jungle around the upper water body

S.No.	Common/ Local Name	Family and Plant Name	Ramap	Mapak	Life forms	Habitat	Nativity status	Native range & Distribution	Rarity Status	Remarks
214.	Surailanthai	*Ziziphus oenoplia* (L.) Mill.	*	*	L	SJ	N	Tropical & Subtropical Asia, N. Australia	C	Evergreen species, on the plains trailing over the trees on the hillocks
		RICCIACEAE								
215.	Liverwort	*Riccia* sp	*	*	H	SJ	N	India	UC	moist areas of tropical dry evergreen forest
		RUBIACEAE								
216.	Coromandel canthium	*Canthium coromandelicum* (Burm. f.) Alston.	*		Tr	TDEF	N	India, Sri Lanka , Bangladesh	R	Evergreen tree near Mango grove and check dam
217.	Madukarei	*Catunaregam spinosa* (Thunb.) Tirveng.	*	*	Tr	SJ	N	Pakistan to S China, Malesia	UC	Evergreen species, foot of the hillocks
218.	Vellarai	*Enicostema axillare* (Poir. ex Lam.) A. Raynal	*		H	Mar	N	Tropical Africa, India, Sri Lanka, W. Indies	UC	medicinally important for Diabetes, abdominal ulcer, hernia, itching & insect poisoning
219.	Tropical girdle pod	*Mitracarpus villosus* (Sw.) DC.	*	*	H	Gr	N	India	C	near the exposed areas of the hospital buildings
220.	Kaim	*Mitragyna parvifolia* (Roxb.) Korth.	*		Tr	SJ	N	India, Sri Lanka	R	Near check dam
221.	Manjanathi	*Morinda coreia* Buch. -Ham.	*	*	Tr	SJ	N	India, Sri Lanka	C	forest behind the hospital buildings
222.	Chayaver, Imburaver	*Oldenlandia umbellata* L.	*	*	H	SJ	N	Tropical Asia	UC	on the open areas and waste lands
223.	Najool	*Psydrax dicoccos* Gaertn.	*	*	Tr	TDEF	N	SE China to Tropical Asia	UC	Evergreen species in the dry evergreen forests around the

S.No.	Common/ Local Name	Family and Plant Name	Ramap	Mapak	Life forms	Habitat	Nativity status	Native range & Distribution	Rarity Status	Remarks
										hospital
224.	Nathaichoori	*Spermacoce articularis* L. f.		*	H	SJ	N	SE Asia	C	in the open areas of tropical dry evergreen forest
225.	Nathaichoori	*Spermacoce hispida* L.		*	H	SJ	N	Tropical & Subtropical Asia	UC	small H mostly occurring in the moist shady places of evergreen forests
226.	Asiatic Tarenna	*Tarenna asiatica* (L.) Kuntze ex K. Schum.	*	*	Tr	TDEF	N	India to Japan, Borneo	UC	Evergreen species, on the hillocks and plains
		RUTACEAE								
227.	Vilva maram	*Limonia acidissima* L.		*	Tr	TDEF	N	India	R	Near Mapakshi and South campus
228.	Orange climber	*Toddalia asiatica* (L.) Lam.		*	L	SJ	N	Indo-Malesia, Africa	UC	Evergreen species from dry evergreen forests
		SANTALACEAE								
229.	Santhanamaram, Sandal wood	*Santalum album* L.	*	*	Tr	TDEF	N	India, Malaysia, Thailand	R	Tropical dry evergreen forest and it's a partial root parasite on other trees
		SAPINDACEAE								
230.	Small balloon vine	*Cardiospermum canescens* Wall.		*	Cl	SJ	N	India, Tropical Africa, Asia, Myanmar	UC	Near Mapakshi and South campus
231.	Velari	*Dodonaea viscosa* (L.) Jacq.	*	*	S	SJ	EI	Tropical America	C	Evergreen species, on the foot of the hillocks

S.No.	Common/ Local Name	Family and Plant Name	Ramap	Mapak	Life forms	Habitat	Nativity status	Native range & Distribution	Rarity Status	Remarks
232.	Ponnankottai maram	*Sapindus emarginatus* Vahl.		*	Tr	TDEF	N	India, Sri Lanka	R	Deciduous tree of dry forest and fringes of grasslands
		SCROPHULARIACEAE								
233.	Rushlike Dopatrium	*Dopatrium junceum* (Roxb.) Buch. Ham. ex Benth.	*	*	Hy	Aquatic	N	Pantropical	UC	aquatic flowering plant in the pools and puddles on the rocky areas
		SOLANACEAE								
234.	Thoothuvalai	*Solanum trilobatum* L.	*		L	SJ	N	India, China, Peninsula Malaysia	UC	medicinally important for respiratory disorders
235.	Kandamkathiri	*Solanum virginianum* L.		*	H	SJ	N	South east Asia, Australia, Polynesia	UC	dry open land
		TYPHACEAE								
236.	Narrow-leaf cattail	*Typha angustifolia* L.	*		Hy	Aquatic	EI	Northern Hemisphere	UC	in the pond in front of main hospital block
		VIOLACEAE								
237.	Orithazhal Thamarai	*Hybanthus enneaspermus* (L.) F. Muell.	*	*	H	Gr	N	Tropical & Subtropical Asia	C	open forests and moist area
		VITACEAE								
238.	Pirandai	*Cissus quadrangularis* L.		*	L	TDEF	N	Palaeotropics	UC	Evergreen species in forest behind the hospital buildings
239.	Pani Bel	*Cissus repanda* Vahl.	*		S	TDEF	N	SE Asia	UC	on the hillock
240.	South Indian Treebine	*Cissus vitiginea* L.		*	L	TDEF	N	India, Sri Lanka, Bangladesh	UC	Deciduous species in open areas and dry forests

S.No.	Common/ Local Name	Family and Plant Name	Ramap	Mapak	Life forms	Habitat	Nativity status	Native range & Distribution	Rarity Status	Remarks
		ZYGOPHYLLACEAE								
241.	Puncture vine	*Tribulus terrestris* Linn.	*	*	H	SJ	N	Old world tropics	C	on the open areas and waste lands

Life forms: Climber – Cl, Herb – H, Hydrophyte – Hy, Liana – L, Parasite – P, Shrub – S, Tree – Tr; **Habitat**: Avenue – Ave; Dry rocky area – DRA, Fallow agricultural land – FAL, Garden – Gard, Grassland – Gr, Grove – Grov, Riparian – Rip, Scrub jungle – SJ, Tropical dry evergreen forest – TDEF, Marsh – Mar; **Nativity status**: Endemic – E, Exotic cultivated – EC, Exotic invasive – EI, Native – N; **Rarity status**: Common – C, Uncommon – UC, Rare – R

CHECKLIST OF AVIFAUNA- CMC, CHITTOOR CAMPUS (FULL VERSION)

Abbreviations:

MS- Migratory status. (R- Resident, Migratory) HAB- Habit (T- Terrestrial, A- Aquatic)

WPA-1972: Indian Wildlife Protection Act 1972

Schedules:1- Schedule I, 2- Schedule II , 3- Schedule -III, Schedule - IV.

NE-Not Evaluated, DD- Data Deficient, LC- Least Concern, NE- Near Threatened, VU- Vulnerable, EN- Endangered, CE- Critically Endangered, EW-Extinct in the Wild and E- Extinct.

Pop.trend- Population trend as per IUCN[37]

S.No.	English name	Scientific name	MS	HAB	WPA 1972	IUCN	Pop-trend	Feeding guild	CITES
	Galliformes								
	Phasianidae (partridges, pheasants, grouse)								
1	Jungle Bush Quail	*Perdicula asiatica* (Latham, 1790)	R	T	4	LC	stable	insectivore	Not listed
2	Grey Francolin	*Francolinus pondicerianus* (J.F. Gmelin, 1789)	R	T	4	LC	stable	insectivore	Not listed
3	Grey Junglefowl	*Gallus sonneratii* Temminck, 1813	R	T	2	LC	decreasing	insectivore	Appendix II
4	Painted Spurfowl	*Galloperdix lunulata* (Valenciennes, 1825)	R	T	4	LC	decreasing	insectivore	Not listed
	Podicipedidae (grebes)								
5	Little Grebe	*Tachybaptus ruficollis* (Pallas, 1764)	R	A	4	LC	decreasing	insectivore	Not listed
	Columbiformes								
	Columbidae (pigeons)								
6	Rock Pigeon	*Columba livia* J.F. Gmelin, 1789	R	T	4	LC	decreasing	Grainivore	Not listed
7	Spotted Dove	*Streptopelia chinensis* (Scopoli, 1786)	R	T	4	LC	increasing	Grainivore	Not listed
8	Laughing Dove	*Streptopelia senegalensis* (Linnaeus, 1766)	R	T	4	LC	stable	Grainivore	Not listed
	Caprimulgiformes								
	Caprimulgidae (nightjars)								
9	Indian Nightjar	*Caprimulgus asiaticus* Latham, 1790	R	T	4	LC	stable	insectivore	Not listed
	Apodidae (swifts)								

[37] IUCN status- IUCN 2020. The IUCN Red List of Threatened Species. Version 2020-2. <https://www.iucnredlist.org>

S.No.	English name	Scientific name	MS	HAB	WPA 1972	IUCN	Pop-trend	Feeding guild	CITES
10	Asian Palm Swift	*Cypsiurus balasiensis* (J.E. Gray, 1829)	R	T	4	LC	stable	aeriel insectivore	Not listed
	Cuculiformes								
	Cuculidae (cuckoos)								
11	Greater Coucal	*Centropus sinensis* (Stephens, 1815)	R	T	4	LC	stable	insectivore	Not listed
12	Sirkeer Malkoha	*Taccocua leschenaultii* Lesson, 1830	R	T	4	LC	stable	insectivore	Not listed
13	Blue-faced Malkoha	*Phaenicophaeus viridirostris* (Jerdon, 1840)	R	T	4	LC	stable	insectivore	Not listed
14	Pied Cuckoo	*Clamator jacobinus* (Boddaert, 1783)	R	T	4	LC	stable	insectivore	Not listed
15	Asian Koel	*Eudynamys scolopaceus* (Linnaeus, 1758)	R	T	4	LC	stable	frugivore	Not listed
16	Grey-bellied Cuckoo	*Cacomantis passerinus* (Vahl, 1797)	M	T	4	LC	stable	insectivore	Not listed
17	Common Hawk Cuckoo	*Hierococcyx varius* (Vahl, 1797)	R	T	4	LC	stable	insectivore	Not listed
	Gruiformes								
	Rallidae (rails and coots)								
18	White-breasted Waterhen	*Amaurornis phoenicurus* (Pennant, 1769)	R	A	4	LC	unknown	insectivore	Not listed
19	Common Coot	*Fulica atra* Linnaeus, 1758	M	A	4	LC	decreasing	insectivore	Not listed
	Ardeidae (herons)								
20	Indian Pond Heron	*Ardeola grayii* (Sykes, 1832)	R	A	4	LC	unknown	insectivore	Not listed
21	Cattle Egret	*Bubulcus ibis* (Linnaeus, 1758)	R	A	4	LC	increasing	insectivore	Not listed
22	Little Egret	*Egretta garzetta* (Linnaeus, 1766)	R	A	4	LC	increasing	insectivore	Not listed
	Phalacrocoracidae (cormorants)								
23	Little Cormorant	*Microcarbo niger* (Vieillot, 1817)	R	A	4	LC	unknown	piscivore	Not listed
	Charadriiformes								
	Charadriidae (plovers & lapwings)								
24	Red-wattled Lapwing	*Vanellus indicus* (Boddaert, 1783)	R	A	4	LC	unknown	insectivore	Not listed
	Scolopacidae (sandpipers)								

S.No.	English name	Scientific name	MS	HAB	WPA 1972	IUCN	Pop-trend	Feeding guild	CITES
25	Common Sandpiper	*Actitis hypoleucos* (Linnaeus, 1758)	M	A	4	LC	decreasing	insectivore	Not listed
26	Green Sandpiper	*Tringa ochropus* Linnaeus, 1758	M	A	4	LC	stable	insectivore	Not listed
27	Wood Sandpiper	*Tringa glareola* Linnaeus, 1758	M	A	4	LC	stable	insectivore	Not listed
	Turnicidae (buttonquails)								
28	Yellow-legged Buttonquail	*Turnix tanki* Blyth, 1843	R	T	4	LC	stable	grainivore	Not listed
29	Barred Buttonquail	*Turnix suscitator* (J.F. Gmelin, 1789)	R	T	4	LC	increasing	grainivore	Not listed
	Accipitriformes								
	Accipitridae (kites, hawks and eagles)								
30	Black-winged Kite	*Elanus caeruleus (*Desfontaines, 1789)	R	T	1	LC	stable	raptor	Appendix II
31	Short-toed Snake Eagle	*Circaetus gallicus* (J.F. Gmelin, 1788)	R	T	1	LC	stable	raptor	Appendix II
32	Black Eagle	*Ictinaetus malaiensis* (Temminck, 1822)	R	T	1	LC	decreasing	raptor	Appendix II
33	Indian Spotted Eagle	*Clanga hastata* (Lesson, 1831)	R	T	1	VU	decreasing	raptor	Appendix II
34	Tawny Eagle	*Aquila rapax* (Temminck, 1828)	R	T	1	LC	decreasing	raptor	Appendix II
35	Bonelli's Eagle	*Aquila fasciata* Vieillot, 1822	R	T	1	LC	decreasing	raptor	Appendix II
36	Shikra	*Accipiter badius* (J.F. Gmelin, 1788)	R	T	1	LC	stable	raptor	Appendix II
37	Besra	*Accipiter virgatus* (Temminck, 1822)	R	T	1	LC	decreasing	raptor	Appendix II
38	Brahminy Kite	*Haliastur indus* (Boddaert, 1783)	R	T	1	LC	decreasing	raptor	Appendix II
39	White-eyed Buzzard	*Butastur teesa* (Franklin, 1831)	R	T	1	LC	stable	raptor	Appendix II
	Strigiformes								
	Strigidae (owls)								
40	Spotted Owlet	*Athene brama* (Temminck, 1821)	R	T	4	LC	stable	raptor	Not listed
41	Indian Eagle Owl	*Bubo bengalensis* (Franklin, 1831)	R	T	4	LC	stable	raptor	Not listed
	Upupidae (hoopoes)								
42	Common Hoopoe	*Upupa epops* Linnaeus, 1758	R	T	4	LC	decreasing	insectivore	Not listed
	Piciformes								
	Picidae (woodpeckers)								

S.No.	English name	Scientific name	MS	HAB	WPA 1972	IUCN	Pop-trend	Feeding guild	CITES
43	Lesser Golden-backed Woodpecker	*Dinopium benghalense* (Linnaeus, 1758)	R	T	4	LC	stable	insectivore	Not listed
	Ramphastidae (barbets)								
44	Coppersmith Barbet	*Psilopogon haemacephalus* (Statius Muller, 1776)	R	T	4	LC	increasing	frugivore	Not listed
	Coraciiformes								
	Meropidae (bee-eaters)								
45	Green Bee-eater	*Merops orientalis* Latham, 1801	R	T	4	LC	increasing	insectivore	Not listed
46	Blue-tailed Bee-eater	*Merops philippinus* Linnaeus, 1767	M	T	4	LC	stable	insectivore	Not listed
	Coraciidae (rollers)								
47	Indian Roller	*Coracias benghalensis* (Linnaeus, 1758)	R	T	4	LC	increasing	insectivore	Not listed
	Alcedinidae (kingfishers)								
48	Common Kingfisher	*Alcedo atthis* (Linnaeus, 1758)	R	A	4	LC	unknown	piscivore	Not listed
49	White-throated Kingfisher	*Halcyon smyrnensis* (Linnaeus, 1758)	R	A	4	LC	increasing	omnivore	Not listed
	Falconiformes								
	Falconidae (falcons)								
50	Common Kestrel	*Falco tinnunculus* Linnaeus, 1758	M	T	4	LC	decreasing	raptor	Appendix II
	Psittaciformes								
	Psittaculidae (old world parrots)								
51	Plum-headed Parakeet	*Psittacula cyanocephala* (Linnaeus, 1766)	R	T	4	LC	decreasing	frugivore	Appendix II
52	Rose-ringed Parakeet	*Psittacula krameri* (Scopoli, 1769)	R	T	4	LC	increasing	frugivore	Not listed
	Passeriformes								

S.No.	English name	Scientific name	MS	HAB	WPA 1972	IUCN	Pop-trend	Feeding guild	CITES
	Pittidae (pittas)								
53	Indian Pitta	*Pitta brachyura* (Linnaeus, 1766)	M	T	4	LC	decreasing	insectivore	Not listed
	Campephagidae (minivets and cuckooshrikes)								
54	Small Minivet	*Pericrocotus cinnamomeus* (Linnaeus, 1766)	R	T	4	LC	stable	insectivore	Not listed
55	Black-headed Cuckooshrike	*Lalage melanoptera* (Rüppell, 1839)	R	T	4	LC	stable	insectivore	Not listed
	Oriolidae (orioles and allies)								
56	Indian Golden Oriole	*Oriolus kundoo* Sykes, 1832	R	T	4	LC	unknown	frugivore	Not listed
	Artamidae (woodswallows, magpies and allies)								
57	Ashy Woodswallow	*Artamus fuscus* Vieillot, 1817	R	T	4	LC	stable	insectivore	Not listed
	Vangidae (vangas and helmetshrikes)								
58	Common Woodshrike	*Tephrodornis pondicerianus* (J.F. Gmelin, 1789)	R	T	4	LC	stable	insectivore	Not listed
	Aegithinidae (ioras)								
59	Common Iora	*Aegithina tiphia* (Linnaeus, 1758)	R	T	4	LC	unknown	insectivore	Not listed
	Dicruridae (drongos)								
60	Black Drongo	*Dicrurus macrocercus* Vieillot, 1817	R	T	4	LC	unknown	insectivore	Not listed
	Rhipiduridae (fantails)								
61	White-throated Fantail	*Rhipidura albicollis* (Vieillot, 1818)	R	T	4	LC	stable	insectivore	Not listed
	Laniidae (shrikes)								
62	Brown Shrike	*Lanius cristatus* Linnaeus, 1758	M	T	4	LC	decreasing	insectivore	Not listed
63	Bay-backed Shrike	*Lanius vittatus* Valenciennes, 1826	R	T	4	LC	stable	insectivore	Not listed
64	Long-tailed Shrike	*Lanius schach* Linnaeus, 1758	M	T	4	LC	unknown	insectivore	Not listed
	Corvidae (crows and jays)								

S.No.	English name	Scientific name	MS	HAB	WPA 1972	IUCN	Pop-trend	Feeding guild	CITES
65	Rufous Treepie	*Dendrocitta vagabunda* (Latham, 1790)	R	T	4	LC	stable	omnivore	Not listed
66	House Crow	*Corvus splendens* Vieillot, 1817	R	T	4	LC	stable	omnivore	Not listed
67	Large-billed Crow	*Corvus macrorhynchos* Wagler, 1827	R	T	4	LC	stable	omnivore	Not listed
	Monarchidae (monarchs & paradise-flycatchers)								
68	Black-naped Monarch	*Hypothymis azurea* (Boddaert, 1783)	R	T	4	LC	stable	insectivore	Not listed
69	Indian Paradise-flycatcher	*Terpsiphone paradisi* (Linnaeus, 1758)	R	T	4	LC	stable	insectivore	Not listed
	Dicaeidae (flowerpeckers)								
70	Pale-billed Flowerpecker	*Dicaeum erythrorhynchos* (Latham, 1790)	R	T	4	LC	stable	insectivore	Not listed
	Nectariniidae (sunbirds)								
71	Purple-rumped Sunbird	*Leptocoma zeylonica* (Linnaeus, 1766)	R	T	4	LC	stable	nectarivore	Not listed
72	Purple Sunbird	*Cinnyris asiaticus* (Latham, 1790)	R	T	4	LC	stable	nectarivore	Not listed
73	Loten's Sunbird	*Cinnyris lotenius* (Linnaeus, 1766)	R	T	4	LC	stable	nectarivore	Not listed
	Irenidae (fairy-bluebirds and leafbirds)								
74	Jerdon's Leafbird	*Chloropsis jerdoni* (Blyth, 1844)	R	T	4	LC	stable	insectivore	Not listed
	Ploceidae (weavers)								
75	Baya Weaver	*Ploceus philippinus* (Linnaeus, 1766)	R	T	4	LC	stable	grainivore	Not listed
	Estrildidae (waxbills)								
76	Red Munia	*Amandava amandava* (Linnaeus, 1758)	R	T	4	LC	stable	grainivore	Not listed
77	Indian Silverbill	*Euodice malabarica* (Linnaeus, 1758)	R	T	4	LC	stable	grainivore	Not listed
78	White-rumped Munia	*Lonchura striata* (Linnaeus, 1766)	R	T	4	LC	stable	grainivore	Not listed
79	Scaly-breasted Munia	*Lonchura punctulata* (Linnaeus, 1758)	R	T	4	LC	stable	grainivore	Not listed
80	Black-headed Munia	*Lonchura malacca* (Linnaeus, 1766)	R	T	4	LC	stable	grainivore	Not listed
	Motacillidae (wagtails and pipits)								
81	Tree Pipit	*Anthus trivialis (*Linnaeus, 1758)	M	T	4	LC	decreasing	insectivore	Not listed
82	Paddyfield Pipit	*Anthus rufulus* Vieillot, 1818	R	T	4	LC	stable	insectivore	Not listed

S.No.	English name	Scientific name	MS	HAB	WPA 1972	IUCN	Pop-trend	Feeding guild	CITES
83	Blyth's Pipit	*Anthus godlewskii* (Taczanowski, 1876)	M	T	4	LC	stable	insectivore	Not listed
84	Grey Wagtail	*Motacilla cinerea* Tunstall, 1771	M	T	4	LC	stable	insectivore	Not listed
85	White-browed Wagtail	*Motacilla maderaspatensis* J.F. Gmelin, 1789	R	A	4	LC	stable	insectivore	Not listed
	Fringillidae (finches, euphonias and hawaiian honeycreepers)								
86	Common Rosefinch	*Erythrina erythrina* (Pallas, 1770)	M	T	4	LC	decreasing	grainivore	Not listed
	Alaudidae (larks)								
87	Rufous-tailed Lark	*Ammomanes phoenicura* (Franklin, 1831)	R	T	4	LC	stable	grainivore	Not listed
88	Ashy-crowned Sparrow Lark	*Eremopterix griseus* (Scopoli, 1786)	R	T	4	LC	stable	grainivore	Not listed
89	Jerdon's Bushlark	*Mirafra affinis* Blyth, 1845	R	T	4	LC	stable	grainivore	Not listed
	Cisticolidae (cisticolas)								
90	Zitting Cisticola	*Cisticola juncidis* (Rafinesque, 1810)	R	T	4	LC	increasing	insectivore	Not listed
91	Grey-breasted Prinia	*Prinia hodgsonii* Blyth, 1844	R	T	4	LC	stable	insectivore	Not listed
92	Jungle Prinia	*Prinia sylvatica* Jerdon, 1840	R	T	4	LC	decreasing	insectivore	Not listed
93	Ashy Prinia	*Prinia socialis* Sykes, 1832	R	T	4	LC	stable	insectivore	Not listed
94	Plain Prinia	*Prinia inornata* Sykes, 1832	R	T	4	LC	stable	insectivore	Not listed
95	Common Tailorbird	*Orthotomus sutorius* (Pennant, 1769)	R	T	4	LC	stable	insectivore	Not listed
	Locustellidae (bush warblers)								
	Acrocephalidae (brush, reed and swamp warblers)								
96	Booted Warbler	*Iduna caligata* (M.H.C. Lichtenstein, 1823)	M	T	4	LC	stable	insectivore	Not listed
97	Sykes's Warbler	*Iduna rama* (Sykes, 1832)	M	T	4	LC	increasing	insectivore	Not listed
98	Blyth's Reed Warbler	*Acrocephalus dumetorum* Blyth, 1849	M	T	4	LC	decreasing	insectivore	Not listed
	Hirundinidae (swallows)								
99	Red-rumped Swallow	*Cecropis daurica* (Laxmann, 1769)	R	T	4	LC	stable	aeriel insectivore	Not listed
100	Barn Swallow	*Hirundo rustica* Linnaeus, 1758	M	T	4	LC	decreasing	aeriel insectivore	Not listed

S.No.	English name	Scientific name	MS	HAB	WPA 1972	IUCN	Pop-trend	Feeding guild	CITES
101	Dusky Crag Martin	*Ptyonoprogne concolor* (Sykes, 1832)	M	T	4	LC	increasing	aeriel insectivore	Not listed
	Pycnonotidae (bulbuls)								
102	Red-whiskered Bulbul	*Pycnonotus jocosus* (Linnaeus, 1758)	R	T	4	LC	increasing	frugivore	Not listed
103	Red-vented Bulbul	*Pycnonotus cafer* (Linnaeus, 1766)	R	T	4	LC	stable	frugivore	Not listed
104	White-browed Bulbul	*Pycnonotus luteolus* (Lesson, 1841)	R	T	4	LC	stable	frugivore	Not listed
	90. Phylloscopidae (old world leaf warblers)								
105	Greenish Leaf Warbler	*Seicercus trochiloides* (Sundevall, 1837)	M	T	4	LC	increasing	insectivore	Not listed
	Sylviidae (sylvia warblers, parrotbills and allies)								
106	Lesser Whitethroat	*Curruca curruca* (Linnaeus, 1758)	M	T	4	LC	stable	insectivore	Not listed
107	Yellow-eyed Babbler	*Chrysomma sinense* (J.F. Gmelin, 1789)	R	T	4	LC	stable	insectivore	Not listed
	Timaliidae (scimitar babblers and allies)								
108	Tawny-bellied Babbler	*Dumetia hyperythra* (Franklin, 1831)	R	T	4	LC	decreasing	insectivore	Not listed
	Leiothrichidae (babblers, laughingthrushes and allies)								
109	Common Babbler	*Argya caudata* (Dumont, 1823)	R	T	4	LC	stable	insectivore	Not listed
110	Yellow-billed Babbler	*Turdoides affinis* (Jerdon, 1845)	R	T	4	LC	stable	insectivore	Not listed
	Sturnidae (starlings)								
111	Rosy Starling	*Pastor roseus* (Linnaeus, 1758)	M	T	4	LC	unknown	insectivore	Not listed
112	Brahminy Starling	*Sturnia pagodarum* (J.F. Gmelin, 1789)	M	T	4	LC	unknown	insectivore	Not listed
113	Chestnut-tailed Starling	*Sturnia malabarica* (J.F. Gmelin, 1789)	R	T	4	LC	increasing	insectivore	Not listed
114	Common Myna	*Acridotheres tristis* (Linnaeus, 1766)	R	T	4	LC	increasing	omnivore	Not listed
	Muscicapidae (chats and flycatchers)								
115	Indian Robin	*Saxicoloides fulicatus* (Linnaeus, 1766)	R	T	4	LC	stable	insectivore	Not listed
116	Oriental Magpie Robin	*Copsychus saularis* (Linnaeus, 1758)	R	T	4	LC	stable	insectivore	Not listed
117	Blue Rock Thrush	*Monticola solitarius* (Linnaeus, 1758)	M	T	4	LC	stable	insectivore	Not listed

S.No.	English name	Scientific name	MS	HAB	WPA 1972	IUCN	Pop-trend	Feeding guild	CITES
118	Pied Bushchat	*Saxicola caprata* (Linnaeus, 1766)	R	T	4	LC	stable	insectivore	Not listed

Abbreviations:

MS- Migratory status. (R- Resident, Migratory) HAB- Habit (T- Terrestrial, A- Aquatic)

WPA-1972: Indian Wildlife Protection Act 1972

Schedules:1- Schedule I, 2- Schedule II , 3- Schedule -III, Schedule - IV.

NE-Not Evaluated, DD- Data Deficient, LC- Least Concern, NE- Near Threatened, VU- Vulnerable, EN- Endangered, CE- Critically Endangered, EW-Extinct in the Wild and E- Extinct.

Pop.trend- Population trend as per IUCN[38]

CHECKLIST OF BUTTERFLIES - CMC, CHITTOOR CAMPUS (FULL VERSION)

Abbreviations:

WPA-1972: Indian Wildlife Protection Act 1972

[38] IUCN status- IUCN 2020. The IUCN Red List of Threatened Species. Version 2020-2. <https://www.iucnredlist.org>

IUCN Status - as per IUCN[39]

Pop.trend - Population trend as per IUCN[40]

S. No	Family	Common Name	Scientific Name	WPA,1972	IUCN status	Pop-trend
1	Hesperiidae	Common Banded Awl	*Hasora chromus chromus (Cramer, [1780])*	Not assessed	Not assessed	Not assessed
2	Hesperiidae	Dart spp	*Potanthus spp.*	Not assessed	Not assessed	Not assessed
3	Hesperiidae	Grey-veined Grass Dart	*Taractrocera maevius (Fabricius, 1793)*	Not assessed	Not assessed	Not assessed
4	Hesperiidae	Indian Bush Hopper	*Ampittia dioscorides dioscorides (Fabricius, 1793)*	Not assessed	Not assessed	Not assessed
5	Hesperiidae	Indian Common Small Flat.	*Sarangesa dasahara dasahara (Moore, [1866])*	Not assessed	Not assessed	Not assessed
6	Lycaenidae	Continental Common Pierrot	*Castalius rosimon rosimon (Fabricius, 1775)*	Not assessed	Not assessed	Not assessed
7	Lycaenidae	Bengal Slate Flash	*Rapala manea schistacea (Moore, 1879)*	Not assessed	Not assessed	Not assessed
8	Lycaenidae	Indian Common Silverline	*Spindasis vulcanus vulcanus (Fabricius, 1775)*	Not assessed	Not assessed	Not assessed
9	Lycaenidae	Asian Zebra Blue	*Leptotes plinius plinius (Fabricius, 1793)*	Not assessed	Not assessed	Not assessed
10	Lycaenidae	Black-spotted Grass Jewel	*Freyeria putli (Kollar, [1844])*	Not assessed	Not assessed	Not assessed
11	Lycaenidae	Common Guava Blue	*Virachola isocrates (Fabricius, 1793)*	Not assessed	Not assessed	Not assessed
12	Lycaenidae	Dark Grass Blue	*Zizeeria karsandra (Moore, 1865)*	Not assessed	Not assessed	Not assessed
13	Lycaenidae	Gram Blue	*Euchrysops cnejus (Fabricius, 1798)*	Schedule II	Not assessed	Not assessed
14	Lycaenidae	Indian Common Lineblue	*Prosotas nora ardates (Moore, [1875])*	Not assessed	Not assessed	Not assessed
15	Lycaenidae	Indian Common Shot Silverline	*Spindasis ictis ictis (Hewitson, 1865)*	Not assessed	Not assessed	Not assessed
16	Lycaenidae	Indian Lesser Grass Blue	*Zizina otis indica* (Murray, 1874)	Not assessed	Not assessed	Not assessed
17	Lycaenidae	Indian Lime Blue	*Chilades lajus lajus (Stoll, [1780])*	Not assessed	Not assessed	Not assessed
18	Lycaenidae	Indian Peacock Royal	*Tajuria cippus cippus (Fabricius, 1798)*	Schedule II	Not assessed	Not assessed
19	Lycaenidae	Indian Tailless Lineblue	*Prosotas dubiosa indica (Evans, [1925])*	Not assessed	Not assessed	Not assessed
20	Lycaenidae	Indian Tiny Grass Blue	*Zizula hylax hylax (Fabricius, 1775)*	Not assessed	Not assessed	Not assessed

[39] IUCN status- IUCN 2020. The IUCN Red List of Threatened Species. Version 2020-2. <https://www.iucnredlist.org>

[40] IUCN status- IUCN 2020. The IUCN Red List of Threatened Species. Version 2020-2. <https://www.iucnredlist.org>

S. No	Family	Common Name	Scientific Name	WPA,1972	IUCN status	Pop-trend
21	Lycaenidae	Monkey Puzzle	*Rathinda amor (Fabricius, 1775)*	Not assessed	Not assessed	Not assessed
22	Lycaenidae	Oriental Forget-me-not	*Catochrysops strabo strabo (Fabricius, 1793)*	Not assessed	Not assessed	Not assessed
23	Lycaenidae	Pea Blue	*Lampides boeticus (Linnaeus, 1767)*	Schedule II	Not assessed	Not assessed
24	Lycaenidae	Syrian Babul Blue	*Azanus jesous gamra (Lederer, 1855)*	Not assessed	Not assessed	Not assessed
25	Nymphalidae	Indian Angled Castor	*Ariadne ariadne indica (Moore, 1884)*	Not assessed	Not assessed	Not assessed
26	Nymphalidae	Indian Common Crow	*Euploea core core (Cramer, [1780])*	Not assessed	Least Concern	Unknown
27	Nymphalidae	Indian Common Three-ring	*Ypthima asterope mahratta Moore, 1884*	Not assessed	Not assessed	Not assessed
28	Nymphalidae	Anomalous Nawab	*Charaxes agrarius Swinhoe, [1887]*	Not assessed	Not assessed	Not assessed
29	Nymphalidae	Chinese Lemon Pansy	*Junonia lemonias lemonias (Linnaeus, 1758)*	Not assessed	Not assessed	Not assessed
30	Nymphalidae	Dakhan Common Baron	*Euthalia aconthea meridionalis Fruhstorfer, 1906*	Not assessed	Not assessed	Not assessed
31	Nymphalidae	Dakhan Common Bushbrown	*Mycalesis perseus tabitha (Fabricius, 1793)*	Not assessed	Not assessed	Not assessed
32	Nymphalidae	Danaid Eggfly	*Hypolimnas misippus (Linnaeus, 1764)*	Schedule I	Not assessed	Not assessed
33	Nymphalidae	Double-branded Black Crow	*Euploea sylvester coreta (Godart, 1819)*	Not assessed	Not assessed	Not assessed
34	Nymphalidae	Indian Common Sailer	*Neptis hylas varmona Moore, 1872*	Not assessed	Not assessed	Not assessed
35	Nymphalidae	Oriental Blue Tiger	*Tirumala limniace exoticus (Gmélin, 1790)*	Not assessed	Not assessed	Not assessed
36	Nymphalidae	Oriental Chocolate Pansy	*Junonia iphita iphita (Cramer, [1779])*	Not assessed	Not assessed	Not assessed
37	Nymphalidae	Oriental Common Leopard	*Phalanta phalantha phalantha (Drury, [1773])*	Not assessed	Not assessed	Not assessed
38	Nymphalidae	Oriental Great Eggfly	*Hypolimnas bolina jacintha (Drury, 1773)*	Not assessed	Not assessed	Not assessed
39	Nymphalidae	Oriental Grey Pansy	*Junonia atlites atlites (Linnaeus, 1763)*	Not assessed	Not assessed	Not assessed
40	Nymphalidae	Oriental Peacock Pansy	*Junonia almana almana (Linnaeus, 1758)*	Not assessed	Least Concern	Stable
41	Nymphalidae	Oriental Plain Tiger	*Danaus chrysippus chrysippus (Linnaeus, 1758)*	Not assessed	Not assessed	Not assessed
42	Nymphalidae	Pale Blue Pansy	*Junonia orithya swinhoei Butler, 1885*	Not assessed	Not assessed	Not assessed
43	Nymphalidae	Tamil Bushbrown	*Mycalesis subdita (Moore, [1890])*	Not assessed	Not assessed	Not assessed
44	Nymphalidae	Tawny Coster	*Acraea terpsicore (Linnaeus, 1758)*	Not assessed	Not assessed	Not assessed
45	Nymphalidae	Yellow Pansy	*Junonia hierta (Fabricius, 1798)*	Not assessed	Least Concern	Unknown
46	Papilionidae	Northern Lime Swallowtail.	*Papilio demoleus demoleus Linnaeus, 1758*	Not assessed	Not assessed	Not assessed
47	Papilionidae	Indian Common Mormon	*Papilio polytes romulus Cramer, [1775]*	Not assessed	Not assessed	Not assessed

S. No	Family	Common Name	Scientific Name	WPA,1972	IUCN status	Pop-trend
48	Papilionidae	Crimson Rose	*Pachliopta hector (Linnaeus, 1758)*	Schedule I	Least Concern	Unknown
49	Papilionidae	Indian Common Rose	*Pachliopta aristolochiae aristolochiae (Fabricius, 1775)*	Not assessed	Least Concern	Unknown
50	Pieridae	Oriental Lemon Emigrant.	*Catopsilia pomona pomona (Fabricius, 1775)*	Not assessed	Not assessed	Not assessed
51	Pieridae	Indian Crimson-tip	*Colotis danae danae (Fabricius, 1775)*	Not assessed	Not assessed	Not assessed
52	Pieridae	Dakhan Common Gull	*Cepora nerissa phryne (Fabricius, 1775)*	Not assessed	Not assessed	Not assessed
53	Pieridae	Dakhan Large Salmon Arab	*Colotis fausta fulvia (Wallace, 1867)*	Not assessed	Not assessed	Not assessed
54	Pieridae	Dakhan Yellow Orange-tip	*Ixias pyrene sesia (Fabricius, 1777)*	Not assessed	Not assessed	Not assessed
55	Pieridae	Indian Jezebel	*Delias eucharis (Drury, 1773)*	Not assessed	Not assessed	Not assessed
56	Pieridae	Indian Pioneer	*Belenois aurota aurota (Fabricius, 1793)*	Not assessed	Not assessed	Not assessed
57	Pieridae	Indian Wanderer	*Pareronia hippia (Fabricius, 1787)*	Not assessed	Not assessed	Not assessed
58	Pieridae	Oriental Common Grass Yellow	*Eurema hecabe hecabe (Linnaeus, 1758)*	Not assessed	Not assessed	Not assessed
59	Pieridae	Oriental Mottled Emigrant	*Catopsilia pyranthe pyranthe (Linnaeus, 1758)*	Not assessed	Not assessed	Not assessed
60	Pieridae	Oriental Psyche	*Leptosia nina nina (Fabricius, 1793)*	Not assessed	Not assessed	Not assessed
61	Pieridae	Plain Orange-tip	*Colotis aurora (Cramer, [1780])*	Not assessed	Not assessed	Not assessed
62	Pieridae	Red-line Small Grass Yellow	*Eurema brigitta rubella (Wallace, 1867)*	Not assessed	Least Concern	Stable

Abbreviations:

WPA-1972: Indian Wildlife Protection Act 1972

Pop.trend - Population trend as per IUCN[41]

[41] IUCN status- IUCN 2020. The IUCN Red List of Threatened Species. Version 2020-2. <https://www.iucnredlist.org>

HERPETOFAUNA

CHECKLIST OF REPTILES - CMC, CHITTOOR CAMPUS (FULL VERSION)

Abbreviations:

WPA-1972: Indian Wildlife Protection Act 1972

IUCN Status - as per IUCN[42]

Pop.trend - Population trend as per IUCN[43]

S.No	Family	Common Name	Scientific Name	WPA, 1972	IUCN Status	Pop.trend*	CITES
1	Agamidae	Oriental Garden Lizard, Bloodsucker	*Calotes versicolor* (DAUDIN 1802)	Not assessed	Not assessed	Not assessed	Not listed
2	Agamidae	Indian Rock Agama	*Psammophilus sp.* (GRAY 1831)	Not assessed	Least Concern	Stable	Not listed
3	Agamidae	Pondichéry Fan Throated Lizard	*Sitana ponticeriana* CUVIER 1829	Not assessed	Least Concern	Stable	Not listed
4	Chamaeleonidae	Indian chameleon	*Chamaeleo zeylanicus* LAURENTI 1768	Schedule II	Least Concern	Unknown	Appendix II
5	Gekkonidae	Common House Gecko	*Hemidactylus frenatus* DUMÉRIL & BIBRON 1836	Not assessed	Least Concern	Stable	Not listed
6	Gekkonidae	Indian golden gecko	*Calodactylodes aureus* (BEDDOME 1870)	Schedule I	Least Concern	unspecified	Not listed
7	Gekkonidae	Otai's Day Gecko	*Cnemaspis otai* DAS & BAUER 2000	Not assessed	Vulnerable	Unknown	Not listed
8	Gekkonidae	Spotted house gecko	*Hemidactylus parvimaculatus* DERANIYAGALA 1953	Not assessed	Not assessed	Not assessed	Not listed

[42] IUCN status- IUCN 2020. The IUCN Red List of Threatened Species. Version 2020-2. <https://www.iucnredlist.org>

[43] IUCN status- IUCN 2020. The IUCN Red List of Threatened Species. Version 2020-2. <https://www.iucnredlist.org>

S.No	Family	Common Name	Scientific Name	WPA, 1972	IUCN Status	Pop.trend*	CITES
9	Gekkonidae	Reticulate Leaf-toed Gecko	*Hemidactylus reticulatus* BEDDOME 1870	Not assessed	Least Concern	Unknown	Not listed
10	Gekkonidae	Treutler's gecko	*Hemidactylus treutleri* MAHONY 2009	Not assessed	Least Concern	Unknown	Not listed
11	Gekkonidae	Termite Hill Gecko	*Hemidactylus triedrus* (DAUDIN 1802)	Not assessed	Not assessed	Not assessed	Not listed
12	Gekkonidae	Giant Leaf-toed Gecko, Giant Southern Tree Gecko	*Hemidactylus giganteus* STOLICZKA 1871	Not assessed	Least Concern	Unknown	Not listed
13	Scincidae	Beddome's Mabuya	*Eutropis beddomei* (JERDON 1870)	Not assessed	Not assessed	Not assessed	Not listed
14	Scincidae	Keeled Indian Mabuya, Common skink	*Eutropis carinata* (SCHNEIDER 1801)	Not assessed	Least Concern	Unknown	Not listed
15	Scincidae	Bronze Mabuya, Bronze Skink, Grass Sun Skink	*Eutropis macularia* (BLYTH 1853)	Not assessed	Not assessed	Not assessed	Not listed
16	Lacertidae	Leschenault's Snake-eyed Lizard, Leschenault's Lacerta	*Ophisops leschenaultii* (MILNE-EDWARDS 1829)	Not assessed	Not assessed	Not assessed	Not listed
17	Varanidae	Bengal Monitor, Indian Monitor	*Varanus bengalensis* (DAUDIN 1802)	Schedule I	Least Concern	Decreasing	Appendix I
18	Boidae	Common Sand Boa	*Eryx conicus* (SCHNEIDER 1801)	Schedule IV	Not assessed	Not assessed	Appendix II
19	Colubridae	Dhaman, Oriental Ratsnake	*Ptyas mucosa* (LINNAEUS 1758)	Schedule II	Not assessed	Stable	Appendix II
20	Colubridae	Common Bronzeback Tree Snake	*Dendrelaphis tristis* (DAUDIN 1803)	Schedule IV	Not assessed	Not assessed	Not listed
21	Colubridae	Streaked Kukuri Snake	*Oligodon taeniolatus* (JERDON 1853)	Schedule IV	Least Concern	Not assessed	Not listed
22	Colubridae	Indian Gamma Snake, Common Cat Snake	*Boiga trigonata* (SCHNEIDER 1802)	Schedule IV	Least Concern	Stable	Not listed
23	Colubridae	Olive keelback	*Atretium schistosum* (DAUDIN 1803)	Schedule II	Least Concern	Not assessed	Appendix III
24	Elapidae	Cobra	*Naja naja* (LINNAEUS 1758)	Schedule II	Not assessed	Not assessed	Appendix II

S.No	Family	Common Name	Scientific Name	WPA, 1972	IUCN Status	Pop.trend*	CITES
25	Pythonidae	Indian Rock Python	*Python molurus* (LINNAEUS 1758)	Schedule I	Not assessed	Unknown	Appendix I
26	Typhlopidae	Brahminy blindsnake	*Indotyphlops braminus* (DAUDIN 1803)	Schedule IV	Not assessed	Not assessed	Not listed
27	Viperidae	Saw-scaled Viper, Phoorsa	*Echis carinatus* (SCHNEIDER 1801)	Schedule IV	Not assessed	Unknown	Not listed
28	Testudinidae	(Indian) Star Tortoise	*Geochelone elegans* (SCHOEPFF 1795)	Schedule IV	Vulnerable	Decreasing	Appendix I
29	Trionychidae	Indian Flap-shelled Turtle	*Lissemys punctata* (BONNATERRE 1789)	Schedule I	Least Concern	Unspecified	Appendix II

Pop.trend- Population trend as per IUCN

CHECKLIST OF AMPHIBIANS - CMC, CHITTOOR CAMPUS (FULL VERSION)

S.No	Family	Common Name	Scientific Name	WPA, 1972	IUCN Status	Pop.trend*	CITES
1	Bufonidae Gray, 1825	Günther's toad or rock toad	*Duttaphrynus hololius* (Günther, 1876)	Not listed	Data Deficient	Unknown	Not listed
2	Bufonidae	Southeast Asian Toad	*Duttaphrynus melanostictus* (Schneider, 1799)	Not listed	Least Concern	Increasing	Not listed
3	Bufonidae	Schneider's Toad	*Duttaphrynus scaber* (Schneider, 1799)	Not listed	Least Concern	Decreasing	Not listed
4	Dicroglossidae Anderson, 1871	Common skittering frog	*Euphlyctis cyanophlyctis* (Schneider, 1799)	Schedule IV	Least Concern	Stable	Not listed
5	Dicroglossidae	Indian six-toed Frog	*Euphlyctis hexadactylus* (Lesson, 1834)	Schedule IV	Least Concern	Stable	Appendix II
6	Dicroglossidae	Jerdon`s Bullfrog	*Hoplobatrachus crassus* (Jerdon, 1853)	Schedule IV	Least Concern	Decreasing	Not listed
7	Dicroglossidae	Indian Bullfrog	*Hoplobatrachus tigerinus* (Daudin, 1802)	Schedule IV	Least Concern	Stable	Appendix II
8	Dicroglossidae	Indian Cricket Frog	*Minervarya agricola* (Jerdon, 1853)	Not listed	Least Concern	Stable	Not listed

S.No	Family	Common Name	Scientific Name	WPA, 1972	IUCN Status	Pop.trend*	CITES
9	Dicroglossidae	Indian Burrowing frog	*Sphaerotheca breviceps* (Schneider, 1799)	Not listed	Least Concern	Stable	Not listed
10	Dicroglossidae	Burrowing Frog sp.	*Sphaerotheca pluvialis* (Jerdon, 1853)	Not listed	Least Concern	Stable	Not listed
11	Dicroglossidae	Marbled Sand Frog	*Sphaerotheca rolandae* (Dubois, 1983)	Not listed	Least Concern	Stable	Not listed
12	Microhylidae Günther, 1858 (1843)	Ornate narrow-mouthed Frog	*Microhyla ornata* (Duméril and Bibron, 1841)	Not listed	Least Concern	Stable	Not listed
13	Microhylidae	Red narrow-mouthed frog	*Microhyla rubra* (Jerdon, 1853)	Not listed	Least Concern	Stable	Not listed
14	Microhylidae	Marbled balloon frog	*Uperodon systoma* (Schneider, 1799)	Schedule IV	Least Concern	Stable	Not listed
15	Microhylidae	Painted Baloon Frog/Sri Lankan Bullfrog	*Uperodon taprobanicus* (Parker, 1934)	Not listed	Least Concern	Stable	Not listed
16	Microhylidae	Variegated Balloon Frog/White-bellied Pug-snout Frog	*Uperodon variegatus* (Stoliczka, 1872)	Not listed	Least Concern	Stable	Not listed
17	Rhacophoridae	Common Tree Frog/Chunam Tree Frog	*Polypedates maculatus* (Gray, 1830)	Not listed	Least Concern	Stable	Not listed

*Pop.trend- Population trend as per IUCN

CHECKLIST OF MAMMALS - CMC, CHITTOOR CAMPUS (FULL VERSION)

S. No	Family	Common Name	Species	WPA 1972	IUCN	Pop-trend*	CITES
1	Cervidae	Indian Spotted Deer	*Axis axis* Erxleben 1777	Schedule III	Least Concern	Unknown	Not listed
2	Suidae	Indian Wild Pig	*Sus scrofa* Linnaeus 1758	Schedule III	Least Concern	Unknown	Not listed
3	Felidae	Jungle Cat	*Felis chaus* Schreber 1777	Schedule II	Least Concern	Decreasing	Appendix II
4	Herpestidae	Indian Gray Mongoose	*Herpestes edwardsi* E. Geoffroy Saint-Hilaire 1818	Schedule II	Least Concern	Stable	Appendix III
5	Herpestidae	Ruddy Mongoose	*Herpestes smithii* Gray 1837	Schedule II	Least Concern	Unknown	Appendix III
6	Viverridae	Small Indian Civet	*Viverricula indica* E. Geoffroy Saint-Hilaire 1803	Schedule II	Least Concern	Stable	Appendix III
7	Vespertilionidae	Pipistrelle	*Pipistrellus sp.* Kaup 1829	Unscheduled	Not Evaluated	NA	Not listed
8	Pteropodidae	Indian Flying Fox	*Pteropus giganteus* Brünnich 1782	Schedule IV	Least Concern	Decreasing	Appendix II
9	Rhinopomatidae	Lesser Mouse-tailed Bat	*Rhinopoma hardwickii* Gray 1831	Unscheduled	Least Concern	Stable	Not listed
10	Leporidae	Indian Hare	*Lepus nigricollis* F. Cuvier 1823	Schedule IV	Least Concern	Unknown	Not listed
11	Cercopithecidae	Bonnet Macaque	*Macaca radiata* É. Geoffroy 1812	Schedule II	Least Concern	Decreasing	Appendix II
12	Sciuridae	Indian Palm Squirrel	*Funambulus palmarum* Linnaeus 1766	Schedule IV	Least Concern	Increasing	Not listed
13	Hystricidae	Indian Crested Porcupine	*Hystrix indica* Kerr 1792	Schedule IV	Least Concern	Stable	Not listed
14	Muridae	Indian Gerbil	*Tatera indica* Hardwicke 1807	Schedule V	Least Concern	Unknown	Not listed
15	Soricidae	Asian House Shrew	*Suncus murinus* Linnaeus 1766	Unscheduled	Least Concern	Stable	Not listed

*Pop.trend- Population trend as per IUCN