



CENTRE FOR EXCELLENCE IN  
SUSTAINABLE  
DEVELOPMENT

# FAUNA OF GOA INSTITUTE OF MANAGEMENT



# DIRECTOR'S NOTE



The Goa Institute of Management is committed to responsible management as part of our stated Mission. Our emphasis on sustainable business is hinged on a 3 P (Profit, People & Planet) approach to sustainable business and in light of this we emphasize on financially sustainable business models that benefit society without a deleterious impact on the environment. This philosophy is deeply embedded in our academic programs, research & advisory initiatives, and the way we conduct ourselves at the institute; thus, guiding the GIM community to integrate ethical, social, and environmental considerations into their decision-making processes, preparing them to become conscientious citizens of the world.

This report represents just one of the many steps we're taking toward environmental sustainability on our campus, which encompasses efforts in renewable energy & energy conservation, water management, waste segregation and disposal, and biodiversity conservation.

In terms of biodiversity, this Faunal Biodiversity Report titled "Fauna of Goa Institute of Management" marks the second publication by the Centre for Excellence in Sustainable Development (CESD). The first is a Floral Biodiversity Report and a coffee table book on Floral Biodiversity. This Faunal diversity enumerating initiative is aimed at cataloging the diverse fauna inhabiting the campus, encompassing birds, butterflies, reptiles, insects, and various other animals in a systematic approach. Commencing in March 2022, the project's primary goal has been to raise awareness about the richly abundant biodiversity within the vicinity while also identifying strategies to conserve this natural heritage. Moreover, it seeks to develop a comprehensive plan for managing and augmenting biodiversity on campus.

This report is the outcome of the collaborated efforts of the CESD along with two private consultants, Ms. Harshada Gauns and Dr. Pronoy Baidya, who provided technical expertise in documenting and identifying the diverse faunal species present on the campus.

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Throughout the project, researchers identified 8 mammal species, 85 bird species, 17 reptile and amphibian species, and 35 butterfly species. Notably, sightings of the rare Amboli Bush Frog (Critically endangered) and Bombay Bush Frog (Vulnerable) were recorded.

I hope this report not only informs but also captivates you with the beauty of the rich biodiversity of Faunal life on our campus. I invite you to dive into its pages with curiosity and wonder, to gain insights into the delicate balance of nature that we are privileged to witness around us. May this report kindle a renewed sense of stewardship among us all towards our environment.

- **Prof. Ajit Parulekar**



# ACKNOWLEDGEMENT



Preparing a Faunal Biodiversity Report for the Goa Institute of Management has been a very gratifying experience for all involved in this project. This comprehensive project has been made possible through the widespread support, guidance, and input received from multiple people, whom we seek to acknowledge here.

At the outset, we place on record our heartfelt gratitude to the Director, Prof. Ajit Parulekar, for giving us the opportunity to prepare this comprehensive report for the institute and for his continuous support and guidance. We are grateful to Prof Sumit Datta for initiating this project. We are thankful to Prof. Venkatesh Naga for his support as Dean (Academics). We appreciate the help from the Mr Jeyakumar, Mr Dhanesh Kote and Mr Samir Salgaonkar and various other administrative departments at GIM for assisting during surveys and offering assistance when required. A word of thanks to the security and gardening staff for their assistance. Grateful to Prof Arpita Amarnani (CESD-Chair), Prof Vithal Sukhathankar (Biodiversity Project-Coordinator) and the CESD Team who were the driving force towards the success of the project.

The Centre for Excellence in Sustainable Development is immensely grateful to Ms. Harshada Gauns and Dr. Pronoy Baidya for undertaking the project and helping CESD-GIM in pursuing the objective of creating awareness among various stakeholders and developing a plan for managing and enhancing biodiversity on campus.

## Team CESD



# ABOUT GIM AND CESD

Goa Institute of Management is a 30-year-old premier management institute in India focused on transforming and improving management education. From a small beginning in 1993, with six faculty members, teaching a single class with an intake of 24 students in a rented premise, GIM has grown to 75+ full-time faculty members, six courses with an intake of over 1000 full-time students, and a 50-acre campus with world-class infrastructure. GIM has undertaken various measures such as rain-water harvesting, solar-powered street lamps, treatment of water for reuse, tree plantation drives, etc., and has made its mark in the field of sustainability, having achieved recognition through a commendable Positive Impact Rating (PIR). The institute has grown under the visionary leadership of Late Fr. Romuald D'Souza, the founding Director.

The Centre for Excellence in Sustainable Development (CESD) was officially formed in 2019 to strengthen and support the commitment of the institution towards sustainable development. CESD focuses on the following SDG's- SDG 6 (Clean water and Sanitation), SDG 7 (Affordable and Clean Energy), SDG 11 (Sustainable Cities and Communities), SDG 12 (Responsible Consumption and production) and SDG 13 (Climate Action). CESD has taken up various projects and initiatives such as the Green Industry Goa campaign, the creation of a floral biodiversity register, the publishing of a Sustainable report, organizing Faculty Development Programmes and Sustainability hackathons, publishing research, and undertaking various international projects. Recently, CESD formed its Advisory Board comprising of members who are academicians, practitioners from the corporate sector, government officials, and experts working with various foundations who would provide advice relating to the various pursuits of the Centre to help CESD at GIM reach greater heights in the field of sustainable development.



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# INTRODUCTION

## Goa Institute of Management Campus: Geophysical and Historical Note

Goa Institute of Management campus ( $15^{\circ}34'19.72''\text{N}$ ,  $74^{\circ}1'28.17''\text{E}$  to  $15^{\circ}34'4.38''\text{N}$ ,  $74^{\circ}1'43.86''\text{E}$ ; Survey Sub-division Numbers: 58/1-C-3 and 58/1-C-2) is in the jurisdiction of Poriem Panchayat, in Sattari Taluka of Goa immediately north of Sanquelim – Arvalem and is designated as institutional area by Town and Country Planning Department, Government of Goa's Regional Plan Division (Town & Country Planning Department n.d. 2022) (Annexure 1). Geographically, the campus is located ~3km from the Western Ghats Range of Morlem on a Low level Ferricrete (LLF)- Lateritic rocky plateau. Ferricretes are often known as "tablelands" owing to the wide flat appearance and steep edges and in Goa region they are known as "Sadas" in the local language [Watve 2013]. Spread over an area of 2,02,300 m<sup>2</sup>, the region where the campus is situated today was used for agriculture and as a grazing by a predominantly agro-pastoralist community who lived in the area. Later when the land was acquired for construction of the campus, this community, moved to the northern side of the plateau outside the campus. Further, the area towards the east of the campus has been developed as human settlement area, and much of those slopes have been converted into residential regions.

Historically, much of the western and south-western region of the campus covering an area of ~62,960 m<sup>2</sup>, had exposed Low level Ferricrete surfaces, which would have harboured several native flora and fauna endemic to the Western Ghats. The elevation of the campus ranges from 106m in the south-western edge to 125m at the south-southwestern region and is the highest region in the surrounding watershed regions.

Monsoon in Goa essentially divides the year into four parts: Pre-monsoon/ summer (March to May) is warm and dry; monsoon (June to August) is the wet season; post-monsoon (September to November) experiences sharp decline in precipitation; winter is comparatively cooler and dry (December to February) (Mudbhakal and Amai 2018). Biodiversity, thus, has attuned its lifecycle based on the cycle of monsoons and hence to assess biodiversity of any region with relatively high confidence all the four seasons need to be considered for assessment.



# OBJECTIVES

## 3

### Objectives

1. Seasonal faunal documentation at GIM campus, Sanquelim- Goa through ground surveys, documentation, and data collection.
2. Mapping important species in the campus and GIS based data interpretation including watershed assessment.
3. Preparation of a biodiversity management plan.



Seasonality



Mapping



Management  
Plan

# METHODOLOGY

## Gridding of GIM Campus

The campus of GIM was divided into 41 one-hectare grids (Fig. 1), a system used for wildlife surveys for scalability and consistency among survey sites so that data can be more readily compared and pooled (Gigante et al. 2016). These 41 grids were initially visited to check for feasibility of conducting surveys. It was found that grids 5, 6 and 7 were steep and accessibility was problematic.

Fourteen grids were intentionally placed outside the campus boundaries to assess the state of faunal biodiversity, outside the zone of influence.



Map 1. Division of GIM campus into grids each admeasuring 1ha.



## Selection of Indicator Fauna for Biodiversity Assessment

Multiple species and groups have been recognized as powerful bio-indicators in scientific literature with detailed rationale behind each species or group. A bio-indicator is any biological species (an "indicator species") or group of species whose function, population, or status can reveal the qualitative status of the environment (Holt and Miller 2011). Groups for study in the present project have been selected based on the following factors:

1. Ability to be a good indicator to derive conclusions about impact activities
2. Abundant and common
3. Well known ecology, life-history and taxonomy making it easy to study
4. Economic and commercial importance

Based on the above criteria, the following faunal groups have been selected for monitoring which includes both vertebrate and invertebrate groups. Vertebrates include Mammals, Birds, Reptiles and Amphibians while invertebrates include Butterflies. All the above-mentioned groups are a critical part of the ecosystem, providing various ecosystem services and forming critical part of the food chain/ web. Among vertebrates, mammals and birds are important agents for pollination and seed dispersal. Reptiles and amphibians are very important in maintaining the ecosystem health and are critical part of various food chain/ web. In invertebrates' butterflies are indispensable as key ecosystem service providers of pollination.

## Field Survey

Thirty-eight grids were surveyed between May 2022 and March 2023, covering both morning and evening sessions to account for variations in faunal activity. Qualitative data was collected for mammals, reptiles, amphibians, and butterflies based on visual encounter survey method while for birds along with qualitative, quantitative data was also collected. For mammal survey, indirect evidence like scat and foraging traces were used for detection. For bird surveys, point count method was used. The radius of detection was fixed to 100m because most grids within the campus were of open type akin to a grassland/plateau, hence similar protocol was adopted for the same (Savard and Hooper 1995). For butterflies, a diagonal transect of 100 with a 10m detection band on each side was established in each grid (Walpole and Sheldon 1999).

For all-out surveys, every grid was combed systematically to try and detect species since all remaining groups included cryptic species. Crepuscular and nocturnal species were noted down incidentally.

1. Ability to be a good indicator to derive conclusions about impact activities
2. Abundant and common
3. Well known ecology, life-history and taxonomy making it easy to study
4. Economic and commercial importance

Faunal Groups	Method for Survey	Data Type
Mammals	Visual Encounter Survey- Three Season	Qualitative
Birds	Point Count- Three Season	Quantitative
Reptiles	Visual Encounter Survey in General, All-out search in Monsoons	Qualitative
Amphibia	Visual Encounter Survey in General, All-out search in Monsoons	Qualitative
Butterflies	Line Transect of 100m- Three Season	Qualitative

Table 1. List of faunal groups, considered for assessment in GIM Campus

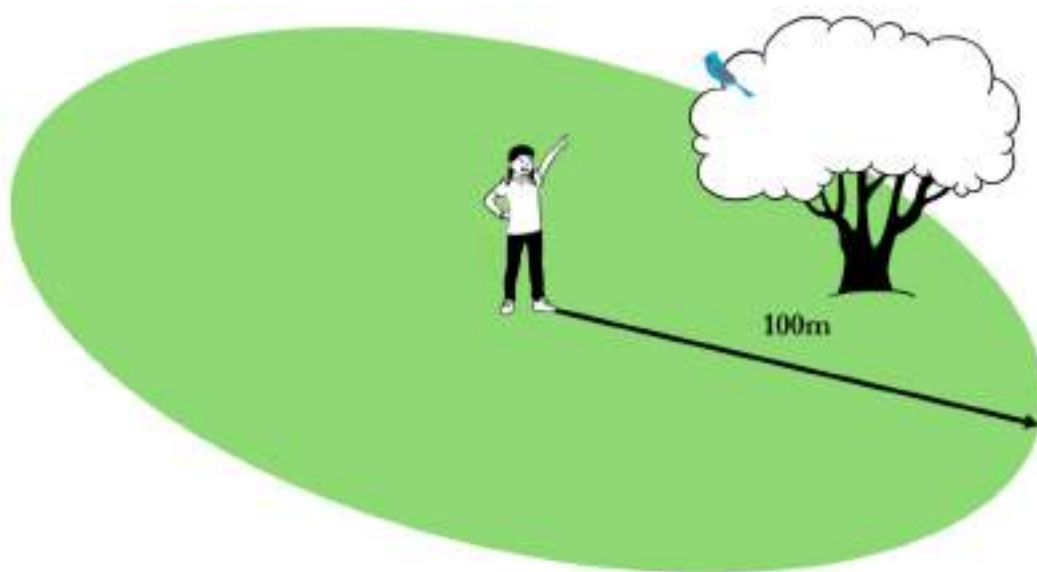


Fig. 1. Point count method for observation and quantification of birds.

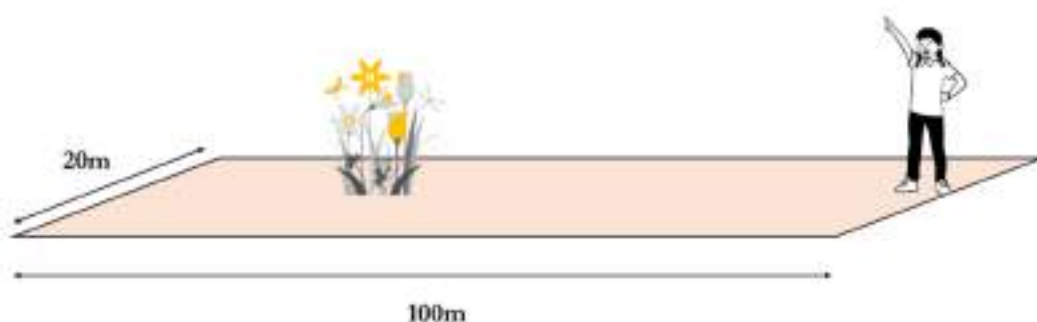
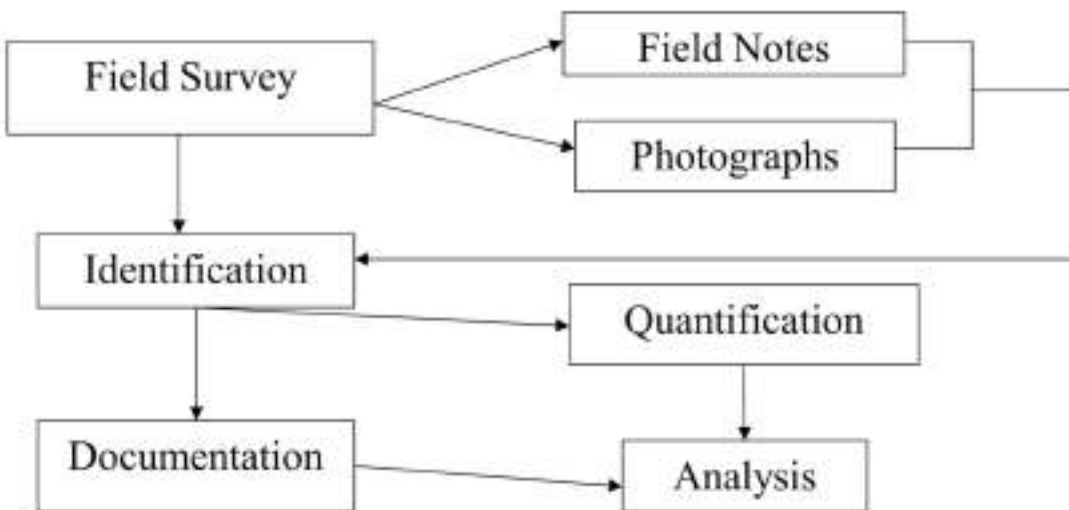


Fig. 2. Transect method used for survey of butterflies.

### Evaluation and Analysis Approach

The General approach for field-based assessment followed the below protocol which was followed rigorously.



### Evaluation and Analysis Approach for Biodiversity Data Aggregation

The FSC QGIS plugin 3.0 is used for the distribution atlas generation features which is used with data encoded with EPSG Projection 4326 - WGS 84 (Burkmar 2023). This biological records tool allows preparation of a spreadsheet of biological records and map them, either as points for individual records, or by aggregating records by OS grid squares. The aggregating feature can also be used on an existing point layer rather than a spreadsheet of records. Aggregation was carried out for birds, butterflies, reptiles, and amphibians since all out survey was used to systematically detect these groups.

### Evaluation of Stream Network and Watershed Analysis

Evaluation of stream networks was done using Digital Elevation Models (DEM), which is a representation of the bare ground (bare earth) topographic surface of the Earth excluding trees, buildings, and any other surface objects. The DEM for this analysis was sourced from NASA's Shuttle Radar Topography Mission (SRTM) (DOI: /10.5066/F7K072R7). Elevation data used for analysis are processed from raw C-band radar signals spaced at intervals of 1 arc-second (approximately 30 meters) at NASA's Jet Propulsion Laboratory (JPL). To address areas of missing data or voids in the SRTM, void filling was performed. Further to identify and fill surface depressions in digital elevation models fill sinks algorithm (Wang and Liu 2006) was executed in SAGA-GIS Module 7.8.2. This method allows the creation of hydrologically sound elevation models, by preserving downward slopes along the flow path.

Further, Strahler Order, outlet points and watershed of the stream network (Strahler 1957) were computed and presented as an interpretable map. Stream network generated this way were subjected to ground truthing in the immediate vicinity of the campus. All post processing spatial analysis was performed in QGIS 3.22.2 (QGIS.org 2023).

### Survey Timelines



### Output Masking for Sensitive Species

Many faunal species face risks from humans of capture, targeted killing, or significant targeted disturbance. The exploitation of wild animals for captive trade is the most significant risk for many species, despite laws that protect wild animals and regulate international trade in threatened animals. Open-access data can be a risk for such species that are targeted for exploitation. In this project data output especially on grid maps is restricted to protect these "Sensitive Species" while still presenting important data about them in a qualitative manner. Here we define sensitive species as those, that are locally known to face direct anthropogenic pressures like Indian Bull Frog (*Hoplobatrachus tigerinus*), Indian Monitor Lizard (*Varanus bengalensis*), and several species of Mammals.

# ASSESSMENT OF FAUNA IN GIM

## Mammals

From the cumulative survey effort across three seasons, eight species of mammals have been documented from the campus (Annexure 2). This includes the record of a stray Malabar Giant Squirrel (*Ratufa indica*) that was rescued from the campus by the Goa Forest Department. Out of the eight documented species, four are listed in Schedule 1 and two are listed in Schedule 2 of Wildlife Protection Act 1972.

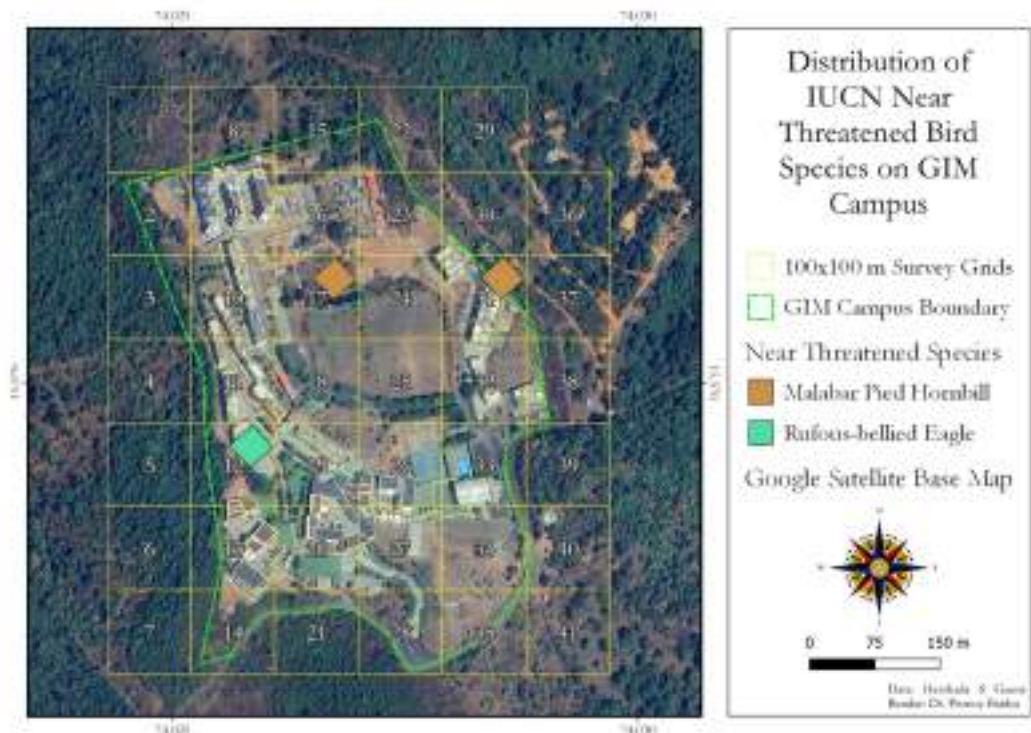
Maximum species were spotted in the pre-monsoon season including a chance encounter with the Indian Jackal (*Canis aureus indicus*) (IMG.1). There also seems to be a good population of the Black-naped Hare (*Lepus nigricollis*), however most of these were from indirect evidence of scat restricted to the periphery of the campus.



IMG. 1: Indian Jackal (Representative Image by Mayur Gawas)

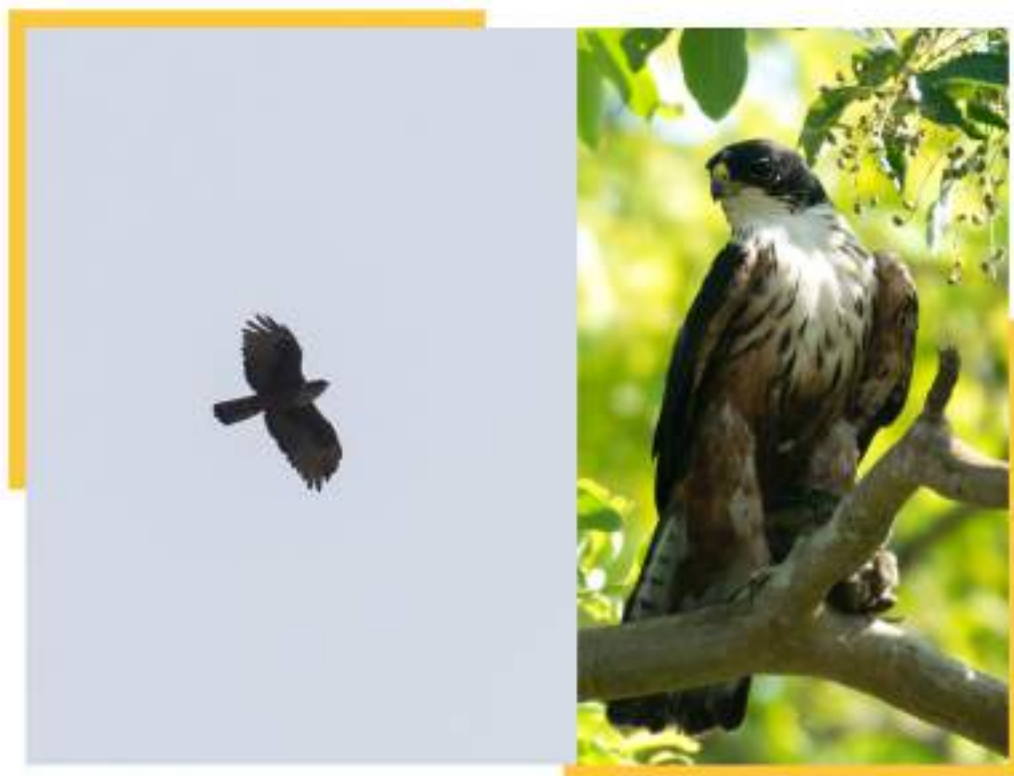
## Birds

Survey of birds on the campus resulted in 830 records representing 85 species (Annexure 3). Of these, nine species are protected under Schedule 1 and 74 under Schedule 2 of WPA. Two species are listed as near threatened by the IUCN viz. Rufous-bellied Eagle (*Lophotriorchis kienerii*) (IMG. 2) and Malabar Pied Hornbill (*Anthracoceros coronatus*) (Map 2).

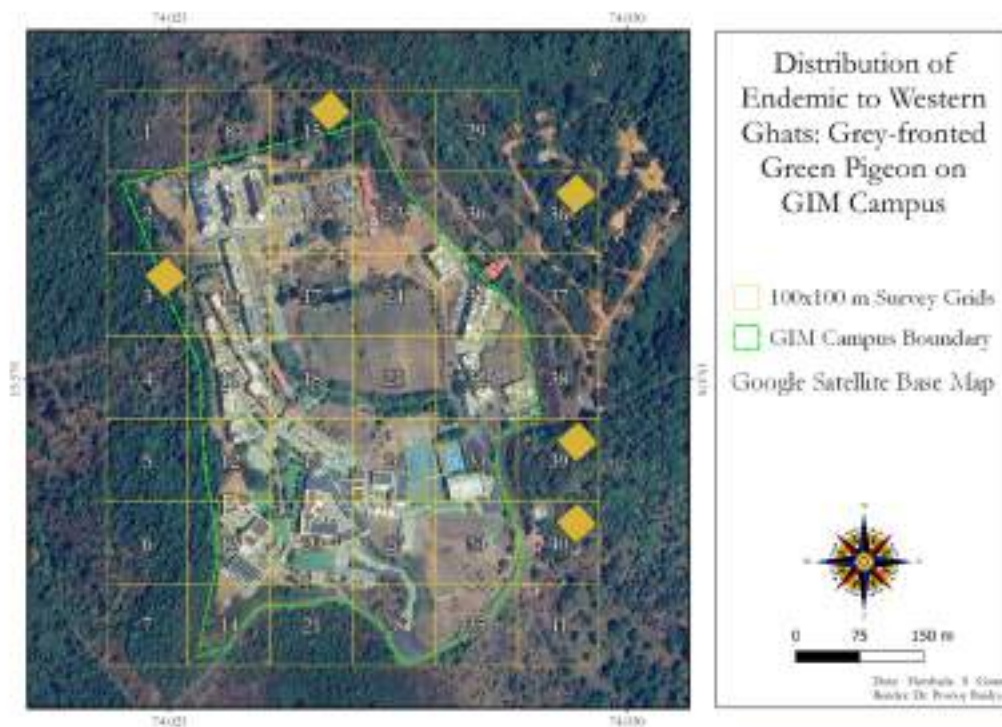


Map 2: Distribution of near threatened bird species under IUCN status on GIM campus

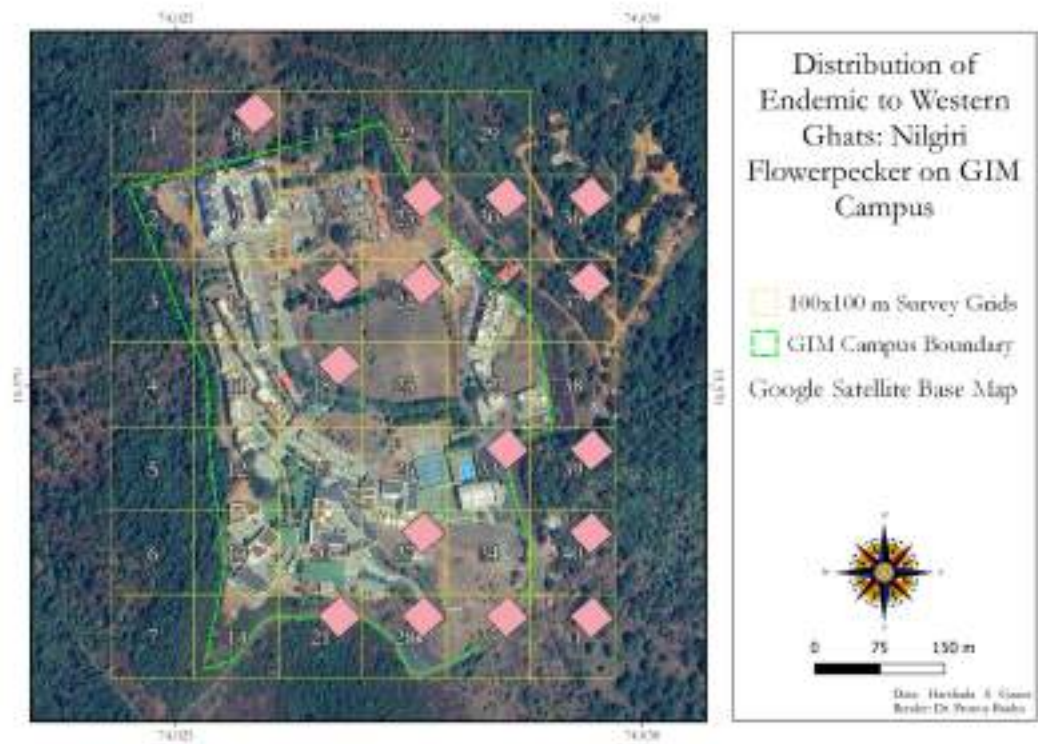
Further two species, Grey-fronted Green Pigeon (*Treron affinis*) (Map 3) and Nilgiri Flowerpecker (*Dicaeum concolor*) (IMG. 3, Map 4) which are endemic to Western Ghats have also been reported from the campus. Nilgiri Flowerpecker is the most widely distributed endemic bird with distribution in seven grids within the campus. House Crow (*Corvus splendens*), Rock Pigeon (*Columba livia*), Indian Robin (*Copsychus fulicatus*), and Red-whiskered Bulbul (*Pycnonotus jocosus*) (Map 5 to 8, IMG. 4 & 5) are the most frequently recorded birds within the campus that are widely distributed.



IMG. 2: Rufous-bellied Eagle (L) photographed on GIM campus (R) representational image by Sagar Naik



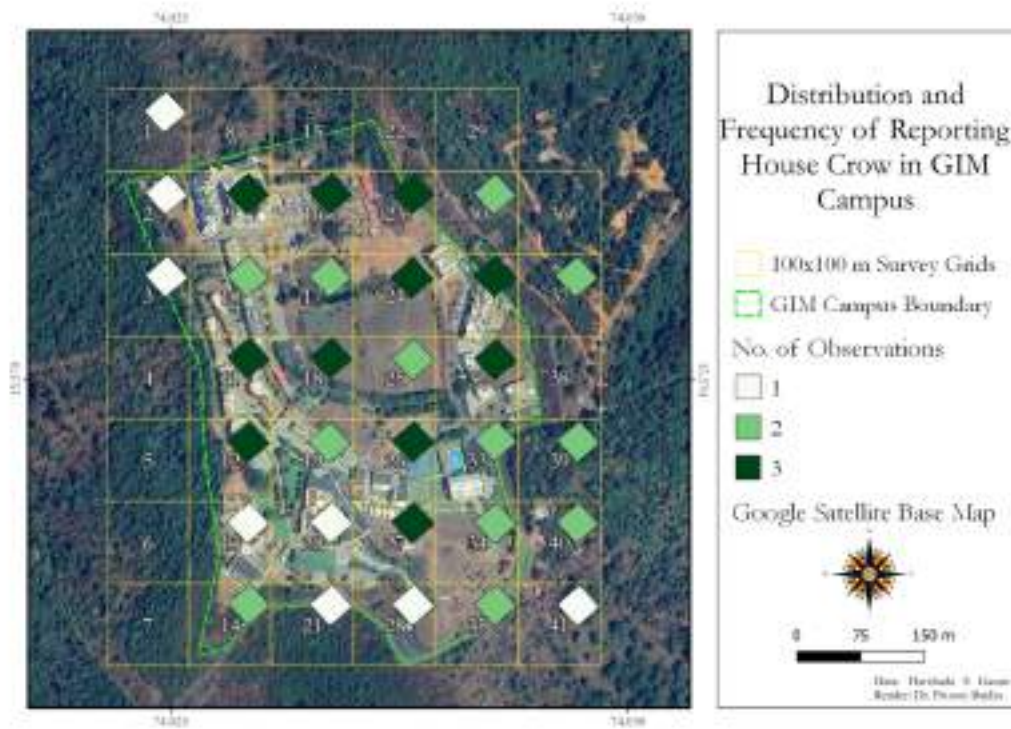
Map 3: Distribution of endemic to Western ghats: Grey-fronted Green Pigeon on GIM campus.



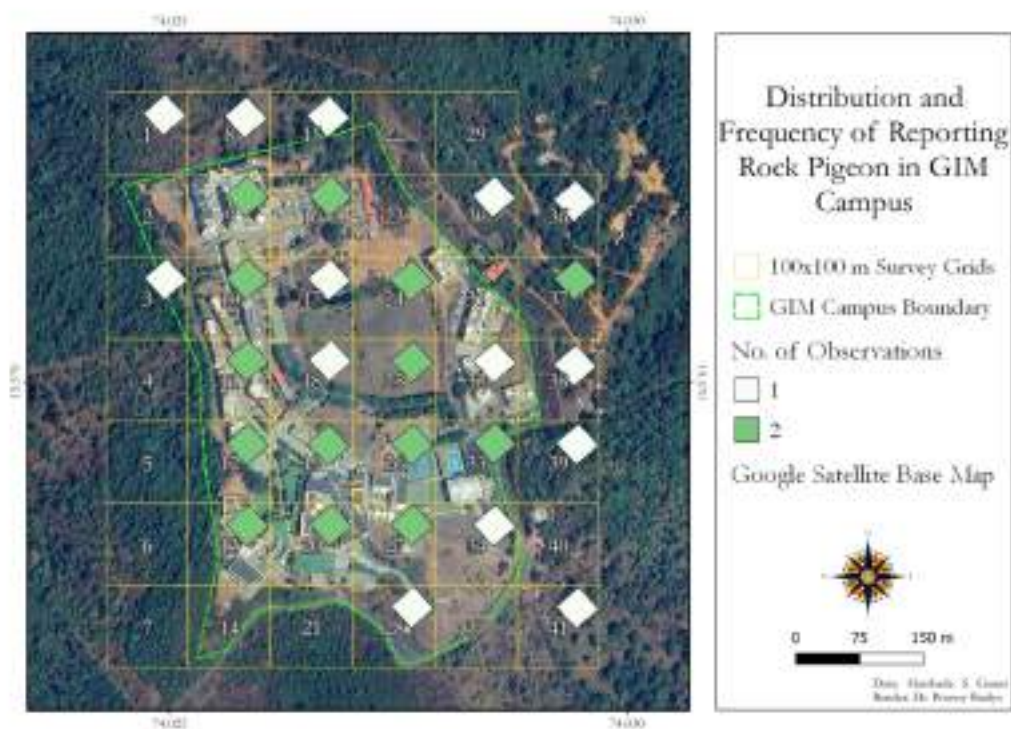
Map 4: Distribution of endemic to Western ghats: Nilgiri Flowerpecker on GIM campus



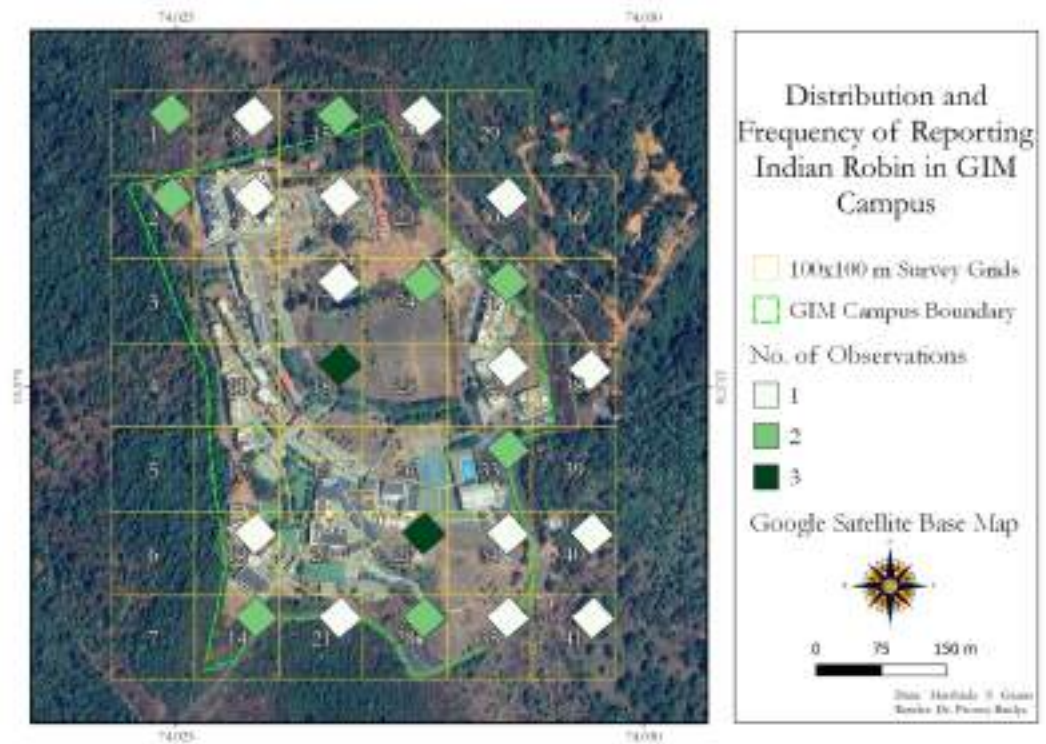
IMG. 3: Nilgiri Flowerpecker photographed in GIM Campus



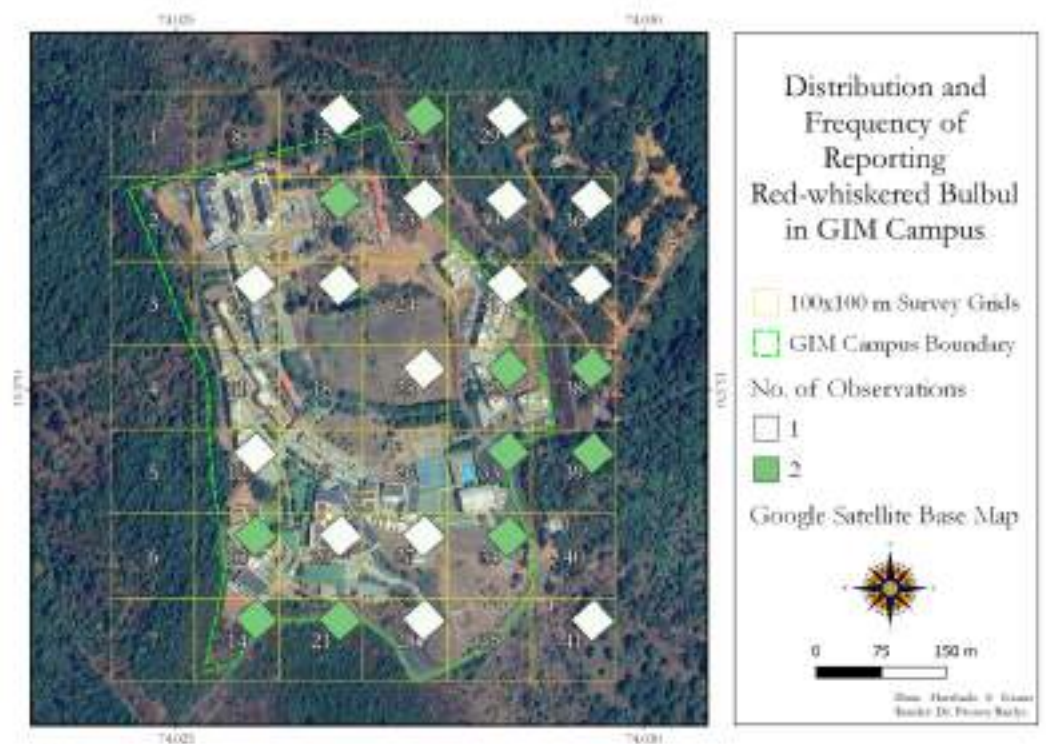
Map 5: Distribution and frequency (ranges from 1 to 3 sightings) of reporting House Crow in GIM campus.



Map 6: Distribution and frequency (ranges from 1 to 3 sightings) of reporting Rock Pigeon in GIM campus.



Map 7: Distribution and frequency (ranges from 1 to 3 sightings) of reporting Indian Robin in GIM campus.



Map 8: Distribution and frequency (ranges from 1 to 3 sightings) of reporting Red-whiskered Bulbul in GIM campus.

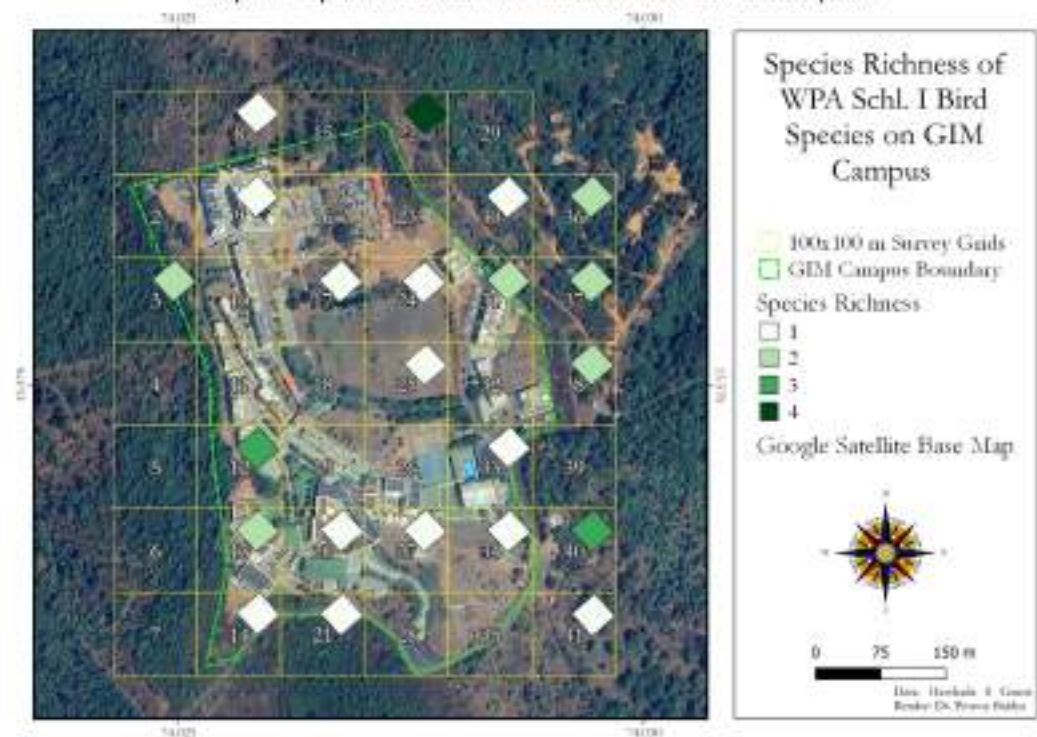
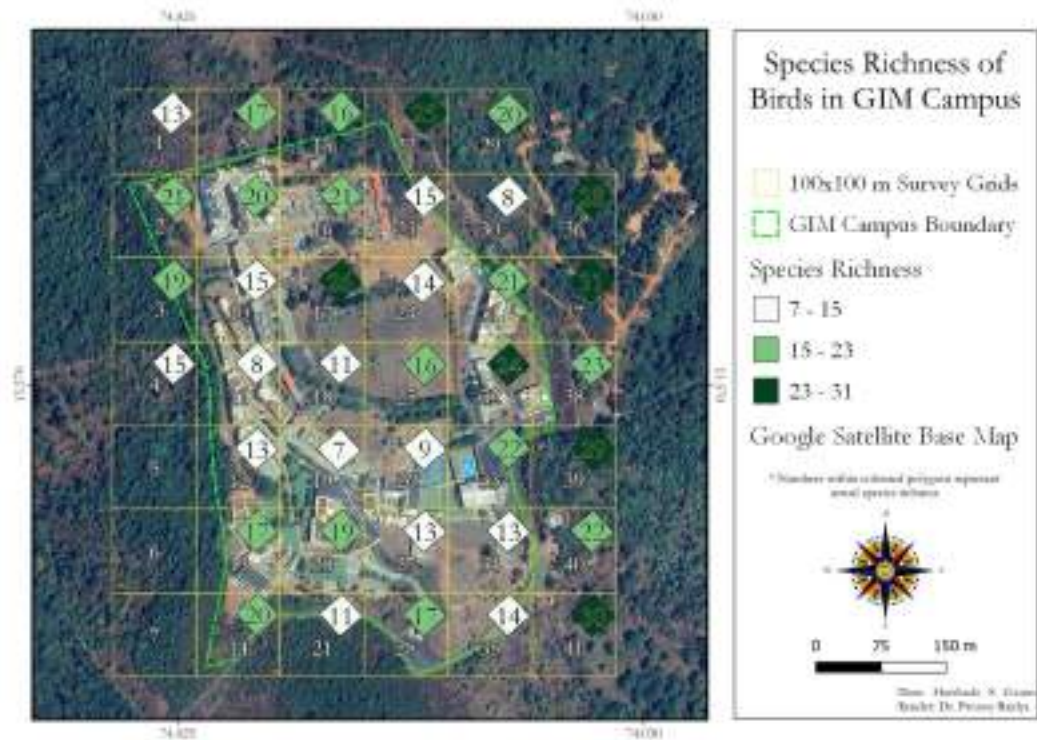


IMG. 4: Rock Pigeon photographed in GIM campus.



IMG. 5: (L) Red-whiskered Bulbul and (R) Indian Robin - Female photographed in GIM campus.

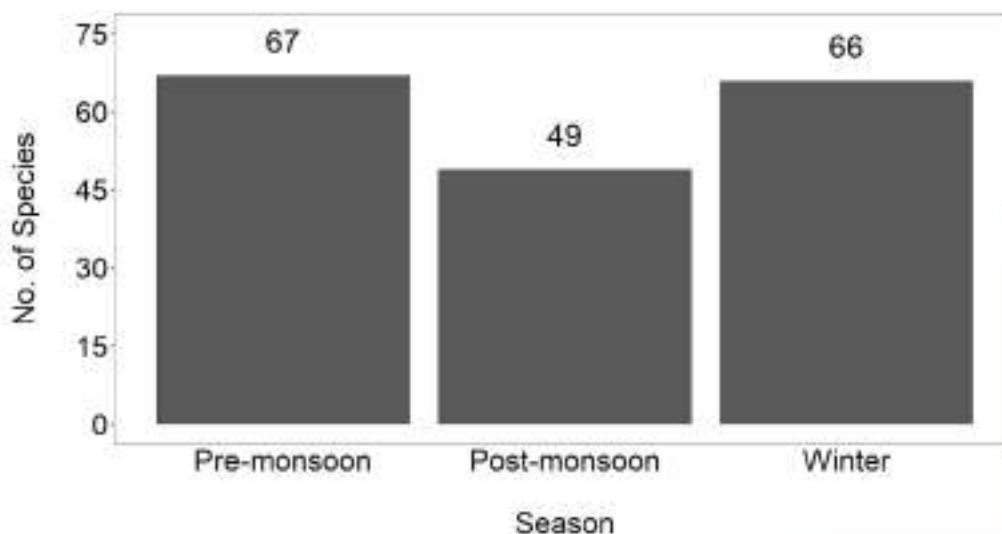
Grid number 17- water pond and grid number 32- plantation behind faculty housing complex had maximum diversity of birds, with 26 and 24 species respectively recorded from these grids (Map 9). Most Schedule 1 species within the campus was recorded from grid number 12, viz. Brahminy Kite (*Haliastur indus*) (IMG. 6), Rufous-bellied Eagle and Small Minivet (*Pericrocotus cinnamomeus*) (Map 10).





IMG. 6: Brahminy Kite photographed in GIM campus.

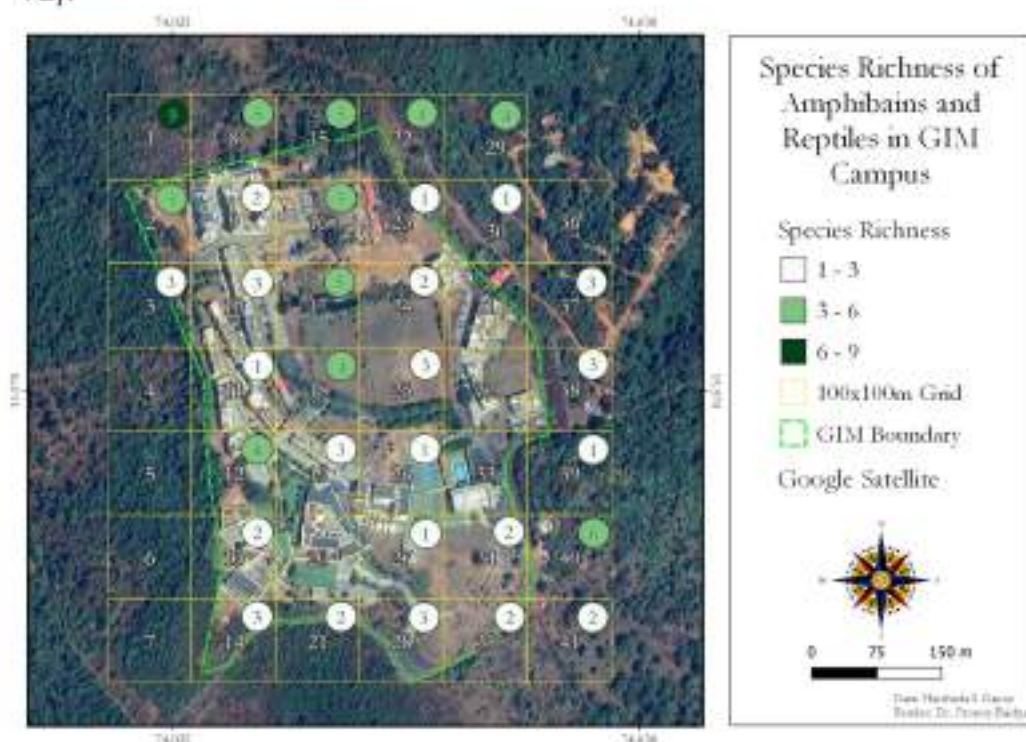
There was distinct seasonality in species richness of birds within the campus, with maximum species recorded in pre-monsoon and winter season (Graph 1). This is an expected pattern due to bolstering of the regional species pool with influx of migratory and passage migratory bird species.



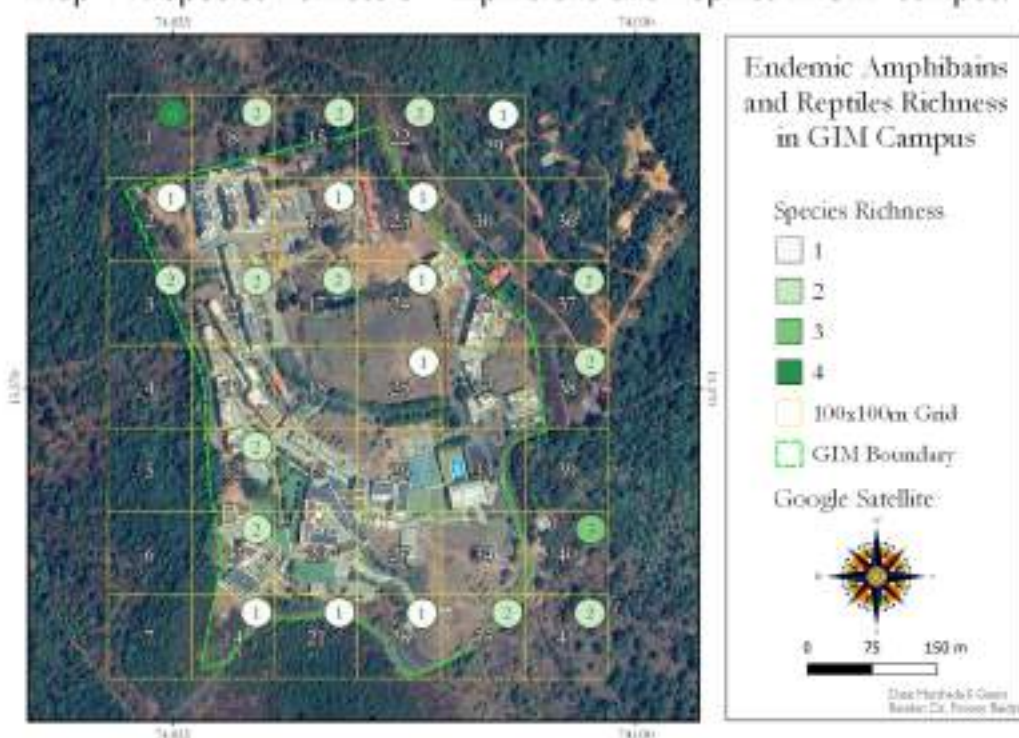
Graph 1: Seasonality in species richness of birds of GIM campus.

## Reptiles and Amphibians

Seventeen species of reptiles and amphibians have been recorded from the GIM campus of which, 14 species were recorded (12 amphibians and 2 reptiles) during the monsoon surveys (Annexure 4, Map 11). Of these 12 amphibians, five species are endemic to Western Ghats (Map 12).



Map 11: Species richness of Amphibians and Reptiles in GIM campus.

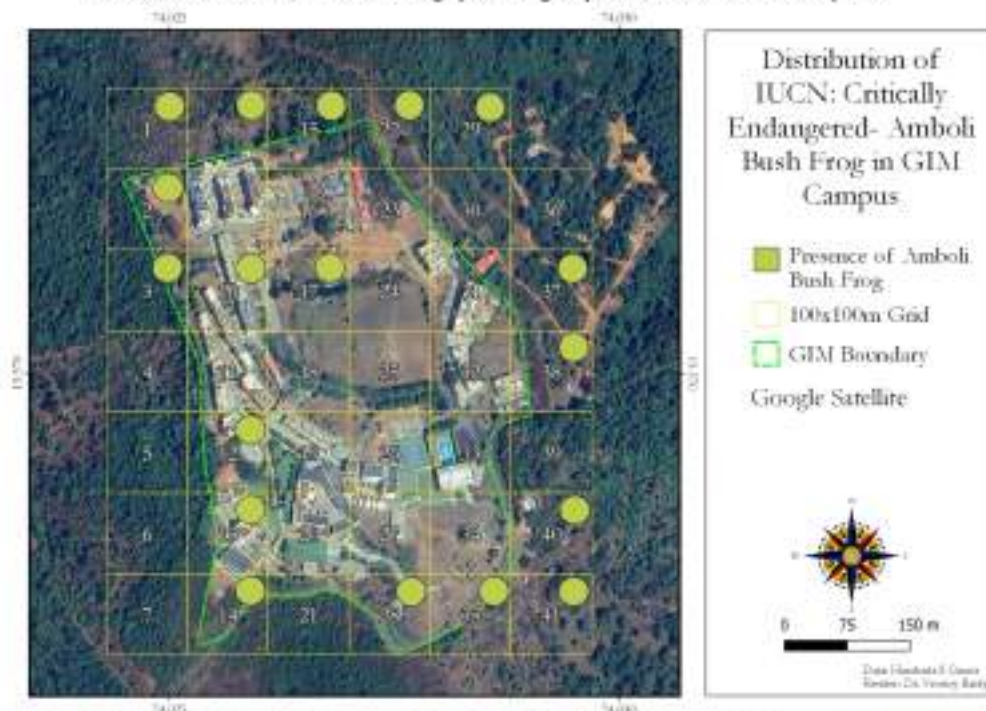


Map 12: Richness of endemic Amphibians and Reptiles in GIM campus

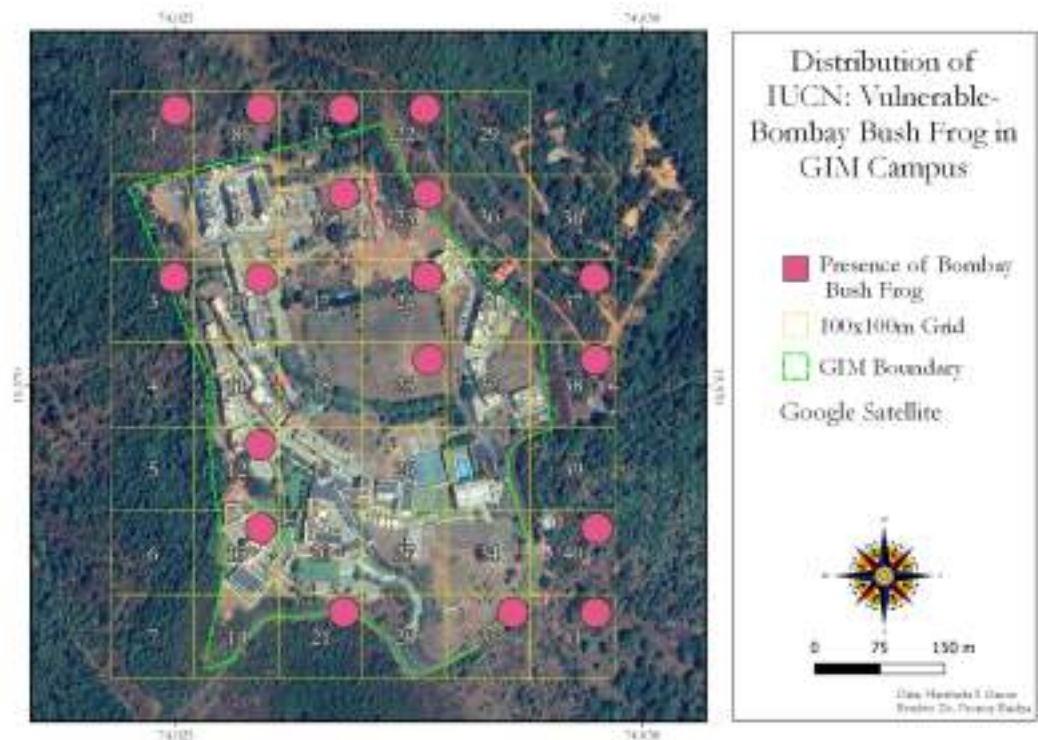
Three species are in the threatened species list of IUCN Red Data Book. Amboli Bush Frog (*Pseudophilautus amboli*) (IMG. 7) designated as Critically Endangered species by IUCN and Bombay Bush Frog (*Raorchestes bombayensis*), designated as Vulnerable were the most widely distributed and frequently recorded species on the campus, with distributions in 18 out of 36 grids that were surveyed (Map 13 & 14).



IMG. 7: Amboli Bushfrog photographed in GIM campus.

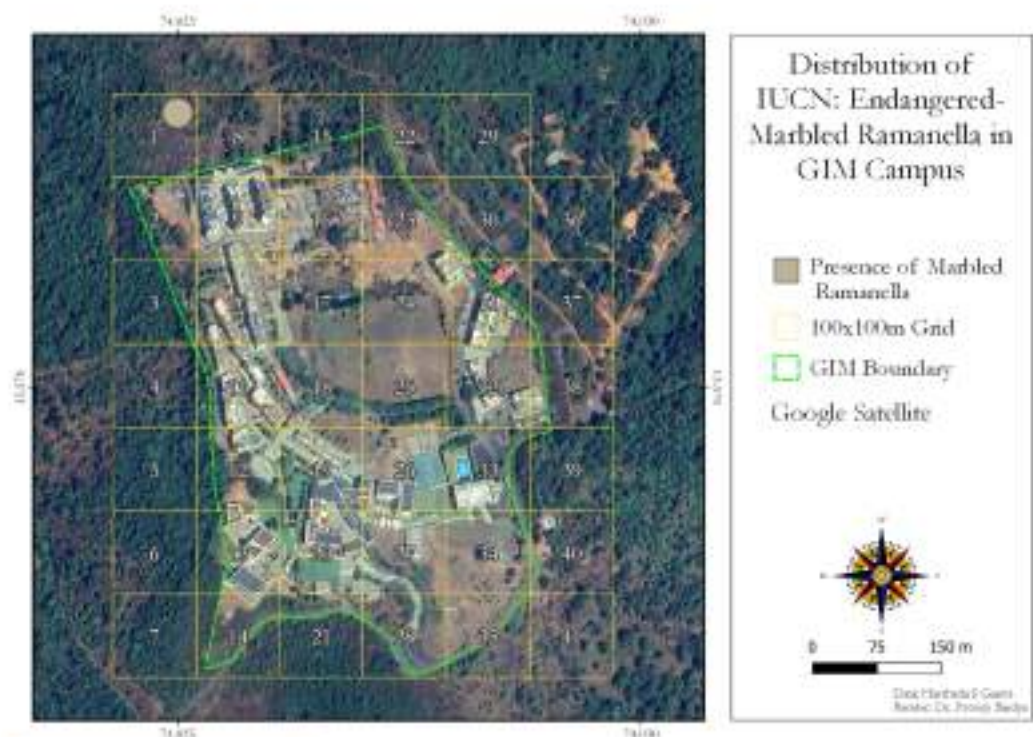


Map 13: Distribution of Amboli Bush Frog in GIM campus.



Map 14: Distribution of Bombay Bush Frog in GIM campus.

Marbled Ramanella (*Uperodon marmoratus*) (IMG. 8) another Endangered species was also recorded from the surveys, but outside the campus (Map 15), which makes it possible for this species to also be found within the campus.



Map 15: Distribution of Marbled Ramanella in GIM campus.



IMG. 8: Marbled Ramanella photographed in GIM campus.

The highlight of the survey was the observation and record of the endemic and charismatic frog of Western Ghats – Malabar Gliding Frog (*Rhacophorus malabaricus*) at the water pond. This is a very important observation, and a species-specific management plan has been suggested in section "Faunal Diversity Management Plan". Other than the 14 species recorded in the monsoons, 3 other species were recorded incidentally that include the Northern Western Ghats Vine Snake (*Ahaetulla borealis*), Indian Rat Snake (*Ptyas mucosa*), and Indian Wolf Snake (*Lycodon aulicus*).

Species Richness of Butterflies in GIM Campus

100x100 m Survey Grids

GIM Campus Boundary

Species Richness

1 - 4

5 - 7

8 - 10

11 - 13

Google Satellite Base Map

0 75 150 m

Don: Harshada S. Vemur  
Rishi: Dr. Dinesh Bhatia

Distribution of WPA Schl. II Part H Butterfly Species on GIM Campus

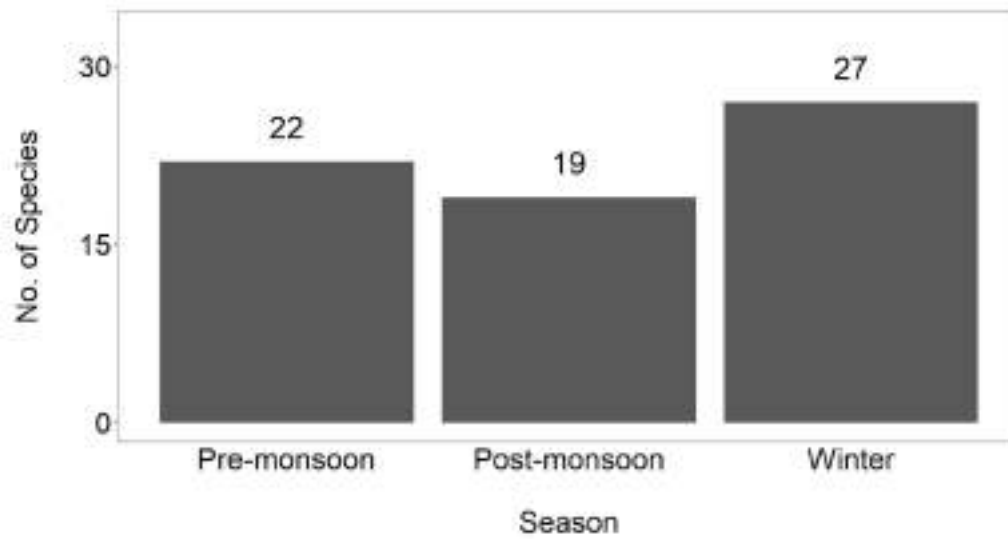
100x100 m Survey Grids  
GIM Campus Boundary  
No. of Species  
1  
2  
3  
4  
Google Satellite Base Map

0 75 150 m

Draw: Harshada B. Ghore  
Border: Dr. Dnyanesh Bhatnagar

Map 17: Distribution of Schedule II butterflies in GIM campus.

There was considerable seasonality observed in species richness of butterflies on the campus, with 22 species recorded in pre-monsoon, 19 in post-monsoon and 27 in winter (Graph 2).



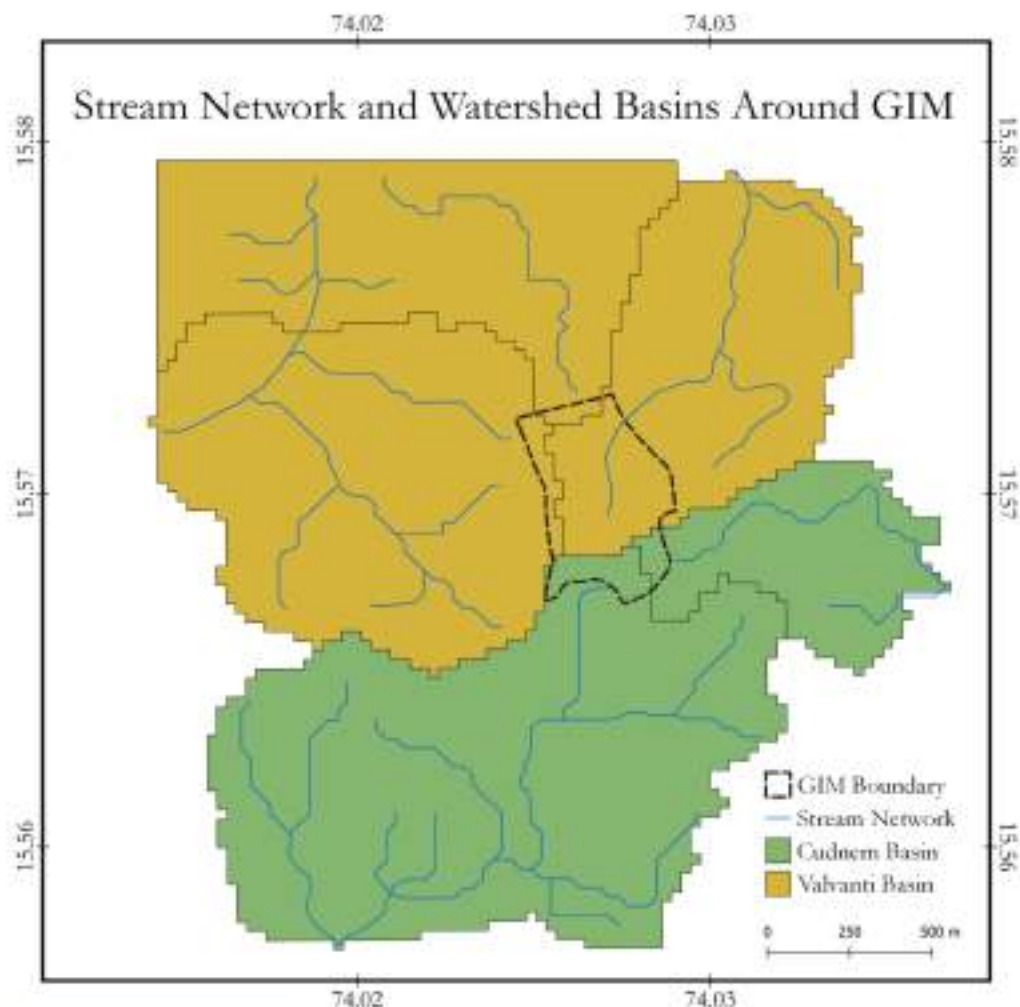
Graph 2: Seasonality in species richness of butterflies of GIM campus.



IMG. 9: Lesser Grass Blue photographed in GIM campus.

# STREAM NETWORK AND WATERSHED

There are nine seasonal streams that originate around the GIM campus. The campus is situated majorly in the watershed basin that supplies to Valvanti River, while a very small portion towards the front end of the campus is within the Cudnem river basin. Analysis of DEM data shows a stream that used to originate from the present football ground on the campus and flowing out towards Valvanti river. However, this area has now been modified due to construction activities. While remnants of later portion of the stream is still visible between the labour settlement and faculty residential complex, due to alteration of the landscape within the campus, no traces of the modelled stream could be seen upstream. All other seasonal streams were observed to drain water to the respective watershed basins around the periphery of the campus.



# FAUNAL DIVERSITY MANAGEMENT PLAN


The present study was envisioned with two major objectives a) assessing faunal diversity attributes within the campus of Goa Institute of Management and b) preparing a management plan for integrating overall biodiversity conservation and sustainable development within the campus.

For faunal diversity data, a three-season approach was used to undertake this study with surveys being conducted in pre-monsoon (summer), post-monsoon and winter seasons with an additional monsoon season survey for herpetofauna (amphibians and reptiles). The area around the GIM campus in general has faunal biodiversity studies that have been conducted in the past. These include several bachelor's degree dissertation projects from the Zoology department of Government College of Arts, Science and Commerce- Sanquelim and biodiversity assays by various mining companies situated around the GIM campus either for environmental clearance documents or for biodiversity management plans prepared for their zone of operational influence. Since, many of these documents are not available for public access, the present report completely depends on the primary surveys that have been conducted.

It is important to note that any faunal survey done within a given time frame and using probabilistic sampling methods will always yield observational records, that are not a complete representation of the entire community unless a species accumulation is obtained (Chao et al. 2009). However, for the purpose of creation of a biodiversity management plan, it is more important to focus on species that are present in exactly half of all the sites that are surveyed and rarer species do not contribute much to this exercise (Brasil et al. 2020, Baidya and Bagchi 2022).

The first step towards formulation and development of a biodiversity conservation management plan is the identification of threatened species viz., Critically Endangered, Endangered, Vulnerable species of IUCN Red List and Schedule I species of Indian Wildlife Protection Act (1972) (Table 2).





S.No	Group	No. of Species	CR	EN	VU	Sch-1
1	Mammals	8				4
2	Birds	85				9
3	Reptiles	5				1
4	Amphibians	12	1	1	1	
5	Butterflies	35				
Total		145	1	1	1	14

Table 2. Cumulative list of threatened and protected species from GIM campus. CR- Critically Endangered, EN- Endangered, VU- Vulnerable and Sch-1 - Species protected under Schedule 1 of Wildlife Protection Act 1972.

Based on this assessment, following management plans identified under this study are listed:

1. Development of area in grid number 17 as a faunal biodiversity refugia through Species/ group specific habitat enhancement.
2. Supplementing gardens and lawns in grid number 12, 13, 19, 20, 26 and 33 with native flowering plants that are butterfly host and nectar plants.
3. Creation of an active eco- club in the campus.
4. Long-term monitoring of biodiversity in the campus and participation in global biodiversity documentation events.

## 1. Development of area in grid number 17

Grid number 17 encompasses the area around the water treatment facility. The pond is lined with shade trees, banana plants and other understory floral elements. There is a Silk Cotton tree within this grid is a regular roosting tree for Asian Green Bee-eater (*Merops orientalis*) and in the winter for Blue-tailed Bee-eater (*Merops philippinus*). Further, the hostel blocks in the adjacent grid (no 10) are a regular nesting site for Dusky Crag Martin (*Ptyonoprogne concolor*). Grid number 17 also is a breeding area for the Malabar Gliding Frog, while several understory birds forage around the bushes in this grid. Further, maximum bird species have been recorded from this grid. Considering the existing value of the area in grid number 17 for faunal diversity, the concept of land sharing can be applied to integrate this area within the existing and future framework for sustainably developing the campus of GIM. The area within grid number 17 can be subjected to the following habitat enrichment process:

### 1. Habitat enhancement for Malabar Gliding Frog (*Rhacophorus malabaricus*)

The Malabar Gliding Frog is an endemic species of the Western Ghats and habitat degradation is a major cause of concern for this species (Kadadevaru and Kanamadi 2000). Males are smaller than females. They are arboreal species tropical moist evergreen, deciduous and secondary forests in Goa (IMG, 10). Females of this species usually build foam nests on their own with no help from the males. The foam nest is attached to leaves of understory vegetation or small sized trees with branches overhanging small puddles or perennial stagnant waterbodies (IMG, 11). It takes 5-7 days for the tadpoles to drop into the waterbody. It takes 8-15 days for tadpoles to completely develop.

- a. Understory vegetation is essential for this species to nest. It is important that along the periphery of the pond, understory vegetation is supplemented with broad-leaved understory vegetation.
- b. Water in the pond needs to be clean and free of chemical pollutants. Biological oxygen demand (BOD) should ideally be maintained below 10 mg/l. If this is not possible, a supplementary shallow seasonal pool can be made in this grid that is operational only in the monsoon season.
- c. This site needs to be continually monitored for breeding success and the effectiveness of this management intervention.





IMG. 10: Mating pair of Malabar Gliding Frogs (Representational image by Mayur Gawas)



IMG. 11: Foam nest of Malabar Gliding Frog attached to leaves (Representational image by Mayur Gawas)

## 2. Development of artificial water sources for birds

Birds are well known to be attracted towards sources of clean water during the hot summer months in Goa. Artificial development of such structure within grid number 17 will be of high conservation value. For this, a shallow pond with depth not exceeding 5-8 cm at the peripheral regions can be constructed. The pond should be cluttered with boulders of various sizes and peripheral understory vegetation should be planted to provide adequate perching sites. The water in the pond should be regularly changed or a continuous flow should be ensured. To keep stray dogs out of this region, the area can additionally be fenced. This structure can additionally be used for habitat enhancement for Malabar Gliding Frog in the monsoons.

The following shrub species can be considered for peripheral understory plantations in grid number 17: *Alsodephne semicarpifolia*, *Tabernaemontana alternifolia*, *Allophylus cobbe*, *Leea indica*, *Ixora coccinea*, *Moullava spicata*, *Senna tora*, *Clerodendrum infortunatum*.

Further, it must be ensured that the existing Silk Cotton Tree is not subjected to further disturbance. Standing instructions must be given to house-keeping staff to not clear nests of Dusky Crag Martins in the hostel blocks during their breeding season for the purpose of cleaning (IMG. 12).



IMG. 12: (L) Dusky Crag Martin (R) Nest, circled area shows clearing

## 2. Developing butterfly friendly habitats

Existing gardens and lawns in grid number 12, 13, 19, 20, 26 and 33 have several exotic plants which are of high aesthetic value, but low value to local biodiversity and contribution to local ecosystem services.

Currently, seven species have been identified that are protected under the Schedule 2 Part H of the Wildlife Protection Act. It is of prime importance to maintain and enhance the richness and abundance of this ecologically important group through targeted plantation of host plants in the gardens within the campus by adopting the concept of land sharing, instead of developing a dedicated butterfly garden.

Below, a list of host plants for the seven species protected under the WPA is provided. To note that this list is derived from a study from the entire Western Ghats (Nitin et al. 2018), and suitable plants for the context of Goa must be selected from the below list for habitat enrichment activities.

Common Name	Scientific Name	Known Host Plants
Common Gull	<i>Cepora nerissa</i>	<i>Cadaba fruticosa</i> (Wynter-Blyth 1957; Kunte 2000), <i>Capparis baducca</i> (Wynter-Blyth 1957; Kunte 2000), <i>Capparis brevispina</i> (Kalesh & Prakash 2015), <i>Capparis cleghornii</i> (Saji & Ogale 2018), <i>Capparis decidua</i> (Wynter-Blyth 1957; Kunte 2000), <i>Capparis sepiaria</i> (Robinson et al. 2010), <i>Capparis zeylanica</i> (Kunte 2006; Robinson et al. 2010), <i>Crateva adansonii</i> (V.C. Balakrishnan pers. obs. 2017), <i>Maerva oblongifolia</i> (Wynter-Blyth 1957; Kunte 2000) (Capparaceae).

Cont..

Common Name	Scientific Name	Known Host Plants
Crimson Rose	<i>Pachliopta hector</i>	<i>Aristolochia</i> (Robinson et al. 2010), <i>Aristolochia bracteolata</i> (Kalesh S. pers. obs. 2017), <i>Aristolochia griffithii</i> (Kalesh S. pers. obs. 2017), <i>Aristolochia indica</i> (Wynter-Blyth 1957; Kunte 2000; Robinson et al. 2010), <i>Aristolochia tagala</i> (Kalesh S. pers. obs. 2017) (Aristolochiaceae).
Danaid Eggfly	<i>Hypolimnas misippus</i>	<i>Asystasia gangetica</i> (Robinson et al. 2010), <i>Asystasia lawiana</i> (Kunte 2006), <i>Barleria cristata</i> (Wynter-Blyth 1957; Kunte 2000), <i>Justicia betonica</i> (Wynter-Blyth 1957; Kunte 2000) (Acanthaceae). <i>Ipomoea carnea</i> (Wynter-Blyth 1957; Kunte 2000) (Convolvulaceae). <i>Abelmoschus</i> (Wynter-Blyth 1957; Kunte 2000), <i>Abutilon</i> (Wynter-Blyth 1957; Kunte 2000; Robinson et al. 2010), <i>Hibiscus</i> (Robinson et al. 2010), <i>Sida cordifolia</i> (Wynter-Blyth 1957; Kunte 2000) (Malvaceae). <i>Portulaca oleracea</i> (Bell 1910a; Wynter-Blyth 1957; Kunte 2000), <i>Portulaca pilosa</i> (Wynter-Blyth 1957; Kunte 2000) (Portulacaceae).

Cont..

Common Name	Scientific Name	Known Host Plants
Glassy Tiger	<i>Parantica aglea</i>	<i>Calotropis gigantea</i> (Wynter-Blyth 1957; Kunte 2000), <i>Ceropegia bulbosa</i> (Wynter-Blyth 1957; Kunte 2000), <i>Ceropegia lawii</i> (Wynter-Blyth 1957; Kunte 2000), <i>Cryptolepis dubia</i> (Bell 1909a; Wynter-Blyth 1957; Kunte 2000), <i>Tylophora indica</i> (Wynter-Blyth 1957; Kunte 2000), <i>Tylophora fexuosa</i> (Davidson & Aitken 1890; Bell 1909a; Wynter-Blyth 1957; Kunte 2000) (Apocynaceae).
Pea Blue	<i>Lampides boeticus</i>	Fabaceae (Wynter-Blyth 1957; Kunte 2000; Robinson et al. 2010), <i>Abrus precatorius</i> (P. Churi pers. obs. 2017), <i>Butea monosperma</i> (Davidson et al. 1896; Bell 1918c; Wynter-Blyth 1957; Kunte 2000; Robinson et al. 2010), <i>Caesalpinia</i> (Robinson et al. 2010), <i>Cajanus cajan</i> (Davidson et al. 1896; Wynter-Blyth 1957; Bell 1918c; Kunte 2000; Robinson et al. 2010), <i>Crotalaria</i> (Robinson et al. 2010), <i>Crotalaria capensis</i> (Bell 1918c; Wynter-Blyth 1957; Kunte 2000), <i>Crotalaria juncea</i> (Robinson et al. 2010), <i>Crotalaria micans</i> (Robinson et al. 2010), <i>Crotalaria pallida</i> (Kunte 2006), <i>Crotalaria saltana</i> (Robinson et al. 2010) <b>Cont..</b>

Common Name	Scientific Name	Known Host Plants
Pea Blue	<i>Lampides boeticus</i>	<b>Cont..</b> <i>Gliricidia sepium</i> (Chhaya & Saji 2018), <i>Lablab purpureus</i> (Robinson et al. 2010), <i>Lupinus</i> (Wynter-Blyth 1957; Kunte 2000; Robinson et al. 2010), <i>Melilotus indicus</i> (Wynter-Blyth 1957; Kunte 2000), <i>Pisum</i> (Robinson et al. 2010), <i>Pisum sativum</i> (V.C. Balakrishnan pers. obs. 2017), <i>Pongamia pinnata</i> (Wynter-Blyth 1957), <i>Puerariaphaseoloides</i> (V.C. Balakrishnan pers. obs. 2017), <i>Vigna unguiculata</i> (Wynter-Blyth 1957; Kunte 2000; Robinson et al. 2010), <i>Xylia xylocarpa</i> (Robinson et al. 2010) (Fabaceae).
Southern Birdwing	<i>Troides minos</i>	<i>Aristolochia griffithii</i> (Wynter-Blyth 1957; Kunte 2000), <i>Aristolochia indica</i> (Robinson et al. 2010), <i>Aristolochia tagala</i> (Wynter-Blyth 1957; Kunte 2000), <i>Braganta wallichii</i> (= <i>Thotea wallichii</i> , see a note under <i>Braganta wallichii</i> ) (Robinson et al. 2010), <i>Thotea siliquosa</i> (Wynter-Blyth 1957; Kunte 2000) (Aristolochiaceae).

Cont..



Common Name	Scientific Name	Known Host Plants
Tailless Lineblue	<i>Prosotas dubiosa</i>	<i>Mallotus philippensis</i> (P. Churi pers. obs. 2017) (Euphorbiaceae). <i>Acacia</i> (Wynter-Blyth 1957), <i>Acacia caesia</i> (V.C. Balakrishnan pers. obs. 2017), <i>Acacia torta</i> (P. Churi pers. obs. 2017), <i>Leucaena leucocephala</i> (V.C. Balakrishnan pers. obs. 2017), <i>Lysiloma latsilium</i> (Wynter-Blyth 1957), <i>Mimosa invisa</i> (V.C. Balakrishnan pers. obs. 2017), <i>Mimosa pudica</i> (Wynter-Blyth 1957), <i>Pithecellobium dulce</i> (V.C. Balakrishnan pers. obs. 2017) (Fabaceae).

Further, a list of general plants is given below which can also be good host and nectar plants for a wide range of butterflies.

S.No.	Species	Habit
1	<i>Acacia catechu</i>	Tree
2	<i>Adhatoda zeylanica</i>	Shrub
3	<i>Adina cordifolia</i>	Tree
4	<i>Ageratum conyzoids</i>	Herb
5	<i>Bauhinia purpurea</i>	Tree

Cont..

S.No.	Species	Habit
6	<i>Bauhinia variegata</i>	Tree
7	<i>Bombax ceiba</i>	Tree
8	<i>Capparis zeylanica</i>	Shrub
9	<i>Carissa spinarum</i>	Shrub
10	<i>Cassia fistula</i>	Tree
11	<i>Oplismenus compositus</i>	Shrub
12	<i>Crotalaria hirsuta</i>	Herb
13	<i>Eranthemum pulchellum</i>	Shrub
14	<i>Flacourtia indica</i>	Tree
15	<i>Hemigraphis repensis</i>	Herb
16	<i>Polyalthia longifolia</i>	Tree
17	<i>Pongamia pinnata</i>	Tree
18	<i>Rostellularia procumbens</i>	Herb
19	<i>Ricinus communis</i>	Shrub
20	<i>Vitex negundo</i>	Shrub





### A step away from grass lawns

Grass lawns are a go to when it comes to aesthetic landscaping in urban areas. However studies have identified the negative impacts of grass lawns for native ecosystems (Simmons et al. 2011), for example grass lawns are known to have adverse impacts on native insect pollinator species, whereas having indigenous species can help improve local insect diversity and improving overall ecosystem health (Mata et al. 2021).

Further grass lawns have the below identified ecological problems:

1. High water demand
2. Low ecosystem services provided
3. Reduced ecological niches for biodiversity
4. High, maintenance related carbon footprint

To avoid these obvious ecological problems and to embrace the ideals of sustainable development goals, it is ideal to develop gardens that have more native floral components. Several alternatives are available in the landscaping market and an experienced landscape manager in tandem with an ecologist with good knowledge of local landscape will be ideal for such development.

### 3. Creation of an active eco- club in the campus

Creating active eco club in the institute can have several benefits to the students, staff, and community around the campus. The objective of this eco club should be to increase awareness of environmental issues and motivate people to instil and inculcate ethos towards environment. In an ideal scenario, designated members of an eco-club can host activities as per the 6. Callender of Internationally significant days to celebrate environment and allied themes (Annexure 6) in whatever possible way. Some of the activities which can be easily hosted are campus clean-ups, field trips, design a nature corner, Nature and sustainability fairs and events promoting eco lifestyle. Participating in such activities can lead to more learning, more networking, and a more fulfilling experience for the students. Teachers, staff, and parents should also be encouraged to become actively involved in the club's activities. This club can help to promote, monitor, and operate environmental activities in the institute and the surrounding community and can be an effective tool for conservation and promote a sustainable practice on the campus.

#### 4. Long-term monitoring of biodiversity in the campus and participation in global biodiversity documentation events.

To begin with, Long-term biodiversity monitoring and conservation require a strong educational and outreach intervention to educate the students about the importance of healthy ecosystems. Awareness program is the process of influencing people's attitudes, emotions, knowledge, and behaviours about biodiversity and natural places. The goal of such program is to foster clear awareness of conservation issues and provide opportunities to acquire knowledge and skill to protect/conservate the resources. It is suggested to develop a robust awareness programme with the help of an ecologist or an organisation with the principles of developing knowledge, connecting, and acting towards biodiversity. Further, to begin with is recommended to target the students and staff who will be willing to implementing the programme in the institute. Introduce them to the areas of conservation priority and make them familiarise with the species documented on the campus for future documentation and maintain data in the following format which can be processed and analysed by the experts in future.

Goa Institute of Management Documentation of campus fauna			
Location:		Habitat:	Date:
S.No	Species Name	Number	Activity

Sample pro forma of a datasheet for monitoring.

Further, to engage students and staff of the campus on a global platform they can be encouraged to participate in the citizen science lead global biodiversity documentation events. Some of the events are as listed below:

1. The Great Backyard Bird Count (GBBC): GBBC is a free, global event that takes place in mid-February. It is a community science project that involves people of all ages counting birds for a snapshot of bird populations. The event is supported by the Cornell Lab of Ornithology and the National Audubon Society.



The GBBC was launched in 1998 and was the first online citizen-science project to collect data on wild birds. The information collected is analysed by scientists to understand trends in bird populations, habitat changes, and migration patterns. More information on this can be found on <https://www.birdcount.org/>

2. The Campus Bird Count: It is a sub-event of the larger Great Backyard Bird Count. It is a coordinated effort to document the birdlife in multiple campuses across India. By "campus", it includes campuses of educational and training institutions, government institutions, research stations, corporate campuses, etc. Here, a group of bird enthusiasts (from within or even outside your campus) organize in such a way that it should cover all the different areas and habitats that your campus contains. The protocol is quite flexible: basically, group would walk around, and collect as many 15-minute 'complete' lists as possible. Upload these lists through eBird Mobile app. More information can be sought on the following link <https://birdcount.in/event/cbc23/>
3. SeasonWatch: It is an India-wide program that studies the changing seasons by monitoring the annual cycles of flowering, fruiting and leaf-flush of 130+ common trees. Whether you are a school student or an undergraduate, a budding naturalist or a serial botaniser, a curious explorer or someone interested in understanding climate change through trees, this is a project where anyone can participate and need not be expert in the field. One need to register yourself with SeasonWatch website and add a tree from your neighbourhood to observe every week and upload your findings on this website! The link to know more about this is <https://www.seasonwatch.in/>

Other than these events, the institute can create accounts on global platforms like eBird (<https://ebird.org/home>), India Biodiversity portal (<https://indiabiodiversity.org/>), iNaturalist (<https://www.inaturalist.org/>) where students can upload data which can be protected on internet platform and can be stored for future generations to use rather than stacking data in manual formats. These platforms help people to upload as well as see what other people across the globe are doing in order to bring in change with the help of citizen science.

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2. Checklist of mammal species recorded from GIM campus with information on their IUCN – Conservation Status, protection accorded to them under the Wildlife Protection Act 1972, and seasonality.

S.No	Scientific Name	Common Name	IUCN	WPA	Pre-Monsoon	Post-Monsoon	Winter
1	<i>Herpestes edwardsi</i>	Indian Grey Mongoose	LC	Sch I	x	x	x
2	<i>Funambulus palmarum</i>	Three-striped Palm Squirrel	LC		x	x	x
3	<i>Lepus nigricollis</i>	Black-naped Hare	LC		x	x	
4	<i>Canis aureus indicus</i>	Indian Jackal	LC	Sch I	x		
5	<i>Sus scrofa</i>	Indian Wild Boar	LC	Sch II	x		
6	<i>Hystrix indica</i>	Indian Crested Porcupine	LC	Sch I	x		
7	<i>Ratufa indica</i>	Malabar Giant Squirrel	LC	Sch I		x	
8	<i>Pteropus medius</i>	Indian Flying Fox	LC				x

**3. Checklist of bird species recorded from GIM campus with information on their IUCN – Conservation Status, protection accorded to them under the Wildlife Protection Act 1972, Western Ghats endemic distribution and seasonality.**

S. No	Order	Family	English Name	IUCN Category	WPA Schedule	Endemic (Western Ghats)	Pre-Monsoon	Post-Monsoon	Winter
1	Galliformes	Phasianidae	Indian Peafowl	Least Concern	Schedule-I			X	x
2	Galliformes	Phasianidae	Red Spurfowl	Least Concern	Schedule-II		X		
3	Columbiformes	Columbidae	Grey-fronted Green Pigeon	Least Concern	Schedule-II	X	X		x
4	Columbiformes	Columbidae	Rock Pigeon	Least Concern	Not protected		X	X	x
5	Columbiformes	Columbidae	Spotted Dove	Least Concern	Schedule-II		X	X	x
6	Cuculiformes	Cuculidae	Asian Koel	Least Concern	Schedule-II		X	X	x
7	Cuculiformes	Cuculidae	Greater Coucal	Least Concern	Schedule-II		X	X	x
8	Cuculiformes	Cuculidae	Grey-bellied Cuckoo	Least Concern	Schedule-II		X		x
9	Caprimulgiformes	Apodidae	Indian House Swift	Least Concern	Schedule-II		X	X	x
10	Caprimulgiformes	Apodidae	Indian Swiftlet	Least Concern	Schedule-I			X	
11	Caprimulgiformes	Apodidae	Asian Palm Swift	Least Concern	Schedule-II				x

S. No	Order	Family	English Name	IUCN Category	WPA Schedule	Endemic (Western Ghats)	Pre-Monsoon	Post-Monsoon	Winter
12	Gruiformes	Rallidae	White-breasted Waterhen	Least Concern	Schedule-II		X	X	X
13	Charadriiformes	Charadriidae	Red-wattled Lapwing	Least Concern	Schedule-II		X	X	X
14	Charadriiformes	Scolopacidae	Wood Sandpiper	Least Concern	Schedule-II		X		X
15	Charadriiformes	Charadriidae	Yellow-wattled Lapwing	Least Concern	Schedule-II				X
16	Pelecaniformes	Ardeidae	Cattle Egret	Least Concern	Schedule-II		X	X	X
17	Pelecaniformes	Ardeidae	Indian Pond Heron	Least Concern	Schedule-II			X	
18	Accipitriformes	Accipitridae	Black Eagle	Least Concern	Schedule-I		X		
19	Accipitriformes	Accipitridae	Black Kite	Least Concern	Schedule-II		X		X
20	Accipitriformes	Accipitridae	Brahminy Kite	Least Concern	Schedule-I		X	X	X
21	Accipitriformes	Accipitridae	Crested Serpent Eagle	Least Concern	Schedule-I		X		X
22	Accipitriformes	Accipitridae	Oriental Honey Buzzard	Least Concern	Schedule-II		X		
23	Accipitriformes	Accipitridae	Rufous-bellied Eagle	Near Threatened	Schedule-I		X		
24	Accipitriformes	Accipitridae	Shikra	Least Concern	Schedule-I		X		X
25	Strigiformes	Strigidae	Jungle Owlet	Least Concern	Schedule-II		X		

S. No	Order	Family	English Name	IUCN Category	WPA Schedule	Endemic (Western Ghats)	Pre-Monsoon	Post-Monsoon	Winter
26	Bucerotiformes	Bucerotidae	Malabar Pied Hornbill	Near Threatened	Schedule-I		X		
27	Coraciiformes	Meropidae	Blue-tailed Bee-eater	Least Concern	Schedule-II		X	X	X
28	Coraciiformes	Meropidae	Green Bee-eater	Least Concern	Schedule-II		X	X	X
29	Coraciiformes	Coraciidae	Indian Roller	Least Concern	Schedule-II			X	X
30	Coraciiformes	Alcedinidae	White-throated Kingfisher	Least Concern	Schedule-II		X	X	X
31	Piciformes	Picidae	Black-rumped Flameback	Least Concern	Schedule-II		X		
32	Piciformes	Picidae	Brown-capped Pygmy Woodpecker	Least Concern	Schedule-II		X		
33	Piciformes	Megalaimidae	Brown-headed Barbet	Least Concern	Schedule-II		X		
34	Piciformes	Megalaimidae	Coppersmith Barbet	Least Concern	Schedule-II		X		X
35	Piciformes	Megalaimidae	White-cheeked Barbet	Least Concern	Schedule-II		X	X	X
36	Psittaciformes	Psittaculidae	Plum-headed Parakeet	Least Concern	Schedule-II		X		X
37	Psittaciformes	Psittaculidae	Rose-ringed Parakeet	Least Concern	Schedule-II			X	X
38	Psittaciformes	Psittaculidae	Vernal Hanging Parrot	Least Concern	Schedule-II		X	X	X

S. No	Order	Family	English Name	IUCN Category	WPA Schedule	Endemic (Western Ghats)	Pre-Monsoon	Post-Monsoon	Winter
39	Passeriformes	Dicruridae	Ashy Drongo	Least Concern	Schedule-II		X	X	X
40	Passeriformes	Cisticolidae	Ashy Prinia	Least Concern	Schedule-II		X	X	X
41	Passeriformes	Artamidae	Ashy Woodswallow	Least Concern	Schedule-II		X		
42	Passeriformes	Hirundinidae	Barn Swallow	Least Concern	Schedule-II		X		X
43	Passeriformes	Dicruridae	Black Drongo	Least Concern	Schedule-II		X		X
44	Passeriformes	Campephagidae	Black-headed Cuckooshrike	Least Concern	Schedule-II		X	X	X
45	Passeriformes	Oriolidae	Black-hooded Oriole	Least Concern	Schedule-II		X	X	X
46	Passeriformes	Acrocephalidae	Blyth's Reed Warbler	Least Concern	Schedule-II		X	X	X
47	Passeriformes	Laniidae	Brown Shrike	Least Concern	Schedule-II			X	X
48	Passeriformes	Aegithinidae	Common Iora	Least Concern	Schedule-II		X	X	X
49	Passeriformes	Cisticolidae	Common Tailorbird	Least Concern	Schedule-II		X	X	X
50	Passeriformes	Vangidae	Common Woodshrike	Least Concern	Schedule-II		X		
51	Passeriformes	Hirundinidae	Dusky Crag Martin	Least Concern	Schedule-II		X	X	X
52	Passeriformes	Phylloscopidae	Green Warbler	Least Concern	Schedule-II			X	X

S. No	Order	Family	English Name	IUCN Category	WPA Schedule	Endemic (Western Ghats)	Pre-Monsoon	Post-Monsoon	Winter
53	Passeriformes	Phylloscopidae	Greenish Warbler	Least Concern	Schedule-II			X	X
54	Passeriformes	Cisticolidae	Grey-breasted Prinia	Least Concern	Schedule-II		X	X	X
55	Passeriformes	Corvidae	House Crow	Least Concern	Not protected		X	X	X
56	Passeriformes	Muscicapidae	Indian Robin	Least Concern	Schedule-II		X	X	X
57	Passeriformes	Leiothrichidae	Jungle Babbler	Least Concern	Schedule-II		X	X	X
58	Passeriformes	Sturnidae	Jungle Myna	Least Concern	Schedule-II		X	X	X
59	Passeriformes	Corvidae	Large-billed Crow	Least Concern	Schedule-II		X	X	X
60	Passeriformes	Dicaeidae	Nilgiri Flowerpecker	Least Concern	Schedule-II	X	X		X
61	Passeriformes	Turdidae	Orange-headed Thrush	Least Concern	Schedule-II		X		X
62	Passeriformes	Muscicapidae	Oriental Magpie Robin	Least Concern	Schedule-II		X	X	X
63	Passeriformes	Motacillidae	Paddyfield Pipit	Least Concern	Schedule-II			X	X
64	Passeriformes	Dicaeidae	Pale-billed Flowerpecker	Least Concern	Schedule-II			X	
65	Passeriformes	Pellorneidae	Puff-throated Babbler	Least Concern	Schedule-II		X		
66	Passeriformes	Nectariniidae	Purple Sunbird	Least Concern	Schedule-II		X	X	X

S. No	Order	Family	English Name	IUCN Category	WPA Schedule	Endemic (Western Ghats)	Pre-Monsoon	Post-Monsoon	Winter
67	Passeriformes	Nectariniidae	Purple-rumped Sunbird	Least Concern	Schedule-II		X	X	X
68	Passeriformes	Hirundinidae	Red-rumped Swallow	Least Concern	Schedule-II		X	X	X
69	Passeriformes	Pycnonotidae	Red-vented Bulbul	Least Concern	Schedule-II		X	X	X
70	Passeriformes	Pycnonotidae	Red-whiskered Bulbul	Least Concern	Schedule-II		X	X	X
71	Passeriformes	Campephagidae	Small Minivet	Least Concern	Schedule-I		X	X	X
72	Passeriformes	Rhipiduridae	Spot-breasted Fantail	Least Concern	Schedule-II		X	X	X
73	Passeriformes	Dicaeidae	Thick-billed Flowerpecker	Least Concern	Schedule-II		X		
74	Passeriformes	Muscicapidae	Tickell's Blue Flycatcher	Least Concern	Schedule-II		X	X	X
75	Passeriformes	Motacillidae	Tree Pipit	Least Concern	Schedule-II			X	X
76	Passeriformes	Pycnonotidae	White-browed Bulbul	Least Concern	Schedule-II		X		X
77	Passeriformes	Motacillidae	White-browed Wagtail	Least Concern	Schedule-II		X	X	X
78	Passeriformes	Hirundinidae	Wire-tailed Swallow	Least Concern	Schedule-II		X		X
79	Passeriformes	Paradoxornithidae	Yellow-eyed Babbler	Least Concern	Schedule-II		X		X
80	Passeriformes	Passeridae	Yellow-throated Sparrow	Least Concern	Schedule-II				X

S. No	Order	Family	English Name	IUCN Category	WPA Schedule	Endemic (Western Ghats)	Pre-Monsoon	Post-Monsoon	Winter
81	Passeriformes	Sturnidae	Chestnut-tailed Starling	Least Concern	Schedule-II				X
82	Passeriformes	Dicruridae	Greater Racket-tailed Drongo	Least Concern	Schedule-II				X
83	Passeriformes	Laniidae	Long-tailed Shrike	Least Concern	Schedule-II				X
84	Passeriformes	Muscicapidae	Red-breasted Flycatcher	Least Concern	Schedule-II				X
85	Passeriformes	Hirundinidae	Streak-throated Swallow	Least Concern	Schedule-II				X

4. Checklist of herpetofauna recorded from GIM campus with information on their IUCN – Conservation Status, protection accorded to them under the Wildlife Protection Act 1972, Western Ghats endemic distribution.

S.No	Species	Scientific Name	Order	IUCN	Endemic	WPA status
1	Amboli Bush Frog	<i>Pseudophilautus amboli</i>	Anura	Critically Endangered	X	
2	Bombay Bush Frog	<i>Philautus bombayensis</i>	Anura	Vulnerable	X	
3	Common Indian Toad	<i>Duttaphrynus melanostictus</i>	Anura			
4	Cricket Frog sp.	<i>Fejervarya</i> sp.	Anura			
5	Dobson's Burrowing Frog	<i>Sphaerotheca dobsonii</i>	Anura		X	
6	Indian Bullfrog	<i>Hoplobatrachus tigerinus</i>	Anura			Schedule II
7	Indian Tree Frog	<i>Polypedates maculatus</i>	Anura			
8	Indian Leaping Frog sp.	<i>Indirana</i> sp.	Anura			
9	Malabar Gliding Frog	<i>Rhacophorus malabaricus</i>	Anura		X	
10	Marbled Ramanella	<i>Uperodon mormoratus</i>	Anura	Endangered	X	
11	Ornate Narrow-mouthed Frog	<i>Microhyla ornata</i>	Anura			
12	Skittering Frog	<i>Euphlyctis cyanophlyctis</i>	Anura			Schedule II
13	Brook's Gecko	<i>Hemidactylus brookii</i>	Squamata			
14	Oriental Garden Lizard	<i>Calotes versicolor</i>	Squamata			
15	Northern Western Ghats Vine Snake	<i>Ahaetulla borealis</i>	Squamata		X	Schedule II
16	Indian Rat Snake	<i>Ptyas mucosa</i>	Squamata			Schedule I
17	Indian Wolf Snake	<i>Lycodon aulicus</i>	Squamata			Schedule II

5. Checklist of butterfly species recorded from GIM campus with information on their IUCN – Conservation Status, protection accorded to them under the Wildlife Protection Act 1972, Western Ghats endemic distribution and seasonality.

S.No	Scientific Name	Common Name	WPA status	Pre-Monsoon	Post-Monsoon	Winter
1	<i>Junonia iphita</i>	Chocolate Pansy			X	X
2	<i>Hasora badra</i>	Common Awl		X		
3	<i>Catopsilia pomona</i>	Common Emigrant		X	X	X
4	<i>Melanitis leda</i>	Common Evening Brown		X		
5	<i>Ypthima huebneri</i>	Common Four-Ring			X	X
6	<i>Eurema hecabe</i>	Common Grass Yellow		X	X	X
7	<i>Cepora nerissa</i>	Common Gull	Sch II (Part H)	X	X	X
8	<i>Euploea core</i>	Common Indian Crow		X	X	X
9	<i>Delias eucharis</i>	Common Jezebel		X	X	X
10	<i>Papilio polytes</i>	Common Mormon		X	X	X
11	<i>Castalius rosimon</i>	Common Pierrot		X		X
12	<i>Neptis hylas</i>	Common Sailor			X	X
13	<i>Pareronia valeria</i>	Common Wanderer			X	X
14	<i>Pachliopta aristolochiae</i>	Comon Rose		X	X	X
15	<i>Pachliopta hector</i>	Crimson Rose	Sch II (Part H)		X	
16	<i>Hypolimnys misippus</i>	Danaid Eggfly	Sch II (Part H)		X	X

S.No	Scientific Name	Common Name	WPA status	Pre-Monsoon	Post-Monsoon	Winter
17	<i>Parantica aglea</i>	Glassy Tiger	Sch II (Part H)	X	X	X
18	<i>Udaspes folus</i>	Grass Demon		X		
19	<i>Hebomoia glaucippe</i>	Great Orange-tip		X		X
20	<i>Rapala varuna</i>	Indigo Flash		X		
21	<i>Zizina otis</i>	Lesser Grass Blue		X		X
	<i>Junonia lemonias</i>	Lemon Pansy				X
22	<i>Lampides boeticus</i>	Pea Blue	Sch II (Part II)	X		X
23	<i>Danaus chrysippus</i>	Plain Tiger		X		X
24	<i>Chilades pandava</i>	Plains Cupid		X		X
25	<i>Leptosia nina</i>	Psyche		X		X
26	<i>Talicauda nyseus</i>	Red Pierrot		X		X
27	<i>Cupha erymanthis</i>	Rustic			X	X
28	<i>Troides minos</i>	Southern Birdwing	Sch II (Part H)		X	X
29	<i>Danaus genutia</i>	Striped Tiger			X	X
30	<i>Prosotas dubiosa</i>	Tailless Lineblue	Sch II (Part H)		X	
31	<i>Acraea violae</i>	Tawny Coster		X		
32	<i>Eurema blanda</i>	Three-spot Grass Yellow			X	
33	<i>Zizula hylax</i>	Tiny Grass Blue		X		
34	<i>Loxura atymnus</i>	Yam Fly		X		X

## 6. Callender of Internationally significant days to celebrate environment and allied themes.

S.No	Month and Date	Day
1	February 2 <sup>nd</sup>	World Wetlands Day
2	February 28 <sup>th</sup>	National Science Day
3	March 3 <sup>rd</sup>	World Wildlife Day
4	March 20 <sup>th</sup>	World Sparrow Day
5	March 21 <sup>st</sup>	International Day of Forests
6	March 22 <sup>nd</sup>	World Water Day
7	March -Last Saturday	Earth Hour Day
8	April 7 <sup>th</sup>	World Health Day
9	April 18 <sup>th</sup>	World Heritage Day
10	April 22 <sup>nd</sup>	International Mother Earth Day
11	May 22 <sup>nd</sup>	International Biodiversity Day
12	May 23 <sup>rd</sup>	World Turtle Day
14	June 5 <sup>th</sup>	World Environment Day
15	June 8 <sup>th</sup>	World Ocean Day
16	June 17 <sup>th</sup>	World Day to Combat Desertification
17	July 11 <sup>th</sup>	World Population Day
18	July 28 <sup>th</sup>	World Nature Conservation Day
19	July 29 <sup>th</sup>	International Tiger Day/ Global Tiger Day
20	August 10 <sup>th</sup>	International Biodiesel Day
21	August 12 <sup>th</sup>	World Elephant Day
22	August 20 <sup>th</sup>	Akshay Urja Diwas

S.No	Month and Date	Day
23	September 16 <sup>th</sup>	International Ozone Day
24	September 18 <sup>th</sup>	International Coastal Clean Up Day
25	September 24 <sup>th</sup>	World Rivers Day
26	October 1 <sup>st</sup> to 7 <sup>th</sup>	Wildlife Week
27	October 3 <sup>rd</sup>	World Habitat Day
28	October 4 <sup>th</sup>	World Animal Welfare Day
29	October 12 <sup>th</sup>	International Day for Natural Disaster Reduction
30	October 15 <sup>th</sup>	Annual Global Hand washing Day
31	October 24 <sup>th</sup>	United Nations Day
32	November 6 <sup>th</sup>	International Day for Preventing the Exploitation of the Environment in War & Armed Conflict
33	November 21 <sup>st</sup>	World Fisheries Day
34	December 2 <sup>nd</sup>	National Pollution Prevention Day
35	December 3 <sup>rd</sup>	Bhopal Gas Tragedy Day
36	December 5 <sup>th</sup>	World Soil Day
37	December 11 <sup>th</sup>	International Mountain Day
38	December 14 <sup>th</sup>	National Energy Conservation Day



A sleeping Garden Calotes behind canteen block.



An Indian Bullfrog behind new boys hostel.



Burrowing Frog near faculty block.



Common Indian Toad behind new boys hostel.



Indian Roller photographed in the football ground, is a local migrant to Goa.



Jungle Babblers photographed near faculty block, are often called as the seven sisters in India.



Red-breasted Flycatcher which migrates from west Europe, photographed near the admin- block.



Brown Shrike, a migratory bird from North East- Asia photographed near the football ground.



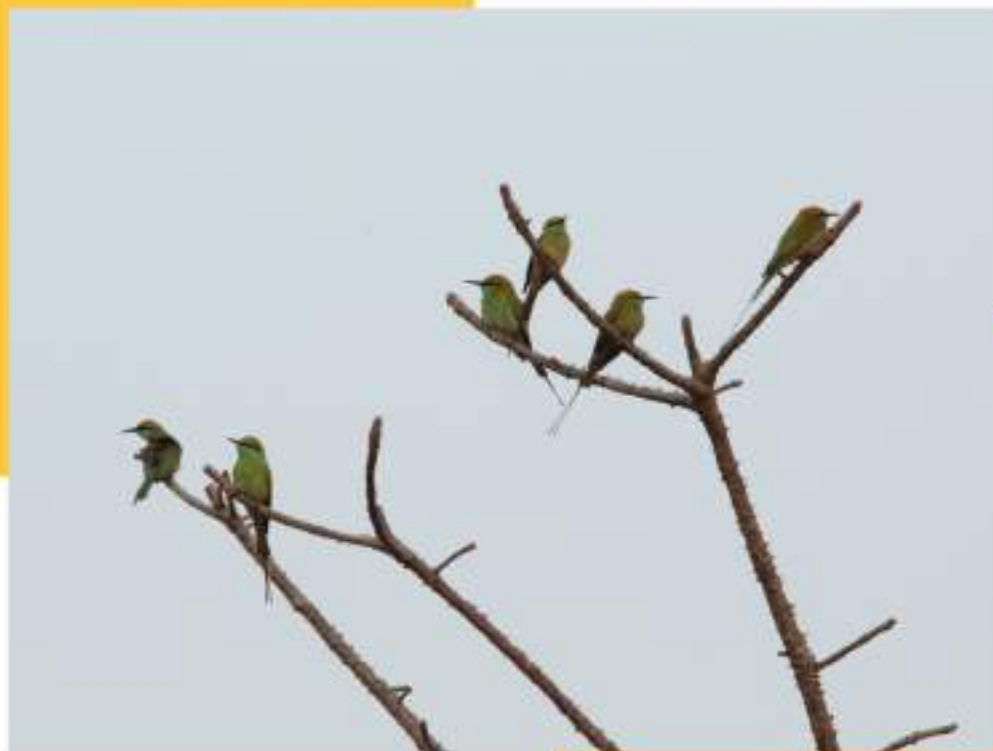
Yellow-wattled Lapwing photographed in the football ground, is facing high threat in Goa due to habitat loss and disturbance.



Paddyfield Pipit, a typical bird of Goa's plateaus and grasslands photographed in the football ground.



A pair of Rose-ringed Parakeets preening early in the morning behind faculty block.



A small breakout group from the large flock of 120+ Asian Green Bee-eaters before going to roost near the waterpond.



Yellow-throated Sparrow- a bird that inspired Dr. Salim Ali to take up ornithology as a career, photographed near car parking.



Ashy Prinia, a resident breeding bird in Goa is the most active and noisiest bird on the campus.



A colony of Asian Weaver Ant (Konkani: *Humlo*) nesting within a fruit cluster of Cluster Fig (*Ficus racemosa*; Konkani: *Rumod*).



*Polyrhachis thrinax* - a species of carton ant has been reported for the first time in Goa from GIM campus.

# FAUNA OF GOA INSTITUTE OF MANAGEMENT

Goa Institute of Management Campus, situated in Poriem, Sattari is abound with rich biodiversity. Eight species of mammals, 85 species of birds, 17 species of reptiles, amphibians and 35 species of butterflies have been documented on the campus in the past one year through rigorous surveys. A detailed faunal management plan is conceived for the campus to ensure a balanced environment that shall also achieve specific targets of SDG - 13 & 15.



CENTRE FOR EXCELLENCE IN  
**SUSTAINABLE  
DEVELOPMENT**

