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WCB RESEARCH LAB

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EDITORIAL NOTE

अशक्यं प्रकृतेः ऋते जीवनम्-

Life is impossible without Nature, so protect nature by all means!

Seasons Warm Greetings to all the contributors and readers of Prithivya!!!As the year 2021 draws near its closure, we reflect back on the activities witnessed by the world amidst the pandemic times and the most significant of these, from our point of view, were COP26, repealment of Farm Laws in India and higher number of species getting added to the list of Red data book due to their habitat loss.

COP26, the 26th conference held to discuss and develop a roadmap to combat Climate change, in Glasgow from 1-12 November 2021, saw the participation of more than 120 leaders from different countries across the world. It was agreed by all, that to keep the goal of limiting temperature rise to 1.5 degrees C within reach, there is a need to cut global emissions in half by the end of this decade. There were also strong arguments regarding the policies of Developed nations to patronize the Underdeveloped ones on their climate protection strategies. Financial provisions for achieving these goals were discussed in details and recognizing the urgency of the challenge, it was agreed that the onus of facilitation of the finances lies firmly on the Developed nations and they should urgently deliver more resources to enable the climate-vulnerable countries to combat the dangerous and costly consequences of climate change.

As for the Indian scenario on the farmer's agitation for Farm laws, there were arguments from both sides. The law makers argued about the benefits of abolishment of middle man and giving the rights of determining the price of the crop to farmers, whereas the opponents argued about corporatization of agriculture due to the abolition of the APMC 'Mandi' system and the fear of no purchase of crops on Minimum Support Price (MSP).

As a student and researcher of Wildlife, one must take cognizance of the changing scenario of the world with respect to events such as mentioned above as our research must have the final goal of achieving a far reaching objective of making people's life easier. Researchers cannot sit in their Ivory towers and alienate themselves from the ground realities related to the environment, whose management is interconnected with events happening in other fields. It would be mandatory for the teacher mentors to ignite the curious minds of their students, so that they make an effort to understand the players and their relationship at large and it reflects in the final ethos of their research. Whether we work on the fast depleting forest cover to aggressive and invasive agricultural practices or the near extinction of the species of 'Little Dodo' from American Samao islands or Leafy Chameleon from North Madagascar or Candle Pine trees from Brazil or work to protect the indigenous wealth of Indian Tribal people, the Mantra to develop a holistic attitude is to open our mind to a multidisciplinary approach and connect the small dots to achieve the final multifaceted and multi-beneficial output.

Wishing all the readers a very Happy and enlightened New Year 2022 and looking forward to expanding the 'Prithiva' family with much more contribution from our young avid researchers….

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DIRECTOR'S COLUMN

Wildlife and Conservation Biology (WCB) Research Foundation has now completed one year on September 10, 2021. We started this foundation in 2020, when the entire world was passing through the tough time of COVID 19. However, I am very pleased to share with you all that the foundation has made remarkable progress and achieved many milestones in a short period of one year. As our motto is "Adding Science to Conservation", the foundation has initiated several scientific conservation programme with the great support of our collaborators and partners.

The foundation has started the Sloth bear Conservation and Outreach programme which is supported by The Bear Trust International, USA; The Serenity Trust, India and the Allwetter Zoo of Germany. Under this programme, our team is monitoring the sloth bear population and corridor in Central Gujarat and conservation education and outreach in all the villages within this corridor. More details about this project is available on https://sites.google.com/view/slothbearconservation/home.

The foundation is now became an official partner with Coalition for wildlife corridors (http://corridorcoalition.org/), ENCOASH, the first international exchange platform on Human-Wildlife interactions (https://encosh.org/en/). I am sure this will help the students and young wildlife researchers of India to work and interact at the global level. Adding to this, we have signed aMoU with K C College, HNSC University of Mumbai for joint research and capacity building that will also open the new arena to include more people into the science based conservation activities of the foundation. Further, under the Vibrant Gujarat Summit-2022, the foundation is going to develop strategic partnership with Gujarat Forest Department and very soon we will start some new research projects in different areas of Gujarat.

At present, we are mentoring five research interns for their short term research and Master's thesis. More than 10 young researchers have presented their research in WCBinar, a virtual seminar to showcase their research in the field of wildlife and conservation biology. The foundation is also planning to organize a couple of training programme, new Internship programme and conservation programme in 2022. Please follow us on our social media (Twittter, Instagram and Facebook) as well as our official YouTube channel for regular updates. At the outset, I welcome you all to join WCB as a member, partner or as an Intern to contribute your share and our efforts to conserve the wildlife and its habitats.

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Nature heals faster than we think: The return of Cotton Pygmy-Goose (*Nettapus coromandelianus)* in Gauhati University Campus, Assam

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The Gauhati University Campus is situated within the geographical coordinates 26.148°N and 91.653°E to 26.156°N and 91.676°E. The campus is full of swamps, water bodies and forest covered hills, surrounded by human settlements and agricultural lands. The swamps and water bodies forms low-lying areas, that served as catchments for flood water during monsoon. The nutrient deposits in these low-lying areas allow various hydrophytes to bloom, including lotus, water hyacinth, pistia and a number of aquatic grasses. On the other hand forests are dominated by Teak Tectona grandis and many Ficus species, forming a dry deciduous type. The forested hills and low-lying swamps forms a tremendous diverse habitat for wild animals. The campus is well known for rich avian diversity and is a home to more than 160+ species of birds including resident, migrant and passage migrant species (Devi et al. 2012; Personal observation, uploaded in www.ebird.org). During winter many waterfowls visited these wetlands and swamps. All these water birds once used to spent couple of months feeding on it's rich food resources and preparing for the next breeding season. This annual cycle of migration have been repeated again and again. Though it is difficult to say the first visit of the migrants to the campus, may be since couple of years/decades or even earlier; from it's establishment in the year of 1948. The campus is set us on the agricultural lands full of swamps and marshes that also has small hills and hillocks of Nilachal hill ranges and is situated within the geographical coordinates 26.148°N and 91.653°E to 26.156°N and 91.676°E (Figure 1). The campus is full of swamps, water bodies and forest covered hills, surrounded by human settlements and agricultural lands. The swamps and water bodies forms low-lying areas, that served as catchments for flood water during monsoon. The nutrient deposits in these low-lying areas allow various Hydrophytes to bloom, including Lotus, Water Hyacinth, Pistia and a number of aquatic grasses. On the other hand forests are dominated by Teak Tectona grandis and many Ficus species, forming a dry deciduous forest type. The forested hills and low-lying swamps forms a tremendous diverse habitat for wild animals. Besides these, there are paddy-fields and scattered grassland patches within the

campus which in spite of traffic and human disturbances surprisingly support a large number of grassland dwelling birds. It is located close to the 'Deepor beel' Ramsar site.

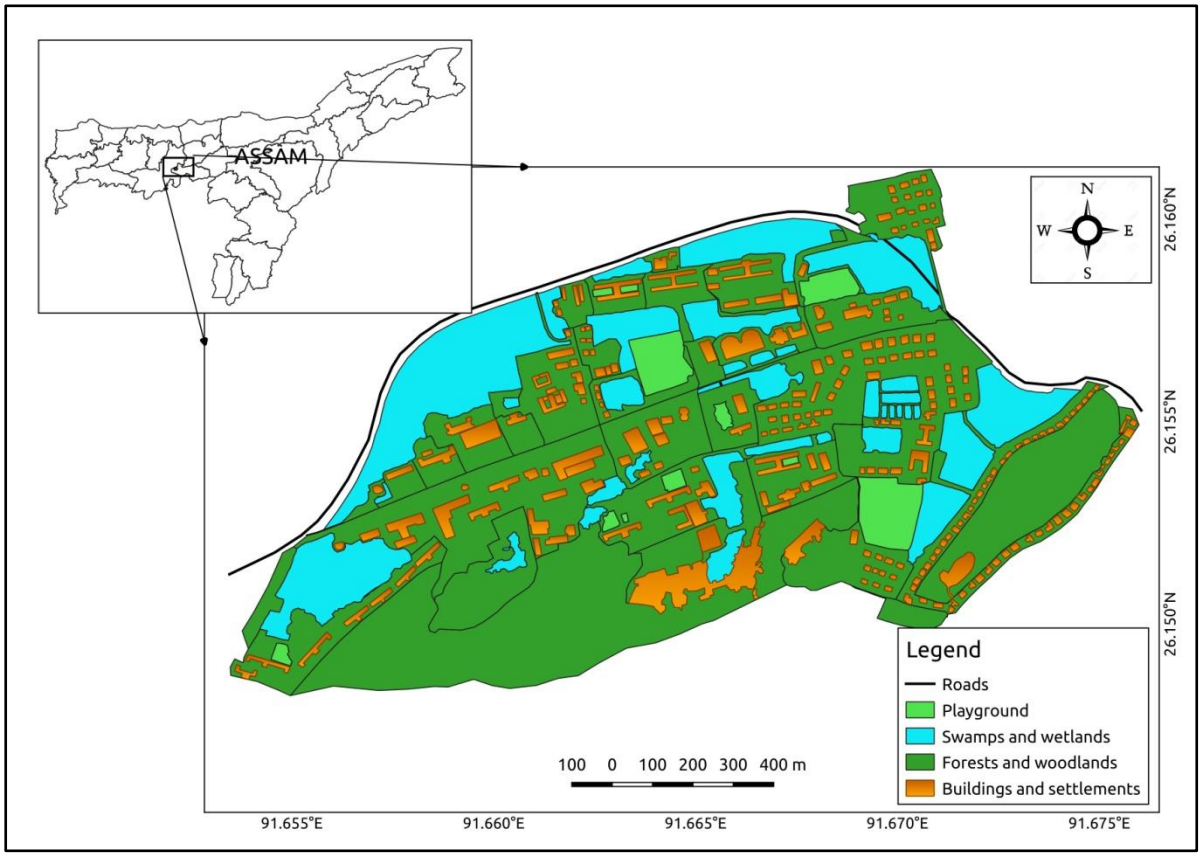

Figure 1: ***Map of Gauhati University Campus, Gauhati, Assam***

It is often said that nothing is permanent and last forever in both ecological and socioeconomic point of view. As 'succession' process in ecology, and 'development' in the socioeconomic perspective. Development is a much required in the process economic growth for developing countries which requires a cost, in the form of economy, labour and many others. But, the question is, what cost should nature pay? In the year 2012 the swamps and wetlands along the North and water bodies of Eastern boundary of the campus have been filled for diversion of the National Highway (NH–37) (Mandal et al. 2013). These abrupt change in the habitat has led to change in floral composition as well as change in physio-chemical properties of the swamps and wetlands. This in turn has resulted in less avian diversity especially water birds belonging to Anatidae family. Soon after these changes, the following year water birds did not return nor did they next. Several years have been passed, so do the developmental activities and succession. The water bodies that were filled and rolled several layers of charcoal over it. People continued using it for their transport. In the

same way, the newly constructed ponds and water bodies kept adding species and changing its community.

Figure 2: ***Cotton Pygmy-Goose Nettapuscoromandelianus in the wetlands of Gauhati University Campus***

The campus harbors more than 150 species of birds of which majority of them are residents and breeds within the campus such as Common Myna, Spotted Dove, red-vented Bulbul etc. May are local migrants and visits the campus only during particulr period of time such as Blue Whistling-Thrush (*Myophonus caeruleus*), Black-naped Monarch (*Hypothymis azurea*), Barn Swallow (*Hirundo rustica*) etc. Some also fall under IUCN red list including endangered species Greater Adjutant (*Leptoptilos dubius*) and Steppe Eagle (Aquila *nipalensis*) and Vulnerable Lesser Adjutant (*L. javanicus*). The Cotton Pygmy-Goose (Cotton Teal) (*Nettapus coromandelianus*) a widespread resident breeder in India (Baker 1897; Higgins 1926; Choudhury 1998; Dickinson 2003; Narasimmarajan et al. 2013) mostly found in wetlands of different kinds. It was on 12 February 2018 when a pair of *N. coromandelianus* was sighted within the university campus (Mandal 2018) after it's last record in 25 February 2010 (Mandal 2010). This species have been recorded after almost eight years. Though, they are resident in this region (Ali et al. 1987; Grimmett et al. 2012), but for the campus they were local migrants. As the chicks and immature have never been seen from this place nor their nests. There are several resident water bird species breeding within the campus. For instance Lesser Whistling-Duck *Dendrocygna javanica*, White-breasted Water hen *Amaurornis phoenicurus*, Eurasian Moorhen *Gallinula chloropus* and Bronze-winged Jacana *Metopidius indicus*. Now the goose species can be frequented during other months as well, for instance it was again sighted in 04 May 2019. The month of May is usually a breeding season for most of the resident species. Thus, there might be some potential habitats within the campus where they might be breeding. The wetlands of the campus still awaits for the winter visitors that once used to teem on its rich resources.

Conclusion

The *N. coromandelianus* a widespread resident breeder in India and can be seen in several smaller flocks in diverse wetlands. On the other hand, like most of the water birds, the *N. coromandelianus* is also susceptible to environmental degradation following anthropological activities. Following the major constructional changes the wetlands of Gauhati University campus has vanished so do the water birds. It was later in the 2017 when the wetlands are cleaned and cleared of weeds and vegetation, a pair of *N. coromandelianus* visited the campus next year. The removal of the infesting weeds from the wetland and their cleaning has given a chance to the water birds to return to the campus.

Acknowledgment

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Threat to Red-wattled Lapwing persistence –A short note on interaction between Red-wattled Lapwing (*Vanellus indicus)*and domestic dog (*Canis familiaris*) in agricultural areas

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Red-wattled lapwing (*Vanellus indicus*) is a prominent bird of Asian agricultural lands and is currently classified as Least Concern by IUCN red list (Arlott 2014), and belongs to the family Charadriidae. From Indian subcontinent, seven species of lapwingshave been reported, among them three are endemic to the Indian subcontinent i.e., River lapwing (*Vanellus duvaucelii*), Yellow-wattled lapwing (*Vanellus malabaricus*), and Red-wattled lapwing (*Vanellus indicus*). Red-wattled lapwing has compact body, short and thick neck with conspicuous black collar, long yellow legs, and brownish grey pointed wings (Kaur and Khera 2017). The prominent characteristic features are loud annoying alarm calls "did he do it or pity to do it", which is why it is called the did-he-do-it-bird (Kaur and Khera 2017). Red-wattled lapwing lives as ground bird and prefers to live in an open kind of habitat nearby water.

Figure 1: Red-wattled lapwing (Vanellus indicus)

Image 2: Breeding pair in post harvesting farm

During breeding period of lapwing, which generally extends from April to June (Dhandhukia and Patel 2015; Kumar et al. 2020), We have observed the interaction of Red-wattled lapwing with dogs (*Canis familiaris*), House crow (*Corvus splendens*), and human beings in the farm of Changa village (Kankrej) district- Banaskatha of

Gujarat (23° 57’59.5 N, 71°46’56.8” E). Red-wattled lapwing laid eggs on a post-harvesting farm of millet with a clutch of 4 eggs in the mid of the farm and the nest was located on a little depression of land surrounded by small twig (Figure 2).

In the early morning of 8th April, 2021 and on evening 9th April, 2021, we have observed that a dog (*Canis familiaris*) was roaming on the farm, seem like he was searching for food, suddenly two individuals of Red-wattled lapwing (Probably parent) started making aggressive noise and tried to attack the dog, and that time lapwing was successful to keep away dog from the nest. We have also observed that lapwing also tried to attack house crow (*Corvus splendens*), who tried to approach nest. Besides this, once when I was looking for the nest, lapwing started making aggressive noise and tried to attack me by flying speedily towards me, so I had to leftthe farm. After few days on 17thApril, when I visited the farm again, I could not find lapwing or nest. After inquiring and interacting with the owner of the farm, we came to know, that probably dog have destroyed the nest. We can conclude this due to presence of two dogs in the field before few days. It is now known that eggs of lapwing may lost due to some predators; may be Grey Mongoose (*Herpestes edwardsii*), or Crow (*Corvus splendens*), or Kite (*Milvus spp*), or Dogs (*Canis familiaris*), or human activity (Ploughing), and trampling by grazing animals (Naik et al. 1961). Hence due to the high rate of unsuccessful hatching and less survival ratio on ground nest, compared to the roof nest (Sethi et al. 2011), lapwing has evolved to build a nest on the roof, which is having a high rate of success in hatching and its survival (Baumann 2006; Muralidhar and Barve 2013). Generally, Red-wattled lapwing feeds on small insects and different invertebrates, thus they play an important role in biological control and pest management (Ali & Ripley 1998; Narwade et al. 2010; Kler & Kumar 2013; Kaur & Khera 2017), but despite the role of bio agents in the farm, population of lapwing is declining, due to loss of habitat and intensive agricultural practice. Besides this nest may lost due to feral dogs, uncontrolled agricultural practices (plowing), trampling by grazing animals, which contribute significantly in dimishing the population of lapwing. Thus, it is imperative to check the influence of

Image 3: Dog (Canis familiaris) fleeing from the farm after attacked of lapwing.

agricultural practices over lapwing breeding and the persistence of the population. This short observation may help to assess the threat to lapwing as well as it shows that lapwing is a highly territorial bird and has effective defensive strategies, however there is question: Will lapwing persist in human modified areas?

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Sighting of Northern Lapwing (*Vanellus vanellus*) (Linnaeus, 1758) in Bikaner, Rajasthan, India

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Introduction:

On date 14 January 2020, during Bikaner birds census 2020 at RD 507 (28.46°N, 73.25°E) near Chhatargarh, Bikaner district. While monitoring and counting of birds at small wetland, some of us saw a bird at 10.50 am, while it was feeding on the ground near the water body. The bird was extremely confiding and we observed it from distances of 10-20 m for more than 45 mins and took a number of photographs before we decided to leave the area. After that we matched the photographs with the field guide book and confirmed identification as Northern Lapwing (*Vanellus vanellus*). We identified it as black crest, white and black face pattern, black breast-band and dark green upper part (Grimmetet al. 2011). It's also known as the peewit, pewit, tuit or tew-it (imitative of its cry) green plover. Over most of its extensive range, it is highly migratory, wintering as far south as North Africa, northern India, Pakistan, and parts of China. This lapwing measures 28-31 cm in length and has a wingspan of 67-72 cm. It has rounded wings and a crest. It is the lapwing with the short-leggs. It's mostly black and white, but the back is green. Female and immature birds have narrower wings and less visibly marked heads, however their plumage is very similar. Northern lapwings feed primarily on small invertebrates. Their primary food sources are earthworms, moths, beetles, ants, flies, crickets, grasshoppers, dragonflies, cicadas, spiders, snails, frogs, small fish, and seeds. The breeding season of these northern lapwing species lasts from April to July in the majority of their range. These birds are mostly monogamous during the breeding season and breed in solitary pairs (Lok and Subaraj 2009).

Figure 1:Northern Lapwing (Vanellus vanellus)

The family Charadriidae (plovers) comes to the order Charadriiformes and suborder Charadrii (Piersma & Wiersma 1996). This family is further divided into three subfamilies the Vanellinae (lapwings), Pluvianellinae (magellanic plovers) and Charadriinae (plovers). Lapwings, like all other plovers, are obligate visual forager, which means they catch their prey at the substrate boundary layers by picking small invertebrates from the surface or from low vegetation cover (Piersma & Wiersma 1996). The worldwide population size of the northern lapwing (*vanellus*) is observed to number 5,600,000 to 10,500,000 individual birds. The general population pattern of these lapwing species is reported for to be diminishing. All through its reach the lapwing species is observed for to be locally common. The Northern Lapwing (*Vanellus vanellus*) is a species of bird which is listed by International Union for Conservation of Nature (IUCN) as Near Threatened (Ver. 2019-3).

There are some previous records of Northern Lapwing from India (Sanjit 2005). As per the data available on Ebird India portal, Northern Lapwing has been reported further inland in Gajodoba (West Bengal), Kaziranga NP (Assam).

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Record of Lesser false vampire bat *Megaderma spasma* (Linnaeus, 1758) inVansda National Park, Gujarat, India

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Abstract:

Present sighting Lesser false vampire bat Megaderma spasma (Linnaeus, 1758) from forest of Sadad Devi, Vansda National Park (VNP), Gujarat is the first report from the park and third records from Gujarat State, after the records of forest of Gir National Park and Sanctuary and Ratanmahal Wildlife Sanctuary. The VNP mammalian fauna is rich and diversified. This observation is an addition to the 28 mammalian species recorded from VNP.

Key Words Bat, Chiroptera, Gujarat, Protect Area, Mammals, Megadermatidae, Megaderma

Introduction:

The insectivores and fructivorous, both the groups of bats play an important role by contributing to a wide range of ecosystem services (Kunz et al. 2011). Owing to the ecological importance of the bats, it is very important to understand their species diversity, ecological services and threats before implementation of effective conservation measures for both bats and their habitats. Bats are often treated as bio-indicators to assess the biodiversity potential and environmental impacts (Fenton et al. 1992; Jones et al.2009; Pedersen et al. 2012). Bats belong to the order Chiroptera, which constitutes of the only mammals to have evolved with the mechanism of true flight. Bats constitute the second largest order of mammals, after rodents and are characterised by their capability of true and sustained flight. There are about 1386 species of bats recognised from two suborders: Yinpterochiroptera and Yangochiroptera (Burgin et al. 2018). The Indian bat fauna is rich and more diversified, there are 123 species of bats belonging to five families (Pteropodidae, Rhinopomatidae, Rhinolophidae, Hipposideridae and Megadermatidae)of the suborder Yinpterochiroptera, and three families (Emballonuridae, Miniopteride and Vespertilionidae) of the suborder Yangochiroptera (Talmale & Pradhan 2009; Srinivasulu & Srinivasulu 2012).

The bat fauna of Gujarat is poorly explored and less studies in the compare other groups of mammals. The literature surveys show the it studied by Ryley (1914), Wroughton (1918a, b),

Ellerman & Morrison Scott (1951), Brosset (1962a, b,c), Sinha (1970, 1975, 1980), Devkar et al. (2013) and Shah & Srinivasulu (2020), who summed up the presence of 22 species of bats. However recent publication shows there were 26 species of bats listed from Gujarat (Chakraborty & Agrawal, 2000; Singh 2013), however, Lesser false vampire bat *Megaderma spasma* (Linnaeus, 1758) is not listed from the state. Alam (2010) and Devkar & Upadhyay (2015) recorded its presence from Gir National Park and Sanctuary, Saurashtra and Ratanmahal Wildlife Sanctuary, Central Gujarat, respectively.

Species Description- *Megaderma spasma* (Figure 1) is a one of member of family: Megadermatidae and it is easily distinguished from other families of microchiroperans on the base of their appearance, especially a tragus which is bifurcate (the tragus is the pointed structure inside the ear). Its fur is deeper grey. Ears are large and oval shaped jointed at the base with no white inner margin. The nose leaf is short compared to *Megadermalyra* and has broad convex flaps on the sides with longitudinal ridge present and base of the nose leaf is heart shaped. Tail is absent in the species (Prater1971, Menon 2014). Lesser False Vampire inhabits mainly primary or mature secondary forest. Its roosts include hollow trees and manmade structures such as road culverts. Roosting groups may comprise up to 5-10 individuals closely packed together.

Figure 1: A typical identical face of Lesser false vampire bat Megaderma spasma ***(Photo Credit: Raju Vyas).***

Species Distribution-This species is widely distributed in south Asian region from Philippines to Brunei Darussalam stretching across Indonesia, Malaysia, Myanmar, Cambodia, Singapore, Sri Lanka, Bangladesh and India (Csorba *et al*. 2011). It is widely distributed in India, including Andaman & Nicobar Islands, Andhra Pradesh, Assam, Goa, Karnataka, Kerala, Maharashtra, Meghalaya, Mizoram, Tamil Nadu, West Bengal (Molur *et al*. 2002), Gujarat (Alam 2010; Devkar & Upadhyay 2015) and Odisha (Debata *et al* 2013, 2017).

Study Area:

Vansda National Park (VNP) (20051'16"-21021'22"N & 73020'30"-73031'20"E) is the one of four National Parks of Gujarat located in the northern end of Western Ghats, in Vansda sub-district of Navsari District, Gujarat. It is a hilly terrain with hills of moderate altitudes from

110-360m as an extension of the Sahyadri hill Range. Once it was a game forest for the ex-ruler of Vansda State, and after 1986 the forest area of 23.99km2 was declared as National Park under the Wildlife (Protection) Act, 1972 by the Government of Gujarat. The forest of VNP is of southern Indian tropical moist deciduous forest type and further classified as southern moist mixed deciduous forest, bamboo break and tropical riverine forest (Champion & Seth, 1968).

The Park has supported a very rich and diverse flora and fauna. A total of 440 species off lowering plants are recorded, of which 108 species are trees, 51 shrubs, 64 climbers, 202 herbs and 25 grasses (Singh *et al.*, 2000). The literatures survey shows the park also harbours many higher vertebrates, including amphibians (13 species), reptiles (41 species), birds (114 species) and mammals (28 species) (Singh *et al.* 2000). The Vansda National Park were explored in second week of June 2021 to study the bats, along with prepared update list on inhabiting mammalian species at the park.

Figure 2: The forest habitat of Sadad Devi, Vansda National Park, Gujarat India.
(Photo Credit: Raju Vyas)

Observation:

On 7th June 2021, we come across a number few small sizes of insectivorous bats in the flight in evening from forest blocks Sadad Devi, VNP. It is absolutely difficult to watch and proper identification in dusk light, but flight and foraging habit of the bats were found interesting.

Figure 3: The Lesser false vampire bat Megaderma spasma roosting in a small cluster of closely packed together 7 individuals at a watch-tower, Vansda National Park, Gujarat India.
(Photo Credit: Kartik Upadhyay).

On 8th June 2021, at noon time we were in the middle of VNP, on forest block of Bharadi and Sadd Devi (Figure2). It is usual practice to explore man-made structures like water tanks, abundant staff

rooms and watch-towers for the searching of snakes and lizards, especially geckos. We were show a small number of bats roosted at height of around seven meters under the roof of a watch-tower (20°46'45.86"N; 73°28' 20.14"E) in asmall clusterof closely packed together2-7 individuals (Figure 3).The floors were covers with dry excreta and old droppings. However, the overall situation of this watch-tower along with condition of floors indicated the presence of bats.

Figure 4: The cluster of four lesser false vampire bat (Megaderma spasma), two female were with a baby on breast, Vansda National Park, Gujarat India. ***(Photo Credit: Raju Vyas)***

On the next day (9th June 2021), we visited the same location for observation and further confirmation of the bats. There were a total of 19 individual bats in three different clusters and some of them were in pairs. A cluster of four bats, including two of them were observed with awarded a baby on the breast (Figure 4). The size of both the baby was probably two or three weeks old, which suggest pre-monsoon (May-June) as breeding season for the species. We were able to take a few pictures of the bats.

Result and Discussions:

The unidentified bats roost at abundant staff rooms and watch-towers and its pictures were examined with help of literatures (Prater1971; Srinivasulu et al. 2010). It was identified as Lesser false vampire bats *Megaderma spasma* and latter it was confirmed by the bat expert.

The literatures show six species of bats were residing in the park (Singh *et al.* 2000; Vyas & Upadhyay 2014) in which the Lesser false vampire bat *Megaderma spasma* was not listed. Thus, the sighting record of *Megaderma spasma* from VNP can be the first report from the protected area and third records from the Gujarat State (Alam 2010) and a man-made structure of overhead water tank at Ratanmahal Wildlife Sanctuary (Devkar & Upadhyay 2015). However, present records and literatures (Singh et al.2000; Vyas & Upadhyay 2014; Patel et al. 2020; Kazi et al. 2021) show VNP mammalian fauna is very rich and more

diversified and the record of this species of bat will be the addition of one more species of mammals in the park.

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A study of Water Quality of *Banganga Tank*: A Freshwater body in Mumbai, Maharashtra

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Abstract:

For a closed waterbody in an urban location, regular checking of the water is very important. Any deviation from normal values for the quality defining establishing parameters suggest potential contamination and pollution of the water body due to anthropogenic intervention. One such water body affected by urbanization is the Banganga Tank in Mumbai. In the current research work, water quality at Banganga Tank has been evaluated in terms of water quality parameters such as pH, Alkalinity, Salinity, Chlorinity, Total Hardness, Dissolved Oxygen, Chemical Oxygen Demand and Biological Oxygen Demand. The values obtained have been compared with the acceptability criteria set by Bureau of Indian Standards (BIS). Water collected from the pond was physically observed to be eutrophic and contaminated due to anthropogenic pollution. These optical observations were supported by the results obtained. Levels of all the above-mentioned parameters were found to be above the acceptable limits. Results suggest that the chemical imbalance in the water is primarily responsible for algal blooms observed and raises a warning for overall degradation of the waterbody. Awareness regarding the degrading conditions of Banganga Tank needs to be generated on war-footing. With help from local governmental authorities, scientific steps for cleaning and rejuvenation of the waterbody need to be implemented. Further in-depth evaluation encompassing other water quality defining parameters will be able to shed more light on the current situation and provide the necessary information for the restoration effort.

Key Words:Water testing, Banganga, Chemical investigation

Introduction:

A pond ecosystem is a closed community of organisms within a water body that serves as an important habitat for several species of aquatic animals, algae, plants, micro-organisms, arthropods, waterfowls, etc. One such ecosystem is the *Banganga Tank*, an urban, spring-fed pond in Malabar Hill, Mumbai, India (18.9455° N, 72.7936° E). The tank is surrounded by numerous temples and *Dharamshalas*, indicating its historic and religious significance. According to Indian mythology, when Lord Rama felt thirsty on his way to Lanka to rescue Sita, he halted here, and shot an arrow piercing the ground causing water to sprout. Even today, there is a pole in the pond signifying where the arrow struck (Sengar 2019). Sadly, the amount of pollution in and around this water tank ruins its serenity and holiness.

Oblivious to the condition of *Banganga*, we visited the pond for the first time in August 2019 to collect water samples to observe its microflora; however, upon witnessing the declining state of the pond, we felt it necessary to assess the probable causes for the same while emphasizing on the need to carry out scientific research to determine the quality of water, thereby providing valid explanations for the pond's condition.

Depleting Conditions of Banganga:

In 2011, the Times of India released an article highlighting the loss of aquatic life of the *Banganga Tank* – people who had encroached the surrounding land, were seen bathing, disposing household waste, washing clothes, utensils, etc. in the pond (Times of India, 2011); such activities were also observed during our visit in 2019. In addition to this, the major issue of concern was that of the illegal channels that deposited sewage into the tank, severely damaging its ecosystem.

Further, a 2014 article in the Indian Express stated that due to the religious importance of this tank, various rituals have been conducted along its banks that did not only pollute its waters but also led to overfeeding and eventually the death of several fishes (The Indian Express, 2014). The same was supported by another article in the Hindustan Times, 2017, that revealed the harmful effects of religious activities on aquatic life. Though this article mentions that awareness measures have been carried out to maintain the cleanliness of the pond, even today, the condition of the pond seems to be deteriorating (The Hindustan Times, 2017).

In September 2020, the Mumbai Mirror reported that on-going construction work in the vicinity of the tank had made its waters muddy (The Mumbai Mirror, 2020). The authorities had suggested to tentatively stop the work and undertake a geotechnical investigation to thoroughly identify the cause; however, even after a month, the situation remained unchanged as stated by the Times of India in October 2020 (The Times of India, 2020). Additionally, the Directorate of Archaeology and Museums decided to identify the source of the pond so as to prevent its contamination with construction debris. Even so, in 2021, the newspaper Deccan Herald mentioned that the construction work continued to deplete the condition of the *Banganga Tank*, forcing the government to take action (The Deccan Herald, 2021). In all, these various newspaper articles also seem to articulate the need for scientific intervention to preserve this heritage site.

Plausible Effects of these Activities:

Pond ecosystems are delicate ecosystems which can be affected in various ways due to anthropogenic interventions. The effects of many of the anthropogenic activities, carried out in and around such an ecosystem, are not always well prognosed. The plausible effect of such activities has been listed below:

Sewage: Disposal of sewage waste into water bodies introduces organic matter, chemicals, micro-organisms, etc. in its aquatic ecosystem hampering its health and ecology. Decomposers, like bacteria, consume the dissolved oxygen in water to metabolize the organic matter accompanying the sewage, resulting in the formation of oxygen-depleted zones within the water-body. This leads to suffocation of the organisms that are present as a part of its natural ecosystem. When people suffer from infectious diseases, their sewage, if left untreated, also contains harmful pathogens. Water contaminated with such sewage, serves as an agent of several faecal-orally transmitted diseases like cholera, typhoid, etc. (Blaettler 2021).

Construction Waste: It has been well documented that the concrete and mud produced as construction waste if released in water bodies can increase the pH of water (Zeng 2018). A change in pH has always spelled disaster for a pond-based ecosystem. Moreover, the increased turbidity caused by the deposition of mud decreases the availability of light for photosynthesis in aquatic autotrophs. These waste influxes can harm aquatic life by reducing their growth rate and resistance to diseases, thereby hampering proper development of eggs and larvae, altering natural movements of organisms in and around the water body and more (Zeng 2018; Minnesota Pollution Control Agency 2008).

Detergents: Domestic activities in and around the pond lead to the entry of cleaning agents into the pond. These additions have been well documented to be poisonous to aquatic life. Surfactants in these chemicals severely damage the external, protective mucous layers of fishes as well as their gills. They also decrease the breeding capacity of aquatic organisms and lower the surface tension of water causing the organisms to absorb more amounts of dissolved chemical substances than usual. Phosphorus and nitrogen compounds in detergents, may also stimulate increased growth of algae, leading to eutrophication of the water body. Additionally, the use of powdered detergents significantly increases levels of pH, total dissolved solids, chlorides, sulphates, carbonates and bicarbonates (Goel & Kaur 2012; Federal Public Service, Health, Food chain Safety and Environment 2016).

Religious activities: Ponds that are used for religious activities and idol immersion show poor quality of water with higher-than-normal levels of most physiochemical parameters. Pouring human ash into water bodies after cremation increases their biological and chemical oxygen demand which adversely affects the ecosystem. Idol immersion not only obstructs the natural flow of water but also exposes the waterbody to numerous heavy metals that cause a significant change in the physiochemical properties, ultimately damaging aquatic life (Gupta et al. 2011; Bhattacharya et al. 2014; Verma & Shrivastav 2018).

Therefore, the aforementioned ongoing anthropogenic activities around the *Banganga Tank* could pose severe consequences to the condition of the tank in subsequent years. Hence, the true sources of pollution of the pond need to be ascertained in order to put forth mitigating measures to restore the health of the waterbody.

Methodology:

Physicochemical evaluation of water sample:

The evaluation of the water quality parameters aids in appraising the degree of suitability of a water sample; thereby, providing an understanding of the level of pollution in the aquatic ecosystem. This also provides a window to understand the impact of polluting activities and anthropogenic intrusions on its inhabitants as well as the surrounding environment. Thus, the data generated from a physicochemical water analysis of the pond could be used to devise methods to further extrapolate a prognosis of the water health and to revive the ailing waterbody (Reza & Yousuf 2016; Sajitha & Smitha 2016; Rana & Jain 2017).

In the current research work, the water quality parameters like pH, Alkalinity, Salinity, Chlorinity, Total Hardness, Dissolved Oxygen (DO), Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD) levels of water at *Banganga Tank* were estimated.

Multiple site visits and sample collection drives were undertaken. Random sampling was implemented and samples collected from the tank were stored in a thoroughly cleaned and dry polyethylene container. Analysis of physicochemical parameters such as pH, alkalinity, total hardness, chlorinity, salinity, dissolved oxygen, etc. was carried out as soon as the samples arrived at the laboratory. A universal indicator, pH strip, and a pH meter were used to record the pH of the water samples, while values of the other parameters were found using the standard methods of examination of water outlined by the American Public Health Association (APHA; 23rd edition, 2017).

The data collected by conducting tests was repeated in triplicates and the averaged-out readings obtained were compared to the acceptable limits as given by the Central Pollution Control Board (CPCB 2008) and the Bureau of Indian Standards (BIS). The values of parameters whose values fall out of the acceptable limits has been used to hypothesize the probable condition of the *Banganga Tank*. In addition to this, a detailed observation of the microflora of the waterbody was also studied by observing the water sample under a compound microscope. The organisms observed were compared with available literature for identification purposes.

Results:

Careful monitoring of the water quality parameters is a vital step to understand the biotic and abiotic interactions that are at work in the water body. It helps us understand the health of the water body as well as the positive and negative effects of various extrinsic factors on its flora and fauna, their growth patterns and health. Though each of the estimated parameters individually may not provide sufficient information about the condition of water at *Banganga Tank*, several of these parameters together reveal the dynamic processes and interactions occurring in the pond.

Moreover, each parameter can be assessed to observe its effect on the health of an aquatic organism, in a delicate and complex pond-based ecosystem, deviation in the levels of these quality parameters affects each other (Makori et al. 2017). Thus, maintaining balanced levels of water quality parameters is fundamental for both the health of the flora-fauna and the water body itself.

In this study, the water quality parameters pH, Alkalinity, Salinity, Chlorinity, Total Hardness, Dissolved Oxygen (DO), Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD) were evaluated. The chemical components of the water body influencing the values of the above-mentioned parameters are dependent on each other. The ionic concentration observed to influence the pH and chlorinity for example also determines the COD and BOD of the water-body. The current results also support these interactions of the parameters.

pH: The pH of water determines the level of its acidity or alkalinity. Deviation from the optimum level of pH results in change in the toxicity of the waterbody. The sample procured from *Banganga Tank* was observed to be slightly alkaline in comparison to normal standards justifying the observed presence of large amounts of algae in the tank. A pH sample value

between 6.5 – 8.5 is marked as acceptable under IS 10500: 2012 by Bureau of Indian Standards (BIS, 2012). Algae have been reported to increase the pH of the water body. The eutrophic algal bloom observed may also be an indication of excess nutrient pollution which may be the actual reason for the increase in pH (Fondriest Environmental, Inc. 2013; Lenntech 2020).

Salinity: It is the quantity of salts present in the water sample. For freshwater organisms, maintaining an osmotic balance between their cells and surrounding fluids is vital and is affected greatly by the salinity of the surrounding water (Willard et al. 2019). The salinity of water of *Banganga Tank* was observed to be within permissible limits.

Alkalinity*:* Alkalinity is determined by the number of alkaline substances (hydroxyls and carbonates) present per volume of the water sample. Analysis of the samples collected from the *Banganga Tank* revealed a high total alkalinity which can result in the loss of aquatic life. The total alkalinity was observed to be 400 mg/L while IS 10500:2012 by BIS suggests a value of NMT 200 mg/L as the acceptable limit (BIS, 2012). High alkalinity has been well documented to damage fish gills, eyes, and skin. A two-fold increase in the levels of total alkalinity is an essential factor which needs to be assessed in case of the *Banganga Tank* as extreme levels of alkalinity may increase the toxicity of certain substances that are otherwise not toxic in a neutral medium (Judkins and McTeer, 2020).

Chlorinity*:* Chlorinity refers to the total chloride ions per volume. High levels of chlorine can have a negative impact on the aquatic ecosystems. The water samples collected were found to have a higher chlorinity; the amount of chloride ions was observed to be 461.5 mg/L whereas IS 10500:2012 suggests an acceptable limit of 250 mg/L (BIS, 2012). Studies propose a sensitivity of free-floating planktonic crustaceans to chlorides concentrations. These crustaceans feed on algae that promote eutrophication, hence an increase in chlorinity indirectly leads to abundance of algae (Salmon and Trout Conservation, 2017). The presence of algal bloom in *Banganga* supports the observation regarding chlorinity levels which may also be attributed to the loss of zooplanktonic diversity as a result of higher levels of chloride ions.

Total Hardness*:* This parameter indicates the quantity of mineral ions (Ca^{2+}, Mg^{2+}) present in the water sample. The hardness of water influences osmoregulation in organisms, suitable levels of hardness allow freshwater fishes to perform osmoregulation and maintain constant levels of water influx with minimal efforts. However, high concentration of Ca^{2+} may lead to

breeding issues and organ blockages in soft water organisms (Gulyani 2018; Iles 2021). *Banganga Tank* water shows a higher but acceptable total hardness value. Sample shows a Ca^{2+} ions concentration at 56.136 mg/L which falls within the acceptable limits of 75.0 mg/L as per IS 10500:2012 (BIS 2012).

Dissolved Oxygen (DO), Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD): DO refers to the atmospheric oxygen dissolved in water. According to Indian Water Standards IS 2296:1992 (BIS 1992), a minimum dissolved oxygen concentration of 5 mg/L is necessary to ensure a reasonable freedom from oxygen consuming organic pollution. Indian Water Standards IS 2296:1992 (BIS 1992) further remarks that the BOD (5 day) value of 3.0 mg/L or less is a necessity for ensuring reasonable freedom from oxygen demanding pollutants and prevent production of obnoxious gases.

In qualitative estimation of DO, BOD, and COD, it was observed that DO values were found to be lesser whereas both BOD and COD values were observed to be more than the permissible and acceptable limits as set by Bureau of Indian Standards (BIS 2012) (BIS 1992). Eutrophication has been reported to cause fluctuation in DO levels and can also be held responsible for increased BOD and COD values (Rounds et al. 2013). A higher COD stipulates that there is an increase in the number of oxidizable substances in the waterbody, leading to the mortality of aerobic organisms due to the reduced levels of dissolved oxygen (Reza & Yousuf 2016). The reduction of DO levels hence indicates the environmental health of the aquatic ecosystem by determining the extent of pollution in the water body. The increase in BOD and COD has also been reported to be proportional to increase in domestic wastes (USGS 2021). Domestic waste has been a reported problem with *Banganga Tank* due to its sociological and religious importance.

Additionally, the microflora study carried out in August 2019 revealed a variety of microorganisms that inhabited the *Banganga Tank*. Phytoplankton, such as *Scenedesmus*, *Pediastrum*, *Eudorina*, *Oscillatoria*, and *Gomphosphaeria*, were clearly distinguished in the sample. Certain zooplanktons like *Paramoecium*, *Daphnia*, *Brachionus*, and *Copepoda*, were also seen.

Discussion:

The results obtained in the chemical analysis and on-site observations of the conditions at *Banganga Tank* recorded during the visit suggest that the water of *Banganga Tank* has become eutrophic. This can also be observed by the presence of algal blooms in some patches

of the tank. Based on the changes reported around the pond in recent years, this eutrophication can easily be attributed to anthropogenic interventions and hence is a cause for concern. These observations also suggest the development of a hypoxic zone in the hypolimnetic zone of the tank; this possibility needs to be further evaluated.

Though as mentioned earlier, only these parameters may not be able to completely define the status of water at *Banganga Tank*, they can be a significant proof to raise a flag of concern for the waterbody. Further, detailed studies shall be able to better shed light on the biochemical condition of *Banganga Tank.*

Phytoplanktons and zooplanktons form the basis of the food chain and can be used as indicators of pollution effects to determine impacts of aquatic contaminants; therefore, as an ongoing component of the research work, seasonal and temporal evaluation of effects observed on the micro-floral composition is underway. The proliferation of these organisms is influenced by anthropogenic factors; observing the variation in their growth and diversity can help understand the ecological conditions of such ecosystems.

Conclusion:

Water possesses a natural capacity to neutralize contamination, however, when water bodies are used as sinks for uncontrolled disposal of numerous contaminants produced by urbanization, industrialization, agriculture, etc., it loses its self-generating ability. Unfortunately, the *Banganga Tank*, which is not just an aquatic ecosystem but also a place of historic and religious significance in the city of Mumbai, has fallen prey to such anthropological activities.

The results obtained in the current research work illuminates the necessity of undertaking a thorough scientific examination

Therefore, this article attempts to illuminate the necessity of undertaking a thorough scientific study to determine the exact sources of pollution of the *Banganga* by means of a detailed and thorough physicochemical water analysis supported by review of available literature to help formulate an articulate plan to tackle the problem at the source.

Alongside the analysis, encouraging people and creating awareness about the status of the waterbody is the need of the hour. This would not only improve the quality of water but also reduce the expenditure of treating polluted water. Awareness programs could be arranged

along with regular clean-up drives while working in tandem with local authorities to aid in the upkeep and sanitation of the *Banganga Tank*.

Construction activities should be made to incorporate appropriate best management practices (BMPs) to minimize the detrimental impacts on the overall water quality of surrounding water bodies. Recent BMC reports and cited high court orders are testaments of this need. Lastly, in order to ensure that all initiatives are having a positive impact on the pond ecosystem, regular testing of physiochemical parameters should be performed, while maintaining systematic records of all the tests for reference.

Acknowledgements:

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Garbage to Garden-Benefits of Bio-waste Home Composting

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Abstract:

This study conducted at Department of Life Sciences at KC College, HSNC University, Mumbai, addressed the issue of waste management of green waste by using the method of composting. This model of generating compost using the bio waste was extrapolated to kitchen waste at home. Home composting has been a preventive option for managing bio waste at local levels as it is a safer and organic way to dispose of the waste. The compost thus generated in 20 days was granulated and odorless. It helped in reducing the waste and also produced a bio fertilizer which was used for the plants in our laboratory as well as home. The plants treated with this compost showed healthier and faster growth than the untreated plants. The results obtained can be used for exploring other bio-waste material that can be used for composting.

Key Words:Waste management, home composting, green waste, bio-fertilizer

Introduction:

Composting is nature's way of recycling and is one of the simplest ways to manage waste. The other advantages are that apart from building healthy soil, composting also nurtures healthy plant growth. It puts an end to the need of using chemical fertilizers in the garden. Food scraps and garden waste together, currently make up more than 30 percent of what we throw away, and could be composted instead. Making compost keeps these materials out of landfills where they take up space and release methane, a potent greenhouse gas (Epstein 1997). The hands-on training received by the students of the Life sciences department at K.C. college helped them to learn the technique of bio-composting. They created a Compost bin first in the laboratory and then created similar bin at home. Due to the pandemic, visiting college was not possible, and hence the students carried out the process of making the green compost at their homes with the bio-waste materials available in their kitchens.

Methodology:

Collection of biodegradable waste materials from the lab (at college) and home

1. Leaf Litter/Foliage – 500gms
2. Vegetable and Fruit Peels - 1cup
3. Egg shells - 3-4 in qty
4. Coconut coir - 1 in qty

5. Soil - 3-5 cups
6. Cardboard Box – 1 (Shoe box)
7. Cow dung or Manure – 2 cups
8. Water - enough to keep the mixture moist

Procedure for making the Compost bin

A cardboard box was used as a container for making the compost. 3-4 holes were made at the base to allow excess seepage of water. Few holes were made on the walls of the box so that air would pass easily. The bottom of the box was layered with soil thoroughly. A tray was kept below the box so as to prevent any spills. Further, a layer of bio waste was added to the soil. Food scraps, coconut coir, etc. Following with a few dry leaves, scraps of paper and dry husk or newspaper shreds in between to have an equal ratio between wet and dry waste. For instance, 1 cup of food scrap to 1 cup of dry waste. Next layer included cow dung or manure to speed up the process of composting.

The last layer of compost was of garden soil to cover the compost. The mixture was turned every 2 days a week to provide enough aeration for the waste to decompose successfully. The box was kept in the balcony, where it received maximum sunlight.

Water was sprinkled eventually for moistness and to speed up the process of composting every 6 hrs./day. The box was monitored accordingly. Every week, a cup of new soil was added to the mixture for making the compost healthy and nourishing. Within 3-5 weeks, results were obtained and a green compost was ready to be used. Rich in nutrients and smelling of earth.

Figure 1- Day 1 of composting: kitchen waste observed

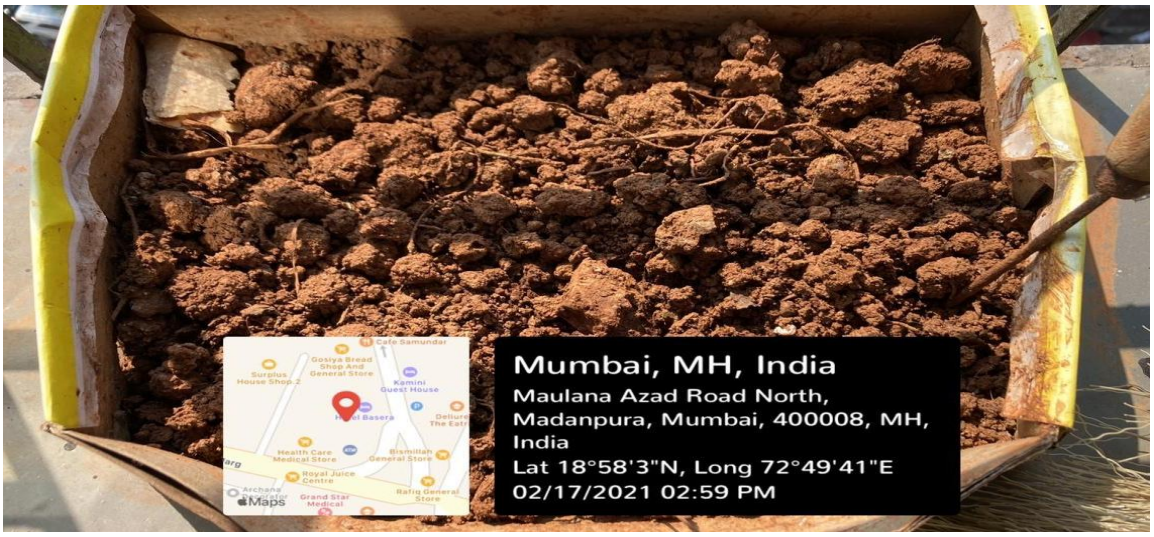

Fig 2 - Day 22 of composting: ready to use

Significance of Composting:

Composting is an environmentally-friendly technique for the management of manure (Neugebauer, Sołowiej & Piechocki, 2014). Some of the drawbacks stated by article- Organic remnants that are difficult to store, are unstable and are good constituents for composting, underlines the need for using it to prepare a biologically active compost. Manures, bio-solids and food leftovers are produced daily but often cannot be used on a daily basis and, therefore, must be stored intermittently. Composting modifies manures into to a drier, cleaner, uniform and biologically stable product with many uses other than just land application (Huhe, Jiang, Wu, Cheng & 2017). It is said that, Composting is one treatment process that converts manure or other organic residues into substances with greater utility and value. It can also reduce the need for chemical fertilizers (Vázquez, Plana, Pérez & Soto, 2020). In recent decades, the rapid increase in human population and advanced economy has caused an augmented increase in the waste generation rate. According to the literature cited, approximately 1,88,500 tons (68.8 million tons per year) of municipal solid waste is generated per day in urban India. However, only 24% of this humongous waste is processed, treated and disposed of, by suitable methods (Font, Artola & Sánchez 2011). Imagine, if we start composting in-situ at home, how much of kitchen waste can be utilized again as fresh compost that can augment our plants nutrition system. Truly proving the term, ‘From Garbage to Garden’.

Composting enhances soil, helping retain moisture and reducing the incidents of infections to plants. It also stimulates the production of useful bacteria and fungi that break down organic matter to create Humus, a rich nutrient-filled material. In addition, compost reduces methane

emissions from landfills and lowers one's carbon footprint (Misra2003). Most importantly, you know what your plants are eating when it's homemade. Free of chemicals and harmful fertilizers, home composting has its own benefits.

Factors affecting Composting:

Few factors that affect the process of composting can be pH, temperature, moisture, aeration, carbon to nitrogen ratio, microbial infection etc. The climatic conditions play a vital role in the process of making a compost, especially when it's on a larger scale and done in an open environment. For instance, a dull and gloomy day will surely slow down the process whereas on a brighter and sunny day, the process of decomposition speeds up.

According to a research article by Institute of Biosystems Engineering, Poznań University of Life Sciences, Poland, the distribution of organic matter occurring during composting causes a clear change in the structure and appearance of the material. Running the composting process of the same material under different conditions can affect the properties of the product obtained after a certain time. (Nsimbe, Mendoza, Wafula&Ndejjo2018). They conducted certain experiments on a larger scale, where they used certain chambers for making compost with sewage sludge, where temperature played a very crucial role. An apparent change in the appearance of the chamber when the temperature increased up to 45 degrees Celsius was observed which was attributed to the increased activity of aerobic bacteria that generate CO_2 as a product of the decomposition of organic matter (Sikora 1998).

Table 1: Materials that can be composted or avoided.

What to compost	What to not compost and why?
• **Fruits and vegetables** • **Eggshells** • **Coffee grounds and filters** • **Tea bags** • **Nut shells** • **Shredded newspaper** • **Cardboard and paper** • **Grass clippings** • **Houseplants** • **Hay and straw and Leaves** • **Sawdust or Wood chips** • **Cotton and Wool Rags** • **Hair and fur**	• Coal or charcoal ash - contains substances that might be harmful to plants. • Dairy products (e.g., butter, milk, sour cream, yogurt) and eggs - Create odor problems and attract pests such as rodents and flies. • Fats, grease, lard, or oils; Meat or fish bones and scraps - Create odor problems and attract pests such as rodents and flies. • Domestic wastes or pet feces - Might contain parasites, bacteria, germs, pathogens, and viruses harmful to humans. And cause plant diseases. • Meat scraps, bones and discarded fats - might smell and create odor issues, which will attract fleas, bugs, insects, etc. • Yard trimmings treated with chemical pesticides - Might kill

• **Fireplace ashes**	beneficial composting organisms (EPA Gov 2021).

Precautions to be taken while making a Bio-Compost

- Avoid using plastic, as it is non-biodegradable and takes years to degrade into water, carbon dioxide and biomass.
- Avoid excessive watering of composting material, as it will lead to sogging of the container (cardboard box).
- Cover the container/area used for the composting at all times to prevent flies and mosquitos buzzing over.
- Keep it in a dry place, preferably in contact with the sunlight.
- Turn the mixture every 2 days a week so as to prevent fungus and algae growth and also to speed up the composting process.
- Always maintain the required amount of moisture during composting.
- Avoid adding any fertilizers to speed up the process. This will change the pH of the compost and its properties which may make it unsuitable for use.

Conclusion:

Composting is the highest form of recycling. An organic discarded material is converted into the compost can benefit the mankind (Kujawa, Janczak & Mazur, 2019; Esperón, Albero & Ugarte-Ruíz 2020). By segregating, recycling and composting, a family of 4 can reduce their waste from 1000 Kg to less than 100 kg every year (Rastogi, Nandal & Khosla 2020).

The materials used in the project at KC were biodegradable waste material obtained from the laboratory which makes the procurement of raw material easy. Since the process of composting was carried indoors, it taught the students of an easy way of producing useful material from waste material with minimal expenses or heavy instrument back up. The minimal requirement of instrument such as pH meter, that was used to check the pH of the ready product.

Through this pilot project participants benefited as follows:

a. Hands-on training from the professionals helped the students at an undergraduate level to learn the science behind preparation of a compost from biological waste.
b. The compost thus generated was further used for treating the plants and a noticeable difference was observed in the growth pattern of the plants, treated and untreated,

writhe height and number of leaves. The treated plants were healthy and showed faster growth, increased height and a greater number of leaves.

c. Repeating the project at home, during pandemic times, kept the students engaged in a beneficial activity.
d. Undergraduate students developed skills of planning and conducting a research project in a systematic manner.

Future Prospects:

As the future prospect of this study, the quality of homemade compost would be checked for different abiotic and biotic parameters from the point of view of plant nutrition. A comparative study of effect of seasonal variation, w.r.t Mumbai weather, on the quality of compost will be carried out. It would also be followed by an awareness drive amongst the students of Junior college, schools in Mumbai and educational institutions in the rural districts, near Mumbai.

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Balpakram: The abode of Spirits

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The thrill and curiosity of exploring Northeast India never ends and the region never fails to amaze one with its remote and inaccessible terrain with plenty of surprises to be discovered each time one steps into the wilderness. The Balpakram Landscape nestled in the Garo hills of the state of Meghalaya are amongst those few places in the Northeast which are still in a state of seclusion and best preserved by the native communities of the region. The picturesque view of the landscape presents a scintillating theatre and leaves the viewer awestruck at their very first visit. Meghalaya is dominated by three ethnic tribes, viz the Garo, Khasi and Jaintia/Pnar situated in the three hill regions of the state. Mostly when we recall a visit to Meghalaya, we often mention Mawsynram the wettest place on the Earth which lies in the Khasi Hills, but what we don't know is that the only two National Parks of the state viz, Balpakram National Park and Nokrek National Park are situated in the Garo Hills region which is lesser known to the world despite being a significant ecosystem in terms of biodiversity conservation.

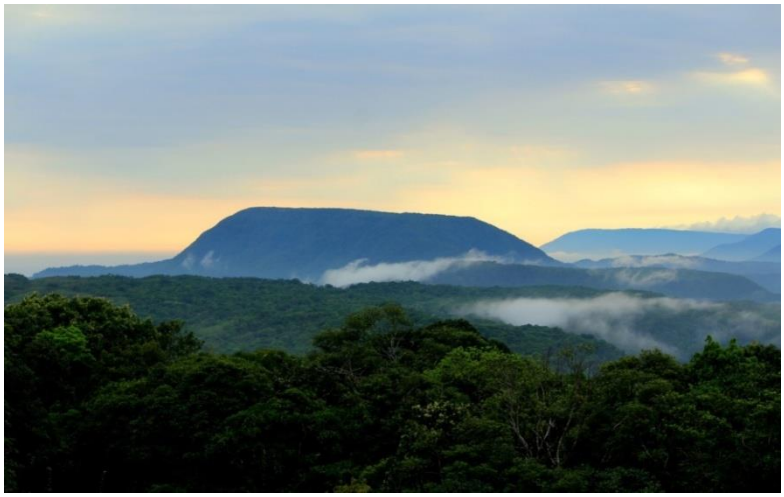

Figure 1: Chutmang Peak, Balpakram National Park

The Balpakram landscape locates between 25°080–25°230N latitude and 90°370–90°580 E longitude. The southern fringe of landscape forms the international boundary with Bangladesh and is a catchment area for the Surma river which is a lifeline to Bangladesh. The highest peak of the landscape Chutmang/Chitmang peak (1150m) is also the second highest peak in the Garo Hills. The landscape is a heterogeneous mosaic of Protected Areas (PAs), Reserve Forests (RFs) and Community Forests (CFs), areas under slash-and-burn shifting cultivation (locally known as

jhum), monoculture plantations and human habitations.Historically, prior to being a Protected Area, Balpakram Landscape was inhabited by small hamlets in and around interspersed with forests and jhum cultivation, but keeping in mind the species diversity and richness of the landscape the Government of India proposed to the villagers for the formation of the Balpakram National Park with appropriate relocations and resettlement plans keeping aside some part of their land. Balpakram National Park is one of its kind in the country as the entire National Park was purchased by the Government of India from the local landowners through outright purchases with compensations and notified in 1986 under the Wildlife Protection Act, 1972. When the park was purchased, it had many settlements in the regions today categorized as core area, therefore the forests we witness today inside the park are a mix of primary and secondary forests which were mostly jhum fallow lands of 25-30 years of age.

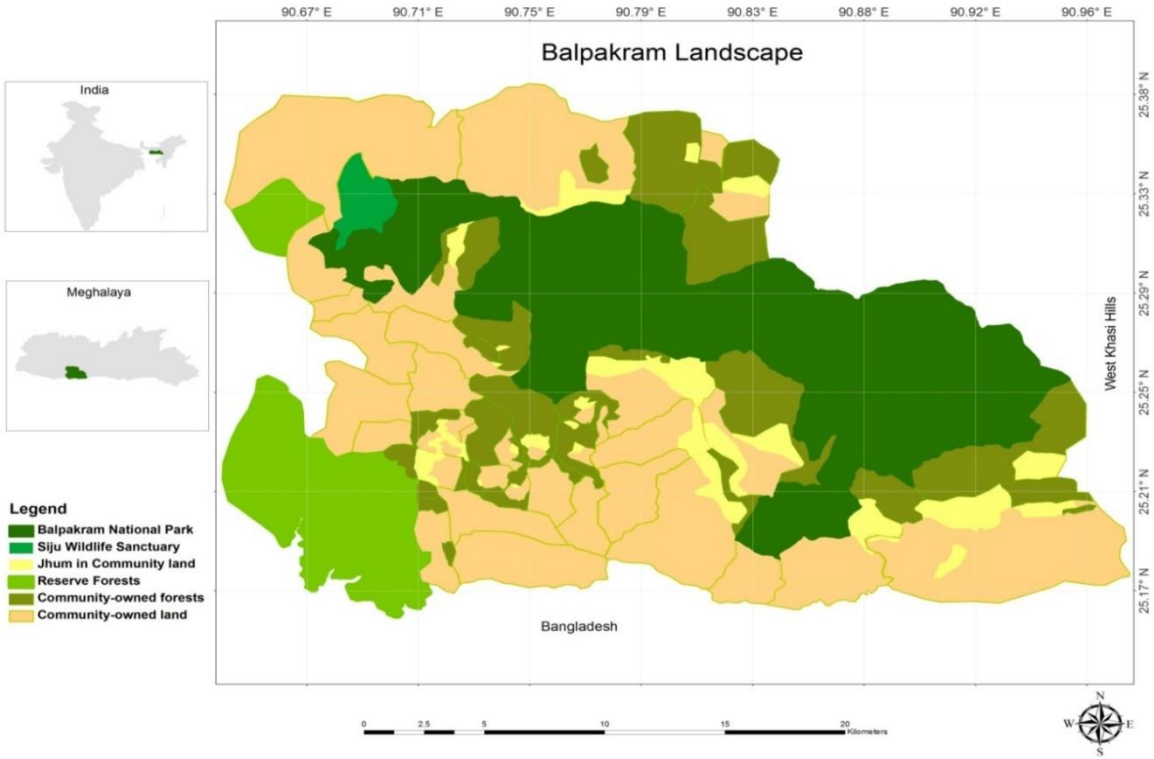

Figure 2: Map of Balpakram Landscape showing the constituent areas

Map of Balpakram Landscape showing the constituent areas:

Historically, prior to being a Protected Area, Balpakram Landscape was inhabited by small hamlets in and around interspersed with forests and jhum cultivation, but keeping in mind the species diversity and richness of the landscape the Government of India proposed to the villagers for the formation of the Balpakram National Park with appropriate relocations and

resettlement plans keeping aside some part of their land. Balpakram National Park is one of its kind in the country as the entire National Park was purchased by the Government of India from the local landowners through outright purchases with compensations and notified in 1986 under the Wildlife Protection Act, 1972. When the park was purchased, it had many settlements in the regions today categorized as core area, therefore the forests we witness today inside the park are a mix of primary and secondary forests which were mostly jhum fallow lands of 25-30 years of age.

Geomorphologically, the Balpakram plateau is a part of the Meghalayan plateau which is an extension of the Indian Deccan Peninsular block of the Rajmahal Hills separated by the Malda gap and represents remnant of an ancient plateau of Pre Cambrian-Indian shield block. The oldest known rocks in the region comprises the 'Archean Group' of about 3600 million years. The entire landscape is dominated by Karst topography forming several caves and crevices with fossilized rocks and coal beds adding to its economic significance to the country. The landscape presents a spectacular view of undulating hills, tablelands and deep gorges. The deepest gorge amongst them is the Mahadeo gorge (locally known as Kundulgop) with over 600 m drop. The presence Grasslands interspersed with the Shola Forest patches in the landscape which is a typical feature of Peninsular vegetation shows its geological continuity with the Deccan Peninsular block. The shola forests play a significant role in the region as majority of the region is a tableland/plateau which faces a water stress during the winter season these shola forests serves as important water sources in the form of small rivulets for the wildlife around forming a perfect shelter for the animals.

The Biodiversity Hub:

The Tropical Lowland Evergreen Rainforests are regarded as one of the most diverse terrestrial ecosystems on earth due to its elevations and high diversity of fruiting trees and shows great diversity of faunal species (Whitmore, 1984). These forests occur around the equator and extend between the Tropic of Cancer and the Tropic of Capricorn comprising of the Amazon basin, Congo basin and the South-East Asian regions but recent studies have confirmed that the lowland rainforests of Meghalaya represent the westernmost limit of the rainforests north of the Tropic of Cancer (Shankar & Tripathi, 2017). The Garo Hills are part of the Indo Malayan Biodiversity Hotspot and harbours a range of endangered species of flora and fauna, the area falls under Bio-geographical Province 4.09.04 (Burma monsoon forest) described by Champion and Seth (1968). It represents bio-geographical unit 9B-

Meghalaya hills in the North East India as described by (1988) Panwar & Rodgers. Both primary and secondary stands of Tropical Moist Evergreen Forest, Tropical Semi-evergreen Forest and Tropical Moist Deciduous Forest, as defined by Champion & Seth (1968), occur here, as do grasslands, shola and riparian forests and degraded land (Kumar & Rao 1985).

Vegetation types of Balpakram Landscape:

Owing to the remoteness of the landscape and the difficult terrain and topography not much detailed scientific studies on faunal diversity of the area have been carried out. The only detailed survey of mammals conducted in Balpakram Landscape using Camera traps (2012-2015) documented a total of 53 mammalian species of which twenty-one are carnivores (Kakati & Srikant,2015). It holds one of the largest and most-threatened populations of Asian Elephant (*Elephas maximus*) and is one of the notified Elephant Reserve (Garo Hills Elephant Reserve) of the country. Other large herbivores documented are the Gaur (*Bos gaurus*), Sambar (*Rus unicolor*) and Red Serow (*Capricornis rubidus*). Although Tigers were historically recorded in the park, currently no evidence have been collected for its presence, other large carnivores here are the Clouded leopard (*Neofelis nebulosa*), Leopard (*Panthera pardus*) and Himalayan Black Bear (*Ursus arctos*). The study also obtained the first camera-trap record in India of the Small toothed palm civet (*Arctogalida trivirgata*). Best known for its primate diversity due to its contiguous forest canopies, the landscape harbours seven species of primates of which Hoolock Gibbons are endangered under IUCN Red List and stump-tailed macaques are best cited here. Amongst other taxa, so far 26 species of amphibians, 45 species of reptiles and 347 species of birds and 348 species of butterflies have been recorded (Samrakshan Trust 2013).

Figure 3: Awlets mud puddling

Figure 4: Tokay gecko

Figure 5: Amphiesma sp.

Figure 5: Capped Langur

Fossilized Limestones: Mahadek/Mahadeo Formation:

The Balpakram landscape forms the part of the Mahadek/Mahadeo Formation. These formations from late cretaceous period have been found with rocks that show the preservation of trace fossil Thalassinoides. Some dinosaur bones were found along with well-preserved foraminifers, echinoids, molluscs and plant fossils in these formations. The event of marine transgression was recognized in the Mahadeo Formation during Late Cretaceous period. The cretaceous anoxic event of no oxygen presence in the environment was well represented by the black shale-pyritic and fossil wood of the Mahadeo Formation (Tewari et al. 2010).

The interaction between Culture and Conservation:

The Garos are believed to be migrated from of Tibeto-Burman region around 400 BC, and find their origin from Tibet (referred to as Tibotgre). Their origin history is still a matter of debate with couple of versions apart from the one mentioned above. They have an intricate clan based social organization which is matrilineal and matriarchal one in practice. They are ethnically known as *Songsareks* and follow the practices which majorlyincludes reverence and worship of nature and natural forces making them animist by nature. Currently, The *Songsarek*s have turned into minority within the region due to various external and internal factors but despite the conversions the traditional practices and beliefs are still being followed by the locals. The *Songsareks* beliefs and faiths play a prominent role in protection and conservation of the entire ecological system of the landscape as they find every element of nature to be a representation of a deity of worship making it scared and far away from interference. The cultural association of the Garos with the nature represents an amazing relationship of interlinkages between human and environment making both an intricate part of the system and demonstrates a model of coexistence of human and wildlife.

This human-nature association of Balpakram landscape is a striking feature which shows us another dimension of conservation practices. There are many locations in and around Balpakram National Park which represents the cultural beliefs of the community, for instance the Balpakram plateau is believed to the abode of their ancestral spirits who travel to the place after death and stay there until they are reincarnated. The families of the demised person take care of all the necessity to living along with utensils and livestock depending upon their status to be provided at the cremation ground with a belief that the spirit of the dead will make a journey to Balpakram and spend rest of its time there till rebirth. Yes, I know this seems quite similar to the discoveries of the Harappan Civilization wherein the cremations were found with essential items along with animals. The whole *Balpakram plateau and gorge* region is hence immensely revered by the locals as their ancestral residence and itself serves as a reason for not to be disturbed in any way by extending their protection. Another place of such reverence is *Ganchisoram- Three hillocks,* a place which marks the funeral sites of tribal ancestors wherein Captain Williamson Sangma, the founder and first Chief Minister of the state walked-in to pay his tribute and gratitude to the ancestors when Meghalaya was granted statehood in 1972. *Mebit- Mebang- the oracle rock* situated inside the park is believed to give prophecy based on the pebble's direction for the next jhum opening as blessed by the goddess of crop *Rukhmini*. *Chidimak-the black pool*, a small pool inside the park is considered the bathing spot for the travelling spirits before they reach the final destination i.e., the Balpakram plateau. The pool water is said to be black as it contains the dirt from bathing. The Chutmang Hills, is also revered by the locals and believed to be almighty and powerful deity to them, people still visit the site and provide their offerings to the Chutmang at the base in a *Kosi* (a pile of stones used as a medium to communicate their prayers to the deities). People tend to stay out of these forests not just out of respect but also fear of bringing an ill omen if they disturb the natural setup of the environment. Usually, game hunting is not done and trees are not cut unless it's a necessity and the villagers follow certain protocols for the same. This fear of humans to nature has kept them at a distance from nature and its elements which helps the ecological system to function in its own pace.

These beliefs and faiths have somewhat created an insulation covering the whole landscape isolating it from outer world and protecting it from influences of changes keeping it intact in a way they can have it for eternity. This surely is beneficial to the conservation polices as this factor alone adds up to the efforts of the respective authority in protection and conservation of the landscape and its biodiversity. No denial that we need development in an inclusive way

but we need to rethink on our efforts wherein we can balance development and Environment without which the long-term sustenance of the ecological system is quite unimaginable at the current pace of change. The Balpakram landscape can be cited as an example of how one can balance development with lifestyle taking both human needs and nature's need hand in hand. This positive association highlights the role of community and their cultural believes in biodiversity conservation.

The run for UNESCO World Heritage Tag:

The mesmerizing beauty and lush green forests of Balpakram is not just a hub for biodiversity but also represents the human nature association at its best form. The occurrence of fossils in the region plays a significant role in understanding the historical and ongoing geomorphological process of the Earth. And together these three elements, biodiversity, geomorphology and human-nature association has been recognized by the of UNESCO World Heritage Site as Outstanding Universal Values (OUV) of Balpakram Landscape along with Nokrek Biosphere Reserve also known as the Garo Hills Conservation Area (GHCA) and was added to the tentative list of UNESCO World Heritage Site under the mixed category in 2018. The preparation of the dossier for the proposed site is in pipeline. The Nokrek National Park is a UNESCO biosphere reserve under Man and Biodiversity Programme declared as National Gene Sanctuary by UNESCO in 2009, known to harbor the germplasm of Wild Indian Orange *Citrus indica* conserved in-situ for all the other wild varieties of citrus fruits. Balpakram Landscape and Nokrek Biosphere Reserve are connected through a narrow stretch of green corridors making it a chain complex.

Way Forward:

It is important for us to understand that like Balpakram Landscape there are many more landscapes throughout the country which are lesser known but that does not reduce the value of the region for their role in the ecosystem services are significant. The current trend in conservation biology of conditional conservation schemes/polices for certain species or landscapes which has brought many success stories to frontline highlights the importance of targeted efforts in a unidirectional way for a species-specific policy but in turn also throws light on the future perspectives of all those left out species or landscapes from the list of priority. The list of left out species and landscapes are longer than the one on the list which highlights the other side of the coin which seems grim. Failing to recognize the ecological and geological importance of places like Balpakram shows the gaps in our policies and

strategies of conservation which needs a deeper look through as going unrecognized will give an easy hand to all those waiting for an opportunity to exploit the natural resources of the region.

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Influence of phorophyte, habitat and climate on the diversity, spatial distribution and community structure of epiphytic orchids of the Southern Western Ghats

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Introduction:

Theenormous representation of epiphytes in the tropical forests is usually related to variations in the local environment, climate (Johansson 1974), and resultant high niche diversification (terSteege and Cornelissen 1989). The selection of habitat and climate by different species of epiphytes may closely be interconnected. Canopy epiphytes, like a community, tend to make a set of microhabitat and microclimatic conditions within the canopy. Characteristics of host, habitat, and climate would be very important in the conservation of canopy epiphytes if epiphytes in the Western Ghats followed such an advanced mechanism for their vertical and horizontal pattern of distribution.Epiphytes, which vary in form and structure but share ecological traits, can also be found in the Western Ghats. Since no comprehensive study has ever been made, data is lacking on the ecology of epiphytes from the Western Ghats. In Silent Valley NP, 50% of total epiphytes recorded are Orchids (Kumar and Manilal 1992). Therefore, Orchids become an interesting group to be studied representing epiphytes, especially in the southern Western Ghats. Orchids are known to be very specific to climatic conditions. Epiphytic orchids could potentially serve as an indication for the health of the southern Western Ghats, given the expected changes in climate such as rainfall and temperature trends in the Western Ghats. Therefore, the influence of habitat, host, and climate on diversity, spatial distribution, and community structure of epiphytic orchids was studied in major vegetation types from the Western Ghats in Kerala to understand:

1. Diversity patterns, spatial distribution, and community structure of epiphytic orchids of southern Western Ghats
2. Phorophyte specificity of orchids
3. Influence of selected environmental variables on epiphytic orchids in differentspatial scales by using suitable empirical models
4. Community level ecological interactions of epiphytic orchids with other epiphytic plants those are associated

Materials and methods:

Due to the limited seasonal access and logistics selected study sites from geographic subdivisions such as Wayanad plateau, Upper Nilgiris, Anamalai hills, Periyar-cardamom hills, and Agasthyamalai hills. Were selected. Lower altitude class (0-800 m asl.), Mid altitude class (801-1600 m asl.), and High-altitude class (1601-2400 m asl.); latitudinal zones such as 8° N- 10° N, 10° 01'N°-12° N, and 12° 01' N-12°50' N; habitats such as Evergreen (EVEG), Montane/Southern Hilltop EVEG (MEVEG-EVEG between 1400 m to 1700 m), Semi-Evergreen (SEVG), Shola (SHLA), Moist Deciduous (MDEC), Savannah (SVNA) and Semi-natural Plantations (SNPL); a tree divided into Trunk Zone, Inner Crown Zone, Middle Crown Zone, and Upper crown Zone were the spatial scales used. The method developed, linear line transects with selective tree scanning (LLTSTS) was carried out in these spatial units. Data on habitat characteristics, host tree characteristics, and the substrate (immediate surrounding) was recorded. The Climatic variables such as Relative humidity (RH), Temperature, Light Intensity, and Rainfall were recorded by using HOBO climate loggers. The associated epiphytes of sampled orchids were collected from the host tree and have been identified.

In statistical software R, Species-Area relationships, Rank Abundance Dominance (RAD) Models ComparingSpecies Diversity, Species Richness, Species Turnover across and within gradients, and ordination(CCA) to address community structure was carried out. Spearman's (rs) correlation coefficient was used to recognize the degree of correlation among species richness of orchids and predictors which includes host characteristics and basedon thesignificance of the correlation, a regression versionwasorganized in R (model 3.6.0). The specificity of orchids within gradients of each tree characteristic was also tested with one-way ANOVA and Tukey's pairwise post hoc. Principal Component Analysis (PCA) with Euclidean distance explained variance in species diversity and abundance along with climatic variables at different logger regions. Redundancy analysis explained the pattern of the epiphytic orchid assemblage with respect to the presence or absence of other epiphytes.

Results:

The study yielded 95 species of epiphytic orchids and 65 sp of terrestrial orchids. Large spatial scales such as altitude, latitude, and habitat affect epiphytic orchid composition on a horizontal scale. The spatial distribution of epiphytic orchids on a vertical scale on the host tree is highly separated into zones. Inner Crown Zone is the most preferred zone as it provides consistent microclimatic conditions. The structure of epiphytic orchid assemblage is best explained at habitat level along distance to water, slope, and habitat/vegetation type. The structure of epiphytic orchid assemblage at the level of tree/macrohabitat is best explained along bark nature, GBH, and height of a tree. The structure of epiphytic orchid assemblage at the level of substrate/microhabitat is explained along position on the tree, substrate girth, inclination aspect of the substratum, degree of substrate inclination, orientation, and height on phorophyte. An exclusive specificity for orchid species on a host species was not seen. Epiphytic orchids are composed in response to the substrate level characteristics and then tree-level characteristics. A combination of optimum light, temperature, and RH determines species diversity and abundance in a region. Other epiphytes do not predict the presence of epiphytic orchids on a tree. However, the community structure of an epiphytic orchid assemblage on a tree/metacommunity/individual community can be distinct responding to the presence or absence of other epiphytes.

Orchids indicate the importance of the micro-environment associated with mature and aged trees and hence the structural complexity of tropical forests. Conservation of epiphytic orchids would ensure conservation of old aged, natural, structurally complex trees hence primary forests.

Meanwhile, our minor research addressed orchid fall in semi-natural plantations and adjacent semi-evergreen forests. Following the sampling of 500 trees in each, seminatural plantations were found to have more taxa of orchids, a high rate of endemism, and found more prone to orchid fall from management activities. Semi-natural plantations (with native trees but transformed land use) are a major habitat that equally supports epiphytic orchids as in other major forest types.

Rare and threatened epiphytic orchids from the study area

Rhytionanthos indicum

Luisia abrahamii

Tricoglottis tenera

Smithsonia straminea

Vanda wightii

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THE WINNER OF DR. M. I. PATEL AWARD 2021.
MS. JIS SEBASTIAN IS AWARDED WITH A RUNNING TROPHY, CASH PRIZE OF RS. 50,000 AND A CERTIFICATE FROM THE WCB RESEARCH FOUNDATION.
CONRATULATIONS!

Conserving the Egyptian Vultures, the silent warriors of Nature: A Conservation research study

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The Egyptian vulture, *Neophron percnopterus*, is a medium sized scavenger and are globally endangered according to IUCN Red List of Threatened Species. Diclofenac is responsible for the mass decline in the number of vulture species in general but in case of Egyptian vultures no specific effect of Diclofenac has been reported or proved so far. They are the most handsome, smartest and intelligent vulture species. Handsome because it is definitely not like common people's stereotype of a vulture. Vultures are nature's own clean-up crew that provide irreplaceable ecosystem services such as waste removal, nutrient recycling and decreasing the risk of disease transmission. Their extinction would cause a permanent imbalance in Ecosystem. The name, Egyptian Vulture is named as because they are considered very important in Egyptian mythology. The ancient Egyptian tribes considered them as the symbol of purity and motherhood. They were considered sacred and protected by the Pharaoh's and hence also known as the, "Pharaoh's chicken". The ancient Egyptians had the intimate connection with nature.

There are two subspecies of Egyptian vultures in India, *Neophron percnopterus percnopterus* and *Neophron percnopterus ginginianus*. Both the subspecies are reported in Uttar Pradesh.

One of the most unique features of Egyptian vulture is that, it is the only tool using vulture Therefore, considered as the most intelligent and smarter than other vulture species. Being an opportunistic feeder with a broad diet range, not only devouring carcasses of dead animals, but feeding on most types of offal or garbage. It has even been observed that farmers as they plough up the ground, the worms, grubs, and similar creatures that are disturbed comes on the surface and the Egyptian vultures feed upon them. It can feed upon whatever it gets and sometimes scavenge small mammals, reptiles and insects also. Maximum number of Egyptian vultures have been observed around slaughterhouses and bone mill factories where they feed upon crushed bones. They are social in behavior at the predictable sources of food and communal roosting sites and co-exist with other species like Black Kite (*Milvus migrans*), House Crow (*Corvus splendens*), Cattle Egret (*Bubulcus ibis*) and Dog (*Canis sp.*).

They prefer feeding along with other birds. It enhances their foraging success and also protects them from predation. The communal roosting sites have been observed at Sambhal, Lakhimpur-Kheri, Aligarh, Bareilly and Faizabad.

It breeds once a year. Breeding season starts from March to June. The nesting is generally in the vicinity of human dwellings, utilizing the different nest materials from the surrounding. The nests are made on ancient temples, trees, electricity pylons, water tanks etc. Nests are often reused. Nest site selection was assessed on the basis of characters of the selected and non-selected substrates.

The nest material selection study was also done during the study period. The nest of Egyptian Vulture is an open, broad, elliptical shaped and loosely built platform type. In the study, anthropogenic matter constituted the maximum percentage which shows their link with human beings, followed by Animal matter, Plant matter, Soil and other unidentified materials. During the nest building process, the hard and sharp materials appeared to be the most effective material for the protection of nest. The mesquite sticks and bones were decorated as a host defence. The data also allow postulates a hypothesis that Egyptian Vultures are able to distinguish between materials based on physical and mechanical properties and thus selective in their use for nest construction.

During the entire study, the major threats reported were, lack of awareness, closure of slaughterhouses, myths, electrocution and increased population of feral dogs. Mass awareness campaigns were also initiated time to time and maximum number of individuals were sensitized. The prominent breeding territory is being monitored actively and the local people(villagers) from the particular village are educated regarding the importance of species and therefore acting as a frontline volunteer for the conservation of active nests in the breeding territory.Mass awareness regarding conservation of Egyptian vultures at various levels has been done, through workshops, census, interactive programs at local level; publication and distribution of awareness material in local language and its distribution in schools and colleges; rescue operation for injured or dehydrated vultures; workshops and awareness programs involving every level of community.

I have also been invited as the key speaker at the workshop organized by DFO Bahraich to deliver an expert talk on Egyptian vulture among the Forest officials at Katerniaghat Wildlife Sanctuary, Uttar Pradesh.

As the study area was large and it was a challenging task to do a study which has no previous baseline data but as it has been rightly said by Nelson Mandela, that, “It always seems impossible until it’s done”. I have strong faith in Almighty and therefore I worked hard to achieve my goals during my study and I got rewarded positively. I have presented my work done on conservation of Egyptian vultures in Uttar Pradesh, India, at several national and international platforms and was awarded with William C. Andersen Award for the best poster presentation at the Annual conference of Raptor Research Foundation, at Kruger National Park, South Africa in 2018 and James Koplin award for the oral presentation at the Annual conference of Raptor Research Foundation held at Fort Collins, Colorado in 2019.In both the conferences there were delegates from around 52 countries of the world and I was the only Indian among them. It was a proud moment for me to represent my country for my work and being appreciated and awarded both the times. Everybody appreciated for my work.

During the prevalent pandemic period of COVID-19, I have delivered several virtual talks on different occasions of green calendar such as, International Vulture Awareness Day, International Day for Biological Diversity, World Environment Day and in other certificate courses by colleges, to keep myself connected with my work and to disseminate the information with students, emerging researchers and other common people.

The present study will provide the baseline data to plan for the effective conservation strategies for Egyptian vultures.

Figure 1: Mass awareness among local people during field work

Figure 2: Awareness at Kasturba Girls College

Figure 3: As a Key speaker at Workshop organized by DFO Bahraich at katerniaghat Wildlife Sanctuary, among Forest officials

Figure 4: Workshop organized by DFO Bahraich at katerniaghat Wildlife Sanctuary, among Forest officials

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HSNC UNIVERSITY, MUMBAI

Kishinchand Chellaram College

Faculty of Science and Technology

Under the aegis of DBT Star Status and Star Scheme

RCRCG '21

REROUTING FROM CODE RED TO CODE GREEN

In Collaboration with WCB Research Foundation and PassionEdx

Presents

Essay Writing Competition

Date: October 8 – 25, 2021 **Participants: 101**

"If you want to change the world, pick up your pen and write."

- Martin Luther

The Department of Life Sciences, Faculty of Science and Technology, K. C. College, HSNC University organized an essay writing competition under DBT Star Status and Scheme initiative of **Rerouting Code Red to Code Green 2021**, from the 8th to 25th of October, 2021. The competition was held in collaboration with **Wildlife and Conservation Biology Research Foundation** and **PassionEdx Non-Governmental Organization.** A total of 101 participants from across Maharashtra and all over India participated in the competition which was held in three different languages Hindi, Marathi and English. Judges from various esteemed institutions and organizations were invited to evaluate the essays.

The multilingual competition was held for undergraduates as well as school students from standards 8th to 12th. The event was promoted through official social media accounts of RCRCG'21 on Instagram and Twitter. The competition invited students to write an essay of 1500 – 2000 words about key areas of concern for achieving sustainability through three topics, **Green Festivals - Caring for Environment**, **Eco-Cities - A Dream for a Better India** and **Earth 2050.**

- The Guru Mantra of Nature. The competition encouraged the youth to find unique suggestions for celebrating festivals while caring for nature and its resources. It also helped understand their perspective on how urban infrastructure can be developed in a sustainable manner. It brought together the sensitive and environment conscious youth of today to persevere for a world where nature does not need to be protected anymore. Therefore, the competition targeted the creativity and passion of youth for finding innovative solutions and ideas to better the environment.

The essays were assessed by leading environmentalists and academicians from esteemed institutions who evaluated the essays based on the content, organization, relevance to the theme, and novelty of ideas. After thorough assessment, 15 participants across three languages were felicitated with cash prizes.

Category	No. of Participants	First Place	Second Place	Consolation Prizes
English Undergraduate	56	Sameeksha Patil, Sonia Gyanchandani	Bhavika Suhas Gurav	Sanskriti Vishal Naik Ruhi Ataullah Pathan, Nehal Hareshwar Patil, Sneha Sharma, Nandini Jha
English 8th -12th Grade	41	Saniya Parkar	Dhruti Jhaveri	Nidhi Dnyaneshwar, Wadekar Saatvik Nigam, Vedanti
Hindi	3	Rama Dubey		
Marathi	5	Sahil Shrinivas Arekar		

The pen is certainly mightier than the sword, the essay writing competition successfully encouraged our youth to seek innovative solutions for issues that affect the environment and find alternatives for the sustainable future of humanity. It also helped them recognize that they are the creators of the future and it is up to them, what kind of world they wish to create. For the team of RCRCG'21, the competition reinforced our belief that the future of our world is in good hands. Kudos to all the 101 participants, as we at RCRCG'21 believe that every one of them is a winner.

~ Team RCRCG'21
Dept of Life Sciences
K. C. College

JUDGES

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Chairperson, Mulund Vibhag, Hariyali

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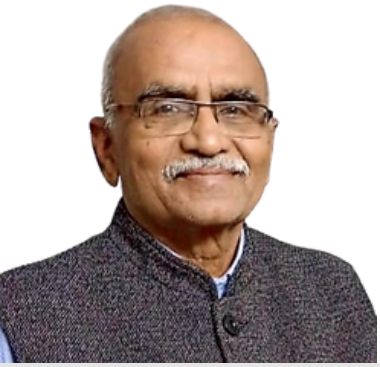

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Prithiviya publishes originalResearch articles, Short Notes, and Comments about wildlife (Flora and Fauna)and conservation biology. Methodological and technical contributions are also welcome. Only submissions in English will be considered for publication.Identification of species, annotated checklists, trip reports, new species records, book reviews, letters, announcements, notices, news from the wildlife world are also welcome.

The text and captions of tables, figures, photographs and appendices should be combined in one Microsoft Word® (".doc," ".docx") file format. The preferred font is 'Times New Roman' in 12 point, with single space.

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The word counts include the Abstract, whole text and References. The Table and Figure captions are excluded from the word count.

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Keywords: 4-5 words for indexing and literature searching; do not repeat words in the titles

Introduction: should provide a review of the state-of-the-art and existing knowledge on the topic as well as state the hypothesis, explain the issues or problems that motivate the research and the knowledge gaps andor the main questions to be answered.

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Discussion: Summarize the main findings of the study (but do not repeat results), explain and comment the results in relation to previous research. Discuss limitations of the study and potential needs in future research.

Conclusion: Optional. It should contain 10-15 sentences, concisely stating the main outcomes of the study.

References: Strictly follow the APA style of referencing. References should be arranged alphabetically by first author. Following are some examples for references.

Unpublished sources
"(Harkirat Sangha, in litt., e-mail/letter dated 02 January 2013)"; if oral, "(Rajah Jayapal, verbally, dated 15 December 2013)".
Journal articles
Naoroji, R., & Sangha, H. S., 2011. Threats to habitat and wildlife in Changthang and Rupshu areas of Ladakh: a case study at Hanle. Prithiviya7 (1): 2–6.
Books
Futehally, Z. (ed.) 2006. India through its birds. 1st ed. Bangalore, India: Dronequill Publishers Pvt. Ltd. Pp. 1–214.
Book chapter
Pittie, A., 2011. Stray Feathers (1872–1899) (p. 247). In: Priority! The dating of scientific names in ornithology: a directory to the literature and its reviewers. Dickinson, E. C., Overstreet, L. K., Dowsett, R. J., & Bruce, M. D. (eds.). Northampton, UK: Aves Press Limited.
Website
2013. Kadalundi makes history with new gull species. The Hindu (Thiruvananthapuram ed.) dated February 7, 2013. Website: http://www.thehindu.com/todays-paper/tp-national/tp-kerala/kadalundi-makes-history-with-new-gull-species/article4388171.ece. [Accessed on 21 July 2014.]

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