



# ZOO'S PRINT

## Communicating Science for Conservation

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# Walk-through aviary at Kanpur Zoological Park, India

Kanpur Zoological Park (KZP) is spread in an area of 76.56 ha of a reserve forest on the right bank of river Ganges having approximately 1,400 wild and domestic animals of around 125 species in its collection. KZP also has a jungle safari of 36 ha in its premises with a natural lake. The park is part of the erstwhile lush green Allen forest. It was opened for the public on 4 February 1974. The zoo is categorized as a 'Large Zoo' by the Central Zoo Authority of India. Many enclosures have been renovated owing to advent of technology and new standards in due course of time. However, since 2013 major changes occurred in the zoo with the construction of serpentarium, pheasantry, aviary, birds of prey, fox, wolf, wild boar enclosures; reptile section for mugger, gharial, & turtles; and a distinctive walk-through aviary.

The KZP lake is home to around 52 types of birds. The common birds of the zoo lake are Black-headed Ibis, White-breasted Waterhen, Black-winged Stilt, Night Heron, Pond Heron, Cattle Egret, Little Egret, Great Egret, darters, Purple Heron, Grey Heron, cormorant, Woolly-necked Stork, Painted Stork, Open-bill Stork, White-breasted Kingfisher, Pied Kingfisher, Moorhen, Jacana and visiting ducks like, Spoonbill Duck & Whistling Duck (Singh et al. 2016). Keeping the above factors in view the KZP authorities decided to display the birds in the walk-through aviary to acquaint and educate the masses about them and their importance for the maintaining the ecological balance.

While designing the walk-through aviary following points were considered.

**Space:** The bird should not be restricted in movement and should have sufficient flying space.

**Spatial familiarity:** Moving around objects like trees, water bodies, shrubs, and covered places causes more investigatory behaviour among birds.

**Temperature:** Variation and gradients of temperature in an enclosure are important to provide choice. Natural heating and cooling sources are considered best for the birds.

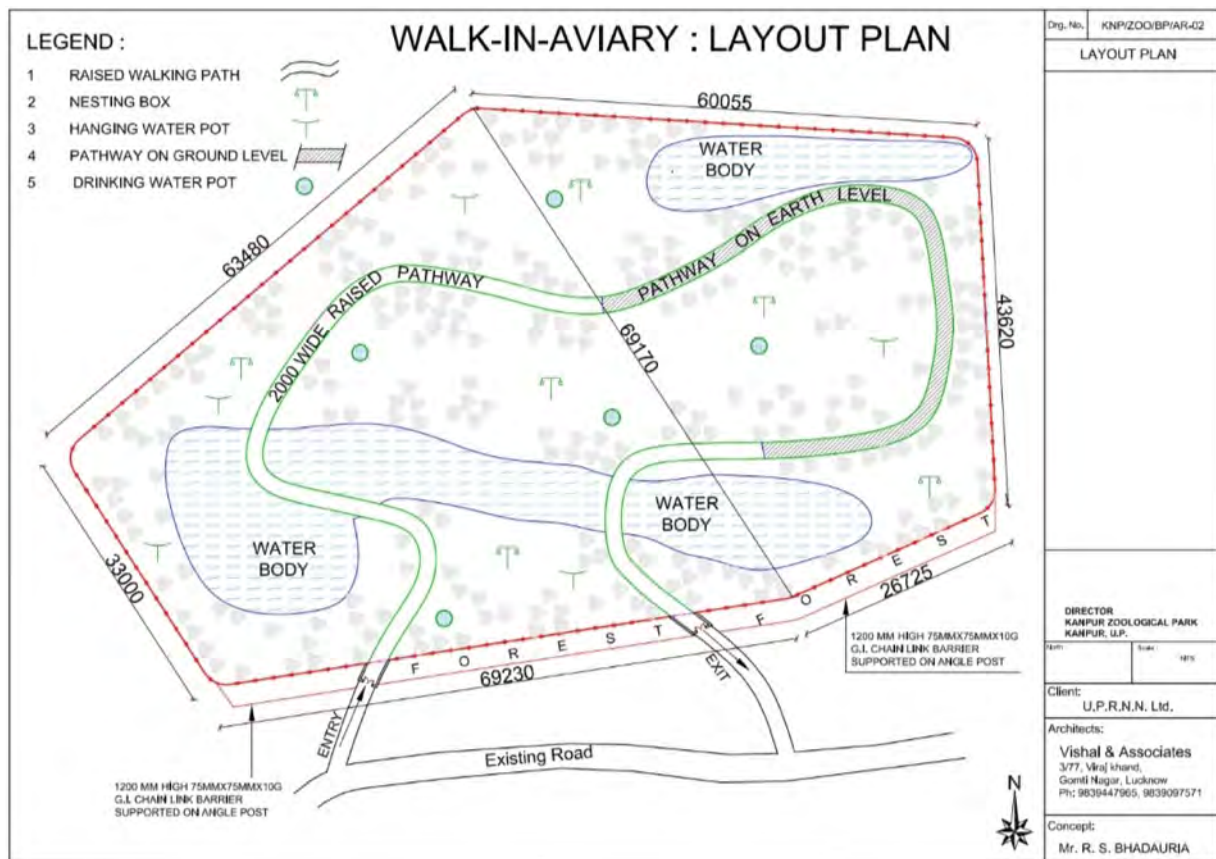
**Light:** Another key variable that can interact with temperature is light. Captive birds are exposed to a light regime that may include some ambient light.

**Water:** Water quality, water source and water may need frequent changes because of need for aquatic feeding, aquatic urination, defecation.

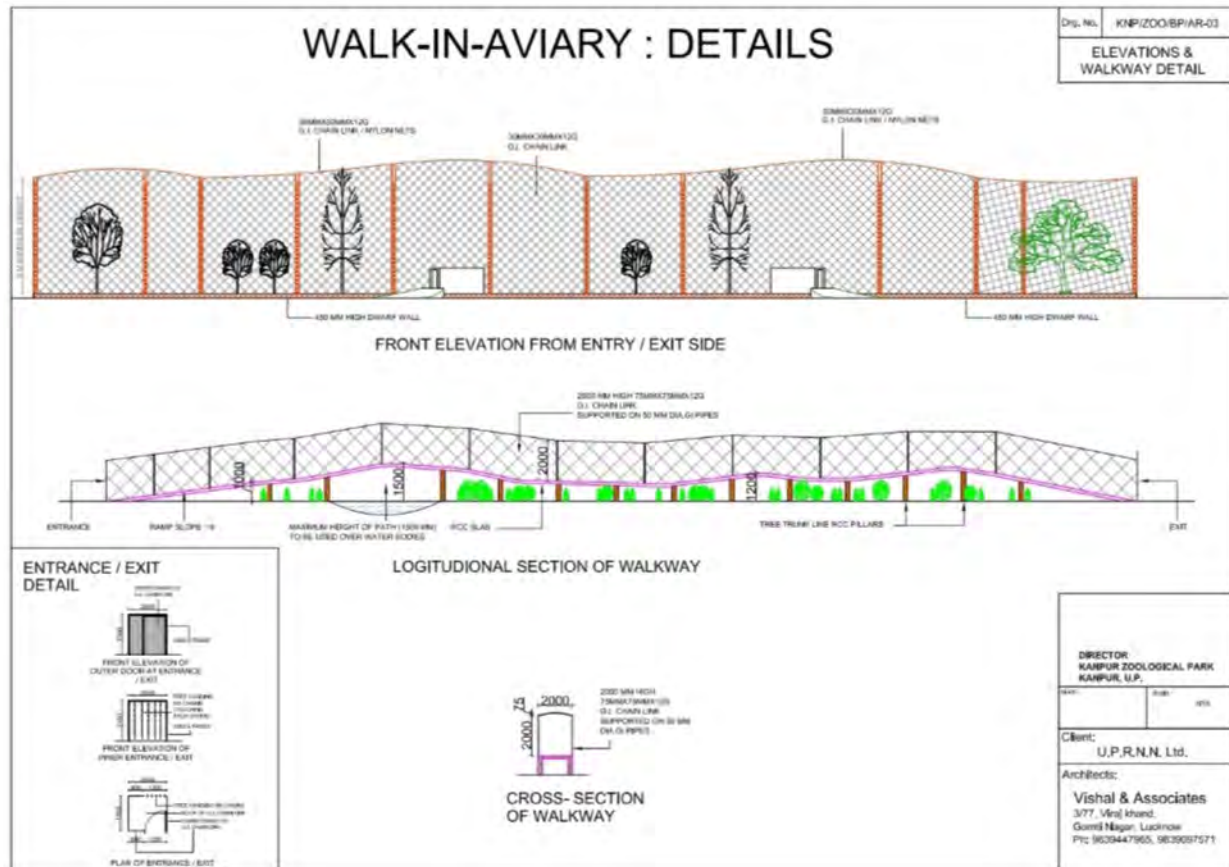
## Details of walk-through-aviary

The walk-through-aviary have been designed and constructed according to the norms set by Central Zoo Authority of India. The enclosure is spread through an area of approximately one hectare.

The whole aviary is overall rectangular in shape with little bit pentagonal to hexagonal outers. The dimensions of outer barriers are 3300 x



Layout plan of the Kanpur Zoological Park walk-through aviary.



Walk-through aviary: Front elevation and walkway/pathway details.

63480 x 60055 x 43620 x 26725 x 69230 mm. The widest transverse distance is 69170 mm in the middle of the walk-through-aviary. It is designed in such a way that even large trees which were already there can come inside its upper chain link. Therefore its height has been kept up to about 45 feet with minimum nine meters at some places. The chain link of 30 mm × 30 mm × 12 G supported by GI pipes on a dwarf wall of 450 mm have been used to cover whole aviary. Provision is also made to accommodate old water bird aviary as a separate enclosure of the new walk-through aviary with a door to connect both sections.

The old water bird aviary is being used to house sarus cranes as they used to attack small birds as well as new born chicks of other birds. The walk-through aviary also has especially designed kutchra water body or pond dividing walk-through-aviary transversely in between.

The depth of water body is as low as two feet at water inlet point and in ascending fashion reached up to around seven feet at water outlet point in order to facilitate all types of birds according to their size. The pond is also having a mound of stones for basking in between water body. The water body is continuously supplied with potable water through zoo water pump house. Apart from above a pucca water body or pond of around four to four and half feet depth is also provisioned separately along with different feeding platforms. Water birds prefer to feed near water body therefore three feeding platforms are especially designed near water body. The walk-through aviary is designed for filling of water body and drainage without the access of keeper inside. The walk-through aviary is covered by thick forest from

three sides which provides a natural and calm ambience to birds.

**Enrichments:** The walk-through-aviary is bird friendly and is having several avian species friendly vegetations, rockery, water troughs, artificial nests and natural nesting materials and hiding places, thus making walk-through-aviary conducive for all types of birds housed.

The walk-through-aviary is presently housing Rosy Pelican, Grey, Painted Storks, Spot-billed Duck, Muscovy Duck, Brahminy Duck or Ruddy Shelduck, Cormorant, Night Heron, and Sarus Cranes.

The temperature of Kanpur city ranges 0–45°C. Therefore, to maintain temperature in winters for sensitive birds thatched huts, paddy and tarpaulins are used. The walk-through aviary has ample sunlight to facilitate basking. However, during summer there is sufficient shade available as number of trees especially several Neem (*Azadirachta indica*), Chilbil (*Holoptelea integrifolia*), Tamarind (*Tamarindus indica*) trees of full length with several other small bushy plants and bamboo are available inside the walk-through-aviary. Apart from this water sprinklers also work during extreme summer.

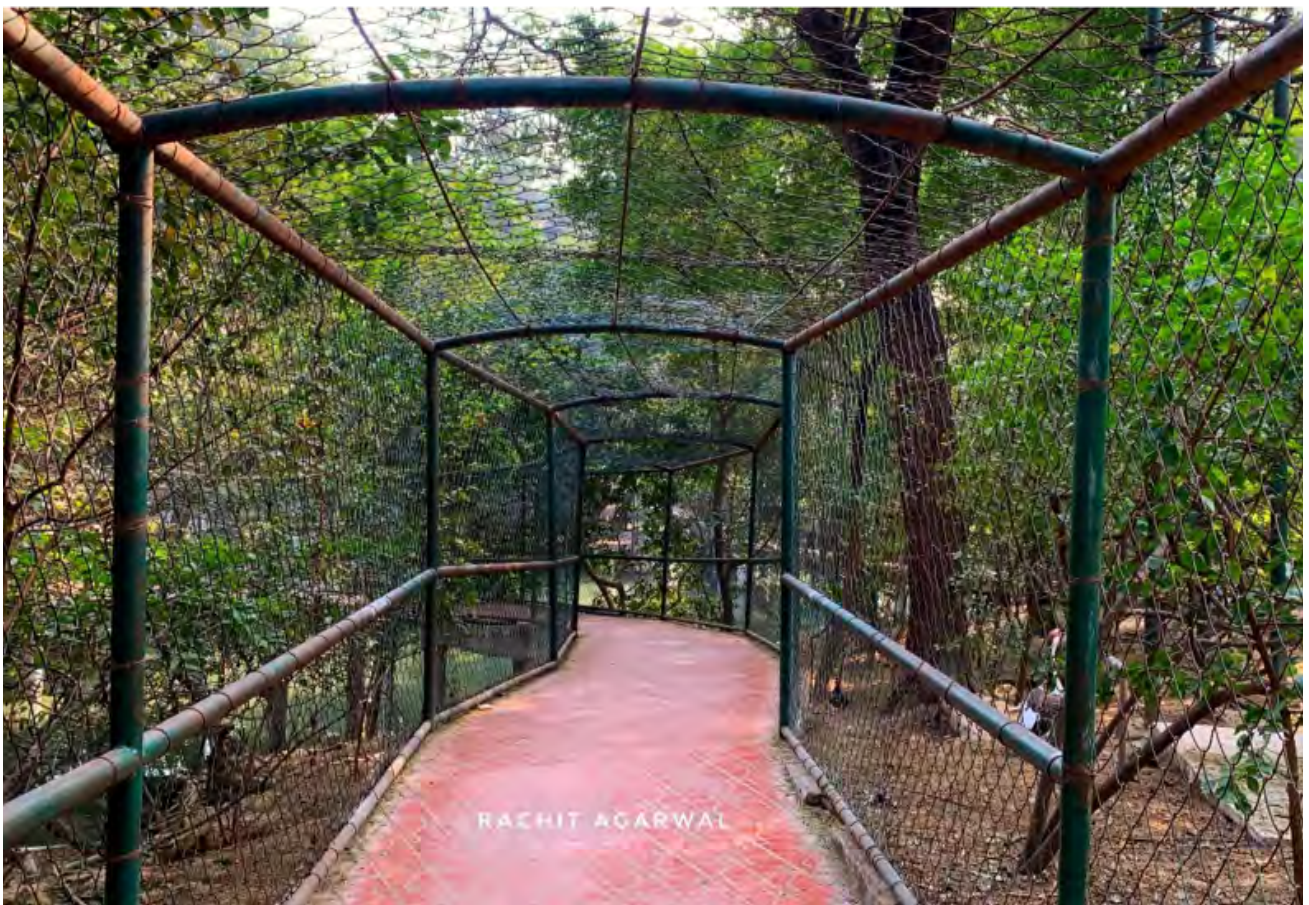
The walk-through aviary has sumptuous wooden and rockery substrate for birds comfort and leisure. Branched woody logs are also placed at several places and are so arranged for visitors to have clear visibility of the birds.

**Keepers enrichment:** The walk-through aviary is approached by four full length MS angle framed chain link doors by keepers. Two keepers door



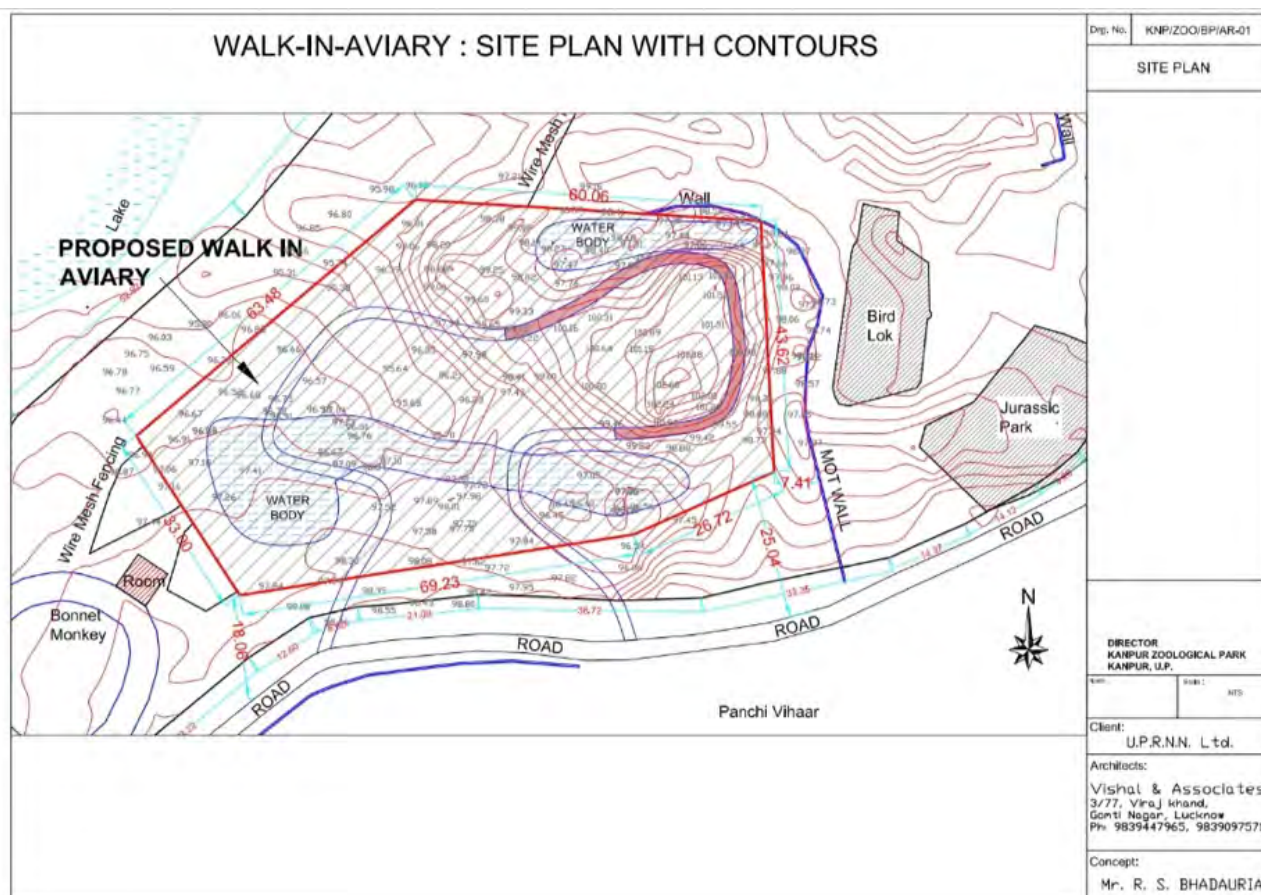


Pucca pond. © Rachit Agarwal.



Visitors pathway/walkway. ©Rachit Agarwal.





**Walk-through aviary: Site plan with contours.**

are at visitors entry and exit point while two others are in between walk-through aviary at sides of visitors path. Aviary has sufficient specific space provided to keep equipments. The zoo administration has provided gum boots, cap, uniform, buckets, mugs, and trays to keepers. One keeper and one assistant keeper along with a sweeper take care of routine services of walk-through aviary.

**Visitors enrichment:** Visitors enter walk-through aviary through a full length iron framed GI chain link door followed by another door of free hanging MS chains touching each other to prevent bird escape. Visitors are allowed entry only after putting their shoes in a lime foot bath tray in order to minimize any contamination. The visitors path or walkway is raised at entrance and moves through water

body twice in the form of two small bridges with maximum height being 1200 mm and 1500 mm over water body. However, due to undulating terrain visitors pathway is also at earth level at few places. The whole length of visitors path is fully covered with chain link of 75 mm × 75 mm × 12 G supported by 50 mm dia. GI pipes, which helps to reduce the chances of any disturbance by unruly visitor, if any. The width of the path is 2000 mm with 2000 to 2075 mm height. The signages are displayed for the visitors with detailed information about the birds. The lower part of the chain link of visitors path is further covered with welded mesh so that the birds can't pierce their thin neck through the small holes of the chain link. It also prevents inadvertently falling of someone's feet on bird's neck or beak.





Visitors pathway over kutchra pond. ©Rachit Agarwal.



Walk-through aviary visitors entrance. ©Rachit Agarwal.



**Cleaning schedule:** As discussed earlier the water body of walk-through aviary is continuously supplied with potable water through zoo water pump house in order to provide regular fresh water and to prevent stagnancy of water. Apart from this the water body is dredged twice a year with water treatment by any certified aqua/bird expert firms (Singh et al. 2018), if required.

The walk-through aviary and visitors path are broomed daily, the water troughs, feeding platforms and feeding trays are cleaned strictly on daily basis. From time to time pruning of branches of trees is also done before winter in order to facilitate entry of sunlight inside the walk-through-aviary. Whenever needed Kohrsolin-Th, Virkon-S or Sokrena-WS are also used for sanitization of walk-through aviary.

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## A recommendation on conservation of the endemic orchid *Bulbophyllum indicum* from the Kerala Western Ghats

*Bulbophyllum* Thouars, 1822 (Orchidaceae) is one of the largest genera with a native range in the tropics and subtropics. It comprises of about 137 species widely distributed in India (Singh et al. 2019), among which 27 species are endemic. The state of Kerala is reported to have 23 species, with 13 species endemic to the Western Ghats (Singh et al. 2015). The family Orchidaceae was surveyed and studied in Kerala since 2018, where the authors collected around 16 species of *Bulbophyllum* from different parts of the state. During the survey, *Bulbophyllum indicum* (C.S. Kumar & Garay) Kottaim was collected from the type locality of Agasthyamalai Biosphere Reserve, Thiruvananthapuram, Kerala and Kulamavu Reserve Forest, Idukki, Kerala. The collection from Idukki confirms the range extension of the species. *B. indicum* could be easily recognized in the field from other species of *Bulbophyllum* by the presence of a solitary flower on a long peduncle and a labellum covered with sepals and petals. After critical study of this species, a short description, live dissected photographs, notes on its distribution and conservation are provided.

Kerala lies on the undulating hills of the Western Ghats from 8.2836 to 12.7836 N latitude and 74.4503 to 77.6169 E longitude, covering an area of about 38,863 km<sup>2</sup>. It has a diverse vegetation pattern, including scrub forests, tropical dry deciduous forests, tropical moist deciduous forests, tropical evergreen and

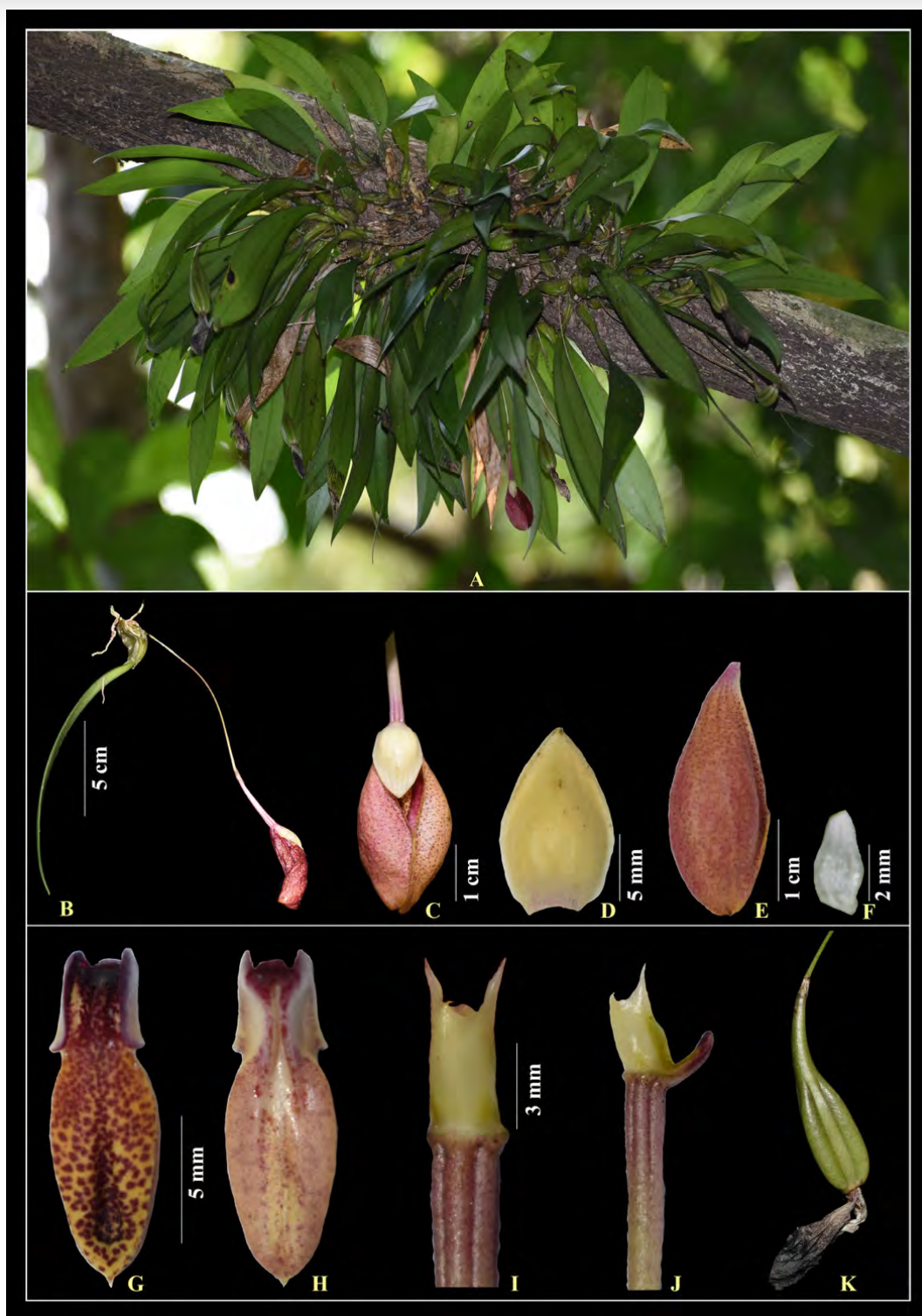
semi-evergreen forests, montane sub-tropical temperate forest, and grasslands.

A frequent survey of different seasons was carried out in the study area. The species were located along with geo-coordinates using GPS (Garmin etrex10) and good live images captured by Canon D5600. The collected species were identified using standard monographs, revisions, state floras, district floras, and literature, and the map was prepared using ArcGIS 10.2 version for future conservation.

***Bulbophyllum indicum*** (C.S.Kumar & Garay) Kottaim., Int. J. Curr. Res. Biosci. Plant Biol. 6(10): 33. 2019. *Rhytionanthos indicus* C.S.Kumar & Garay, Proc. 20th World Orchid Conf.: 114. 2013.

Epiphytes up to 15 cm tall. Pseudobulbs 1.5–2.5 × 1–1.5 cm, ovoid, clusters, green color. Leaf 8–10 × 0.8–1.2 cm, solitary in each pseudobulb, lanceolate, coriaceous, apex at acute. Peduncle 4–6 cm long, with basal sheath. Flower 2.5–3 × 1.2–1.5 cm, solitary, pink, pendulous, slender. Bracts ca 5×4 mm, ovate-oblong, mucronate. Dorsal sepal 1.3–1.5 × 0.8–1 cm, pale yellow, ovate, apex obtuse-acute, 7-veined; lateral sepals 2.5–3 × 1.2–1.5 cm, apex obtuse-acute, 7-veined, cohering together laterally to form a sac like structure. Petals 3.5–4 × 1.5–2 mm, white, lanceolate, apex acute, 3-veined. Lip yellow with pink tinge, 1.3–1.5 × 0.4–0.45 cm, lanceolate, thick, fleshy, 3-lobed; lateral lobes





*Bulbophyllum indicum* (C.S.Kumar & Garay) Kottaim: A—Habit | B—Inflorescence | C—Flower | D—Dorsal sepal | E—Lateral sepal | F—Petal | G, H—Lip (dorsal & ventral) | I—Column | J—Column with foot | K—Fruit.

3.5–4 mm long, obtuse, incurved; mid lobe 7–8 mm long, grooved, attached to the foot, mesochile saccate, apex acuminate. Column 4–5 mm long, with two narrow projections or horn at the side of anthers short foot. Anther

2-celled; pollinia 4, in 2 pairs, ca 1.8×0.6 mm, pyriform. Pedicel with ovary 1.5–2.5 cm long.

**Flowering & Fruiting:** January–April.

**Distribution:** Kerala (Agasthyamalai Biosphere Reserve, Thiruvananthapuram, 8.6208 N and



77.2264 E, Alt. 1005m, and Kulamavu Reserve Forests, Idukki, 9.8156 N and 76.9006 E, Alt. 857 m).

*B. indicum* is threatened in the type locality of the Agasthyamalai Biosphere Reserve, because of habitat loss through the introduction of tourism and recreation. Besides, the species is sensitive to long-term survival as the plant is structured with a pseudobulb of solitary flower with enclosure of essential parts over non-essential parts; thus leading to an uncertain condition of pollination. It has been observed that there are very few pollinated flowers among 10–20 individuals. A very few individuals are observed in this type of locality in Kerala, whereas about three localities were identified in the Kulamavu Reserve Forest of Idukki District with very little population in the marginal areas of the forest.

On scrutiny of the related literature, it was revealed that the documentation of the same species is only from the protologue (Kumar & Garay 2013) while distributional records on other parts are untraceable in recent publications.

If assessed as per the IUCN Red List Categories and Criteria, this species will be Vulnerable and is recommended for the conservation through: (i) It is necessary to conduct population monitoring program together with orchid ecological study in the adjoining regions. (ii) Since *B. indicum* produces large numbers of seeds per capsule, invitro propagation techniques could be used to produce mass production with restoration and reintroduction programme. (iii) Conserving a database through a repository would help

to locate the species, trace out the current status or distribution of species and plan the species recovery management. (iv) Finally, the forest department and local people should be enlightened about the orchid conservation programme and achieve it through the progressive transfer of conservation knowledge to students and tourists.

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## *Physalis lagascae*, an invasive species found in Odisha, India

Many Solanaceae genera, including *Physalis* Linnaeus (1753) (Solanaceae, Solanoideae, Physalinae), have a variety of economically significant species, from edible and ornamental. It is an American genus with about 90 species (Martinez 1998). Mexico and Central America have the highest species diversity, followed by the rest of North America and South America.

About six *Physalis* species have been identified in India, but there are discrepancies in the opinions of the various authors/researchers. Two invasive species, *Physalis minima* and *P. peruviana*, as well as one garden species, *P. angulata* are described in the Flora of British India (Hooker 1885). Deb (1980) identified four domesticated species, including *P. alkekengi* L. and *P. angulata* L. as garden plants, *P. peruviana* L. and *P. ixocarpa* Brot. for their edible fruit, and two invasive taxa, *P. minima* L. and *P. virginiana* Mill. var. *sonorae* (Torr.) Waterfall with a distribution throughout India. Haines (1921) reported two species *Physalis minima* and *P. angulata*.

In a study of southern India, Ganapathi et al. (1991) identified four invasive *Physalis* species which are *P. pubescens* L., *P. peruviana*, *P. minima*, and *P. angulata*. Among these, *P. pubescens* L., and *P. peruviana* are found in high altitude and the other two species *P. minima* and *P. angulata* are both widespread. Later, while doing the flora of Odisha, these two species were even reported by Saxena & Brahmam (1995). While working on the flora of

Eastern Ghats, Kottaimuthu & Kalidass (2015) reported *P. prinuosa* as one of the new species from the state of Tamil Nadu.

During the revisionary studies of the family Solanaceae of Eastern Ghats, we collected some interesting specimens of *Physalis* from Balesore District, Odisha. A detailed examination with relevant literature (Flora of North America and the Flora of the World online) revealed it to be *P. lagascae* Roem. & Schult. Therefore, it has been a new record for Odisha as a result of the species occurrence there. For simple identification and recognition, images have been included with the nomenclature, a brief explanation of the ecology and the phenology of the species.

***Physalis lagascae*** Roem. & Schult. Syst. Veg. 4: 679 (1819); *Physalis lagascae* var. *glabrescens* O.E.Schulz Symb. Antill., 6: 147 (1909); *Physalis parviculea* S.F. Blake Contr. U.S. Natl. Herb., 24: 20 (1922).

Erect to decumbent or prostrate, weak or occasionally ± robust, ± dichotomously much branched, annual herb, (0.05) 0.1–1 m high (elsewhere said to reach 1.5 m). Branches angular or angular-ribbed, striate, drying ± sulcate, sparingly villous, with ± long hairs mainly on the emergent parts and also short and minute hairs somewhat localized near the nodes, occasionally sub glabrous. Leaves solitary or geminate; petiole 0.5–4.5(8) cm long, often slightly winged, rather sheathing at the base;





*Physalis lagascae* Roem. & Schult.: A—Habit | B—A view of single flower | C—A view of stamens arrangement | D—single flower in each node | E—Fruting with calyx closeup.

lamina membranous or  $\pm$  fleshy, 1.5–7.5 (10.5)  $\times$  0.8–4.5 (7.5) cm, ovate to lanceolate, sometimes rhombic, ovate-oblong, elliptic or oblanceolate, base shortly cuneate or attenuate, sometimes obtuse, rounded, truncate or subcordate, rarely dentate, the teeth unequal,  $\pm$  triangular, obtuse, the sinuses rounded, both surfaces  $\pm$  sparsely

pilose or subglabrous but pubescent along the nerves and near the margins; minor leaves with lamina 0.5–0.7  $\times$  0.3–0.4 cm, elliptic, sometimes present. Flowers solitary, inserted by the side of the petiole base appearing axillary, erect to pendulous; pedicel 2–5(9) mm long, villous or puberulous, occasionally subglabrous. Flowers

solitary, inserted by the side of the petiole base appearing axillary, erect to pendulous. Calyx (1.5) 2–3.5 (4) mm long, 1.5–2.5(3) mm across at the base of the lobes, campanulate, sub-angled-ribbed, truncate or invaginated at the base, in fruit greenish, usually drying purple-veined, (10) 12–20 (23) × (8)10–15(20) mm, globose to ± ovoid, 10-angled-ribbed or 10-ribbed, slightly obtuse or apiculate at the summit, half to almost filled by the fruit, subglabrous to pilose, mostly with long hairs especially along the ribs and nerves, often the ribs with widely spaced small teeth or enations derived from the hair bases, the lobes (0.5)1–2.5 (3) × 1–2 mm. Corolla greenish-yellow or yellow to white or greenish-cream, slightly purplish marked or apparently unmarked, more rarely blotched with 5 ± dark purple to brown markings not strongly contrasting with the surrounding limb, (3) 4–5 (7) mm long, tubular-campanulate. Stamens included or slightly exerted, equal or subequal; filaments (1) 1.5–3 (3.5) mm long, filiform, attached to the corolla tube near the base, furnished with few hairs; anthers yellowish, sometimes blue margined, 0.8–1 mm long, ± oblong or elliptic in outline, straight after anthesis. Disk 0.2–0.3 mm high, fleshy, glabrous pistil ovary 0.8–0.9 × 0.6–0.7 mm, ellipsoid or ± globose, glabrous; style 2–3 mm long, filiform, ± curved upwards. Fruit greenish-yellow or pale yellow, occasionally yellow, sessile or with a gynobase up to 1mm long on the invaginated base of the erect to pendulous calyx, (5) 6–10 mm in diameter, ± globose or slightly ovoid, viscid seeds light brown or yellowish, (1.5) 1.8–2 × (1.5) 1.6–1.8 (2) mm, ovate to orbicular in outline, sometimes reniform, reticulate-foveolate.

**Flowering & Fruiting:** June to July

**Habitat:** Sunny to somewhat shaded fields, gardens, wastelands, fallow fields, along roadsides, in open forests and forest margins.

**Distribution:** Central & South America; Alien invasive species in India (Kerala, Tamil Nadu, & Odisha -- districts of Balesore (Baliapal) and Khordha (Bhubaneswar).

**Specimen examined:** India, Eastern Ghats, Odisha, Baleswar, Baliapal, 21.5051 N; 86.8905 E, Madhusmita Mallia & PK Das RPRC-11211, 10.vi.2020.

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#229  
21 December 2022

## Note on the interaction between house gecko and potter wasp

The year 2020 is a notable year in human history due to the spread of the novel virus COVID-19 and the kind of threat the entire globe faced. Due to this, lockdown events were confronted by the whole human civilization, and many activities were shut down in Vadodara City as well. During this period, I visited some new construction sites in the city. These unused vacant spaces and homes were used by some potter wasps (Hymenoptera: Vespidae) to construct their nests in the summer months (between March to June) for breeding performance. There were six potter wasp nests at various heights from 0.2–2.4 m from the ground level and close to the roof. Four nests are close to roofs and two above floors. I observed all these nest construction activities regularly out of



The Northern House Gecko licking up a nest of the potter wasp. © Raju Vyas.



The Northern House Gecko approaching a potter wasp © Raju Vyas.



**An unsuccessful attack on the potter wasp by an adult Northern House Gecko. © Raju Vyas.**

curiosity to learn the movement of the wasps.

Potter wasps make tiny nests that look like ceramic jugs or pots. They build these small containers' nests on twigs, branches, trunks of trees, or vacated houses' walls. Each pot has only one chamber, unlike the many chambers found inside a honeybee hive. Females lay just one egg inside the room and then place paralyzed caterpillars inside

with the egg before sealing the pot at the opening. The potter wasp larva eats the caterpillars as it grows and develops before digging its way out of the side of the chamber; the top of the pot is the thickest part and requires more work to break through.

On 18 March 2020, I noticed an adult gecko slowly approaching one of the nests under construction, high and close to the roof. The gecko

settled close to the nest and started licking the outer walls of the nest. The intent of licking a wasp's nest by a gecko was found interesting. Such unusual behaviours of the gecko ignited enthusiasm that tempted me to keep track of the nest. On the second day, at noon, the gecko approached one of the potter nests. The gecko attacked a wasp while the wasp was bringing the nesting materials. It was an unsuccessful attempt by the gecko. I observed that the gecko was regularly predated on the wasp after a few unsuccessful attempts. The reason for licking remained unanswered.

The gecko was identified as the Northern House Gecko *H. flaviviridis* (Smith, 1935). The wasp was identified up to genus level *Eumeninae* sp. with the help of literature (Girishkumar et al. 2020). The Northern House Gecko is a nocturnal and insectivore reptile and grows 15–18 cm in length (Daniel 2002). This gecko species is widely distributed naturally and by anthropogenic activities in many parts of the world, including Egypt, Kuwait, Saudi





Arabia, United Arab Emirates, Oman, Iraq, Iran, Afghanistan, Yemen, north Somalia, Sudan, Ethiopia, Eritrea, Nepal, Bangladesh, Pakistan, and India (Uetz et al. 2022). In addition, this species is found in many Indian states and is the most adapted and common gecko found in human habitation.

The literature surveys indicated the gecko species from *Hemidactylus* feed on various types of nocturnal insects. Geckos are occasionally cannibalistic (Bauer 1990; Daniel 2002), eat rice grain and sugar (Smith 1935), at times seeds of wild plants (Sharma 1982), and rarely flowers too (Vyas 1997). The geckos predate stingless bees and prefer incoming, heavily loaded bees with honey and pollen grains (Vyas 2012). Such feeding behaviour might have developed due to the gecko's preference for sweet taste. It is often observed that *H. flaviviridis* likes sweet and is found in empty teapots in the kitchen (author's unpublished observation). Earlier, the same kind of interaction was observed in Asian House Gecko *H. frenatus* preying on nests of paper wasp (*Polisties* sp.) at Brisbane, NW Queensland, Australia (David 2006).

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## Preliminary survey on avianfauna at Osam Hill, Gujarat, India



Habitat view of Osam Hill.

In any type of ecosystem, avian fauna constitutes one of the major biotic components. Ali (1956) has described 423 species and 444 species of birds were described by Dharmakumarsinghji (1954).

The Gujarat State avian diversity updated checklist reported 609 species (Ganpule 2020). Joshi (2009) reported 79 species of birds in some reservoirs of Rajkot City and Vadhel (2010) reported 30 species of water birds from Nyari Dam-1 of Rajkot.

Currently, 82 bird species are recorded at Rajkot from Saurashtra University Campus (Trivedi & Vaghela 2020).

The study was conducted to investigate the bird diversity at the Osam Hill, as no work on bird diversity has been carried out at Osam Hill, Patanvav, Rajkot. The study area is 110km south west side from Rajkot City and 32km from Junagadh City.

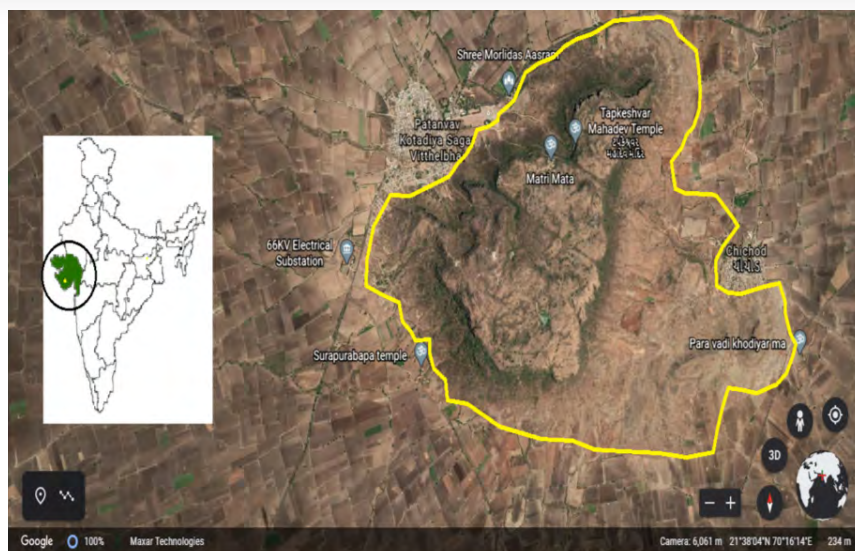
Osam Hill is located in Patanvav Village (21.6358 N; 70.2739 E),

Rajkot, Gujarat. Patanvav is at an elevation of 68m while Osam Hill is located at an elevation of 148 m. Entire area is hilly covered with shrubs and woody at slopes. Five water points are present in the study area including two check dams and three small ponds.

It bears more vegetation at base compared to apex of the hill.

Complete avian survey was conducted in the study area for two years from October 2017



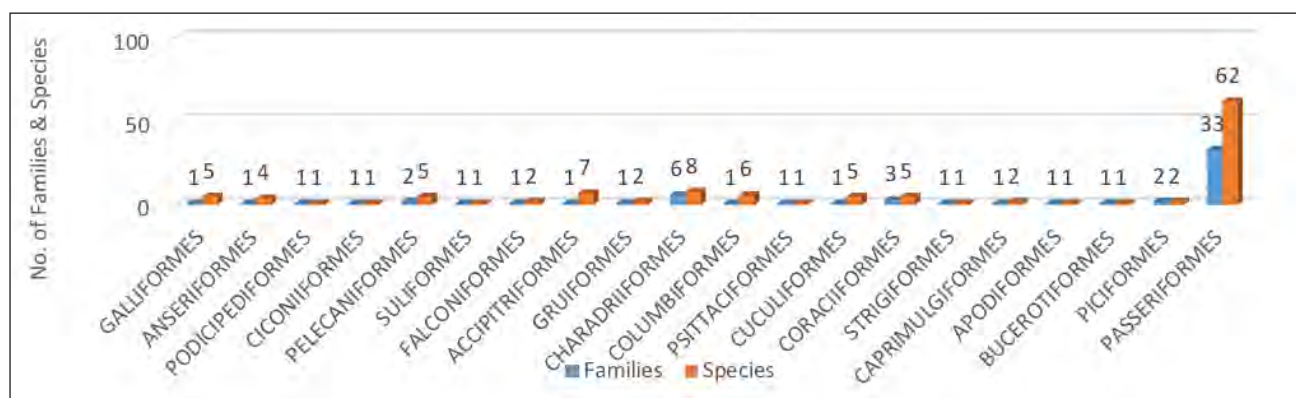


**Osam Hill, Patanvav, Gujarat.** Source: Google Earth retrieved on 1 May 2020 (map not to scale).

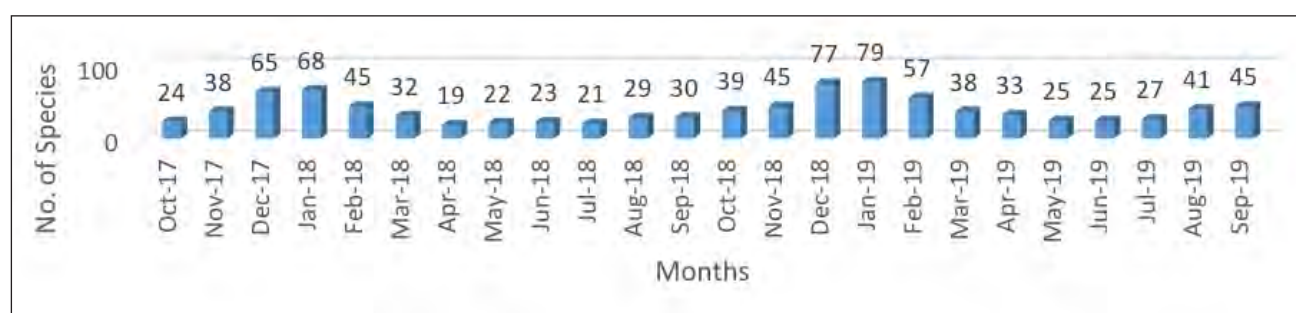
to September 2019. Data were collected by random sampling method (Taherdoost 2016). Feeding guild of birds were also observed.

Following both the methods, area was explored by walking on foot in the field. Birds were observed with the help of Nikon aculon 10–22 x 50mm

binocular. Identification of birds was done by using standard field guides (Ali & Ripley 1983; Grimmett et al. 2011; Ali 2012). The status of birds was categorized into Resident (R): which is observed throughout season, Winter Migrant (WM): sighting observed during March–May, Passage Migrant (PM): they occur for a short period between the origin and destination mainly found in pre and post season period, Monsoon Migrant (MM): sighting observed during rainy season June–October, Common species (C): Species



**Order-wise families and species richness.**

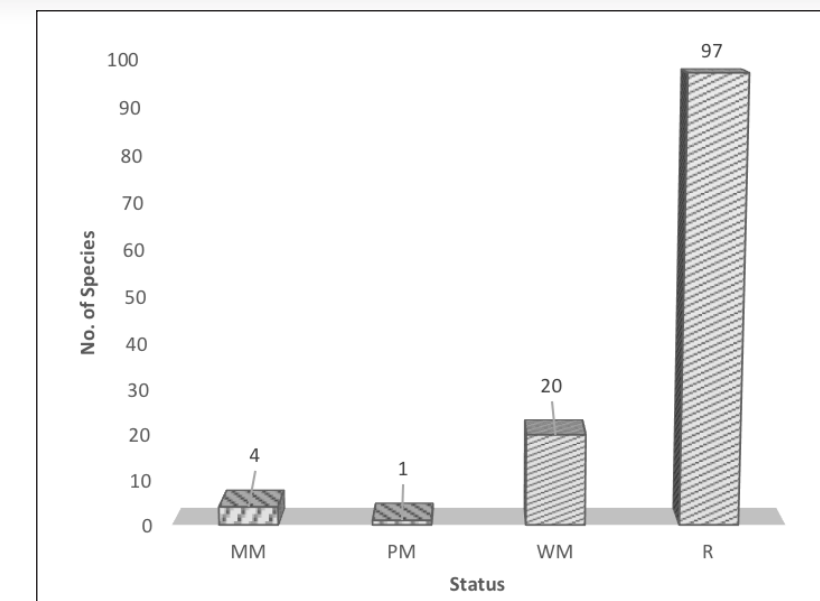


**Month-wise number of species.**

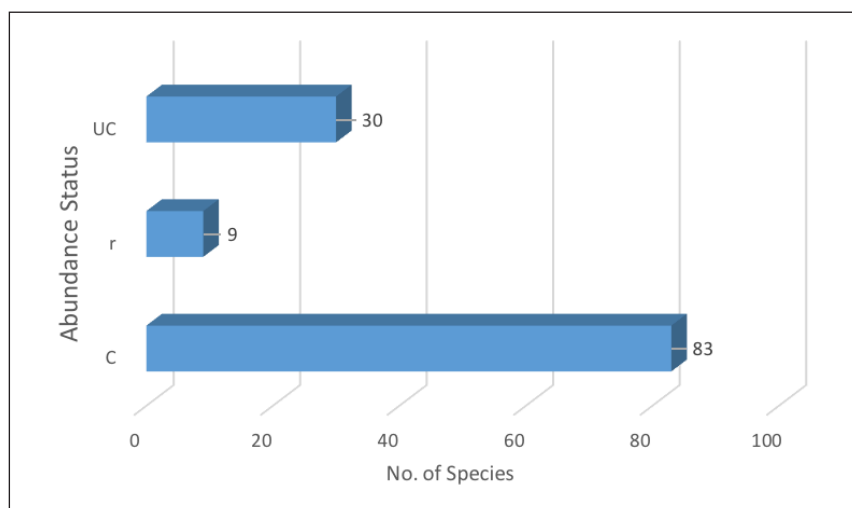
Observed more than four times during survey (<4), Un-Common species (UC): Species observed three to four times during survey and rare species. Rare (r): Species observed once or twice during survey.

The threatened status of the birds given in the checklist as per IUCN Red List of Threatened Species (BirdLife International 2001a,b). The common-rare, resident-migratory status of the birds are classified as per Bird Fauna in northeast India (Saikia & Saikia 2000). Total time spent for the observations was 650h. Observations were taken mainly for 350 hours in morning session and 300 hours in evening session. The observations were taken twice a day while the avifauna is usually most active (0630–1000 h and 1600–1830 h).

During the study, total of 20 orders, 61 families and 122 species of birds were observed (Table 1) and it holds almost 20% bird species of Gujarat (Ganpule 2020). The majority of migratory birds were observed during winter. The Osam Hill provides best habitat for migratory and residential



Status: R—Residential | WM—Winter Migratory | MM—Monsoon Migratory | PM—Passage Migratory.



Abundance status: C—Common | UC—Uncommon | r—Rare.

birds and supports a rich species diversity (20% count) of state avifauna.

During the two-year survey, highest number of species were found from December to February. December to February is the winter season and study area attracts 20%

count of bird species of state diversity. In summer, i.e., April to June temperature was too high between 40–48°C hence, fewer bird species were encountered. Sightings in the year 2018–19 were more than the year 2017–18 due to knowledge of sighting places from previous year.



Table 1. Checklist of birds of Osam Hill, recorded during September 2017 to October 2019.

Order	Family	Common Name	Scientific Name	Status	Abundance Status	Feeding Guilds
Galliformes	Phasianidae (Pheasants and allies)	Painted Francolin	<i>Francolinus pictus</i> , Jardine and Selby 1828	R	UC	O
		Grey Francolin	<i>Francolinus pondicerianus</i> , Gmelin, JF 1789	R	C	O
		Rain Quail	<i>Coturnix coromandelica</i> , Gmelin, JF 1789	R	C	O
		Rock Bush-Quail	<i>Perdicula argoondah</i> , Sykes 1832	R	UC	G
		Indian Peafowl	<i>Pavo cristatus</i> , Linnaeus 1758	R	C	O
Anseriformes	Anatidae (Ducks, Geese, Swans)	Lesser Whistling-Duck	<i>Dendrocygna javanica</i> , Horsfield 1821	R	C	O
		Knob-billed Duck	<i>Sarkidiornis melanotos</i> , Pennant 1769	R	C	H
		Indian Spot-billed Duck	<i>Anas poecilorhyncha</i> , Forster, JR 1781	R	C	H
		Eurasian Teal	<i>Anas crecca</i> , Linnaeus 1758	WM	UC	O
		Little Grebe	<i>Tachybaptus ruficollis</i> , Pallas 1764	R	C	I
Podicipediformes	Podicipedidae (Grebes)	Painted Stork	<i>Mycteria leucocephala</i> , Pennant 1769	R	C	P
Ciconiiformes	Ciconiidae (Storks)	Black-headed Ibis	<i>Threskiornis melanocephalus</i> , Latham 1790	R	C	C
		Red-naped Ibis	<i>Pseudibis papillosa</i> , Temminck 1824	R	C	O
		Indian Pond Heron	<i>Ardeola grayii</i> , Sykes 1832	R	C	I/P
		Western Cattle Egret	<i>Bubulcus ibis</i> , Linnaeus 1758	R	C	I
		Little Egret	<i>Egretta garzetta</i> , Linnaeus 1766	R	C	I/P
Suliformes	Phalacrocoracidae (Cormorants, Shags)	Little Cormorant	<i>Microcarbo niger</i> , Vieillot 1817	R	C	P
Falconiformes	Falconidae (Caracaras, Falcons)	Common Kestrel	<i>Falcon tinnunculus</i> , Linnaeus 1758	WM	UC	C
		Eurasian Hobby	<i>Falco subbuteo</i> , Linnaeus 1758	WM	r	C
Accipitriformes	Accipitridae (Kites, Hawks, Eagles)	Black Kite	<i>Milvus migrans</i> , Boddaert 1783	R	UC	C
		Black-winged Kite	<i>Elanus caeruleus</i> , Desfontaines 1789	R	C	C
		Oriental Honey-buzzard	<i>Pernis ptilorhynchus</i> , Temminck 1821	R	C	C
		Eurasian Marsh-Harrier	<i>Circus aeruginosus</i> , Linnaeus 1758	WM	UC	C
		Shikra	<i>Accipiter badius</i> , Gmelin, JF 1788	R	C	C
		White-eyed Buzzard	<i>Buteo teesa</i> , Franklin 1831	R	UC	C
		Booted Eagle	<i>Hieraetus pennatus</i> , Gmelin, JF 1788	WM	UC	C

Order	Family	Common Name	Scientific Name	Status	Abundance Status	Feeding Guilds
Gruiformes	Rallidae (Rails, Crakes and Coots)	White-breasted Waterhen	<i>Amaurornis phoenicurus</i> , Pennant 1769	R	C	O
		Eurasian Coot	<i>Fulica atra</i> , Linnaeus 1758	R	C	O
	Turnicidae (Buttonquail)	Barred Buttonquail	<i>Turnix susciator</i> , Gmelin, JF 1789	R	C	O
Charadriiformes	Burhinidae (Stone-curlews, Thick-knees)	Eurasian Thick-knee	<i>Burhinus oedicnemus</i> , Linnaeus 1758	R	C	C
	Recurvirostridae (Stilts, Avocets)	Black-winged Stilt	<i>Himantopus himantopus</i> , Linnaeus 1758	R	C	O
		Yellow-wattled Lapwing	<i>Vanellus malabaricus</i> , Boddaert 1783	R	UC	C
	Charadriidae (Plovers)	Red-wattled Lapwing	<i>Vanellus indicus</i> , Boddaert 1783	R	C	C
		Little Ringed Plover	<i>Charadrius dubius</i> , Scopoli 1786	R	C	C
	Scolopacidae (Sandpipers, Snipes)	Common Sandpiper	<i>Actitis hypoleucos</i> , Linnaeus 1758	WM	C	C
	Laridae (Gulls, Terns, Skimmers)	River Tern	<i>Sterna aurantia</i> , Gray, JE 1831	R	C	C
		Common Pigeon	<i>Columba livia</i> , Gmelin, JF 1789	R	C	G
	Columbiformes	Eurasian Collared-Dove	<i>Streptopelia decaocta</i> , Frivaldszky 1838	R	C	G
			<i>Streptopelia tranquebarica</i> , Hermann 1804	R	r	G
Spotted Dove		<i>Streptopelia chinensis</i> , Scopoli 1786	R	C	G	
		Laughing Dove	<i>Spilopelia senegalensis</i> , innaeus 1766	R	UC	G
Yellow-footed Green-Pigeon		<i>Treron phoenicopterus</i> , Latham 1790	R	C	F	
Pittaculidae (Old World Parrots)		Rose-ringed Parakeet	<i>Psittacula krameri</i> , Scopoli 1769	R	C	F
Cuculiformes	Cuculidae (Cuckoos)	Jacobin Cuckoo	<i>Clamator jacobinus</i> , Boddaert 1783	MM	C	I
		Common Hawk-Cuckoo	<i>Hierococcyx varius</i> , Vahl 1797	MM	C	I
	Grey-bellied Cuckoo	<i>Cacomantis passerinus</i> , Vahl 1797	MM	r	I	
		Asian Koel	<i>Eudynamys scolopaceus</i> , Linnaeus 1758	R	C	F
	Greater Coucal	<i>Centropus sinensis</i> , Stephens 1815	R	C	O	
Strigiformes	Strigidae (Owls)	Spotted Owllet	<i>Athene brama</i> , Temminck 1821	R	C	C
Caprimulgiformes	Caprimulgidae (Nightjars)	Indian Nightjar	<i>Caprimulgus asiaticus</i> , Latham 1790	R	C	I
		Jungle Nightjar	<i>Caprimulgus indicus</i> , Latham 1790	R	r	I
Apodiformes	Apodidae (Swifts)	Little Swift	<i>Apus affinis</i> , Gray, JE 1830	R	C	I
Bucerotiformes	Upupidae (Hoopoes)	Common Hoopoe	<i>Upupa epops</i> , Linnaeus 1758	WM	UC	I



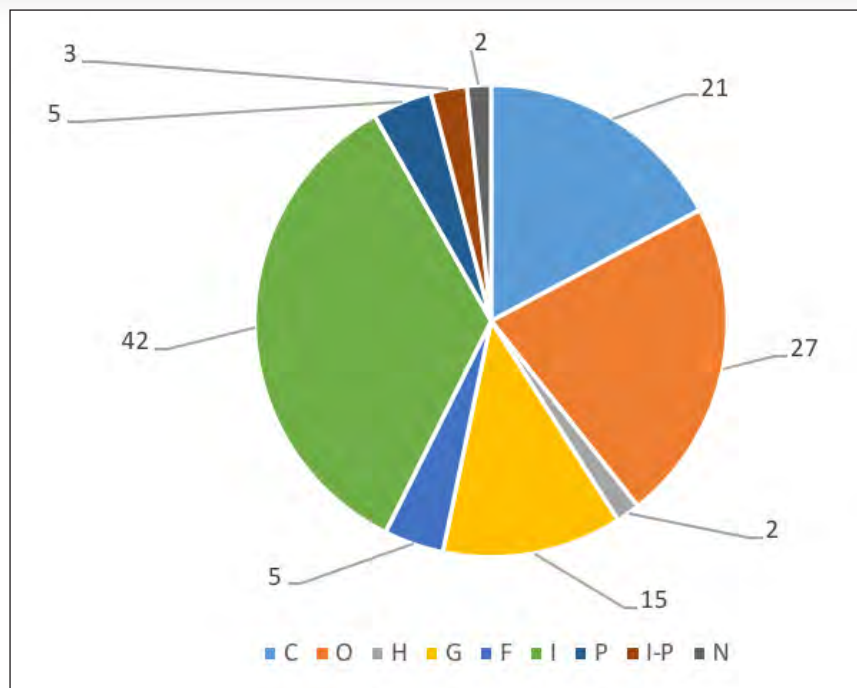
Order	Family	Common Name	Scientific Name	Status	Abundance Status	Feeding Guilds
Coraciiformes	Coraciidae (Rollers)	Eurasian Roller	<i>Coracias garrulous</i> , Linnaeus 1758	PM	UC	I
	Alcedinidae (Kingfishers)	White-throated Kingfisher	<i>Halcyon smyrnensis</i> , Linnaeus 1758	R	C	I/P
		Common Kingfisher	<i>Alcedo atthis</i> , Linnaeus 1758	R	UC	P
		Pied Kingfisher	<i>Ceryle rudis</i> , Linnaeus 1758	R	C	P
	Meropidae (Bee-eaters)	Green Bee-eater	<i>Merops orientalis</i> , Latham 1801	R	C	I
Piciformes	Megalaimidae (Asian Barbets)	Coppersmith Barbet	<i>Megalaima haemacephala</i> , Statius Müller, PL 1776	R	C	F
	Picidae (Woodpeckers)	Yellow-crowned Woodpecker	<i>Leiopicus mahrattensis</i> , Latham 1801	R	UC	I
	Pittidae (Pittas)	Indian Pitta	<i>Pitta brachyura</i> , Linnaeus 1766	WM	UC	I
	Vangidae (Vangas and Allies)	Common Woodshrike	<i>Tephrodornis pondicerianus</i> , Gmelin, JF 1789	R	UC	I
		Large Cuckooshrike	<i>Coracina macei</i> , Lesson, R 1831	R	UC	I
Passeriformes	Campephagidae (Cuckooshrikes)	Black-headed Cuckooshrike	<i>Lalage melanoptera</i> , Rüppell 1839	WM	r	I
	Aegithinidae (Ioras)	Common Iora	<i>Aegithina tiphia</i> , Linnaeus 1758	R	C	I
	Campephagidae (Cuckooshrikes)	Small Minivet	<i>Pericrocotus cinnamomeus</i> , Linnaeus 1766	R	C	I
	Laniidae (Shrikes)	Bay-backed Shrike	<i>Lanius vittatus</i> , Valenciennes 1826	R	C	C
		Long-tailed Shrike	<i>Lanius schach</i> , Linnaeus 1758	R	C	C
	Dicruridae (Drongos)	Black Drongo	<i>Dicrurus macrocercus</i> , Vieillot 1817	R	C	C
		Ashy Drongo	<i>Dicrurus leucophaeus</i> , Vieillot 1817	R	UC	C
		White-bellied Drongo	<i>Dicrurus caeruleus</i> , Linnaeus 1758	R	r	I
	Oriolidae (Figbirds, Orioles, Tur-nagra)	Indian Golden Oriole	<i>Oriolus (Oriolus) kundoo</i> , Sykes 1832	R	UC	F
	Rhipiduridae (Fantails)	White-browed Fantail	<i>Rhipidura aureola</i> , Lesson R, 1831	R	UC	I
	Monarchidae (Monarchs)	Indian Paradise-Flycatcher	<i>Terpsiphone paradise</i> , Linnaeus 1758	R	C	I
		Black-naped Monarch	<i>Hypothymis azurea</i> , Boddaert 1783	R	UC	I
	Corvidae (Crows, Jays)	Rufous Treepie	<i>Dendrocitta vagabunda</i> , Latham 1790	R	C	O
		Indian Jungle Crow	<i>Corvus (Macrorhynchis) culminatus</i> , Sykes 1832	R	C	O

Order	Family	Common Name	Scientific Name	Status	Abundance Status	Feeding Guilds
Passeriformes	Corvidae (Crows, Jays)	House Crow	<i>Corvus splendens</i> , Vieillot 1817	R	C	O
	Paridae ( Tits, Chickadees)	Great Tit	<i>Parus major</i> , Linnaeus 1758	R	C	O
	Hirundinidae (Swallows, Martins)	Dusky Crag-Martin	<i>Ptyonoprogne concolor</i> , Sykes 1832	R	C	I
		Wire-tailed Swallow	<i>Hirundo smithii</i> , Leach 1818	R	C	I
		Red-rumped Swallow	<i>Cecropis daurica</i> , Laxmann 1769	R	C	I
	Alaudidae (Larks)	Rufous-tailed Lark	<i>Ammomanes phoenicurus</i> , Franklin 1831	R	C	G
		Ashy-crowned Sparrow-Lark	<i>Eremopterix griseus</i> , Scopoli 1786	R	C	G
		Crested Lark	<i>Galerida cristata</i> , Linnaeus 1758	R	UC	I
	Pycnonotidae (Bulbuls)	Red-vented Bulbul	<i>Pycnonotus cafer</i> , Linnaeus 1766	R	C	O
	Cisticolidae (Cisticolas and Allies)	Ashy Prinia	<i>Prinia socialis</i> , Sykes 1832	R	UC	I
		Plain Prinia	<i>Prinia inornata</i> , Sykes 1832	R	C	I
		Grey-breasted Prinia	<i>Prinia hodgsonii</i> , Blyth 1844	R	C	I
	Vireonidae (Vireos, Greenlets, Shrike-Babblers)	Green Shrike-Babbler	<i>Pteruthius xanthochlorus</i> , Gray, JE & Gray, GR 1847	WM	C	O
	Phylloscopidae (Leaf Warblers and Allies)	Sulphur-bellied Warbler	<i>Phylloscopus griseolus</i> , Blyth 1847	WM	r	I
	Timaliidae (Babblers, Scimitar Babblers)	Tawny-bellied Babbler	<i>Dumetia hypertythra</i> , Franklin 1831	R	r	O
	Leiothrichidae (Laughingthrushes and Allies)	Common Babbler	<i>Argya caudata</i> , Dumont 1823	R	C	O
		Large Grey Babbler	<i>Argya malcolmi</i> , Sykes 1832	R	C	O
		Jungle Babbler	<i>Argya striata</i> , Dumont 1823	R	C	O
	Sylviidae (Sylviid Babblers)	Yellow-eyed Babbler	<i>Chrysomma sinense</i> , Gmelin, JF 1789	R	UC	O
	Zosteropidae (White-eyes)	Oriental White-eye	<i>Zosterops palpebrosus</i> , Temminck 1824	R	C	N
	Sturnidae (Starlings, Rhabdornis)	Common Myna	<i>Acridotheres tristis</i> , Linnaeus 1766	R	C	O
		Bank Myna	<i>Acridotheres ginginianus</i> , Latham 1790	R	UC	O
		Brahminy Starling	<i>Sturniapa godarum</i> , Gmelin, JF 1789	R	C	O
		Rosy Starling	<i>Pastor roseus</i> , Linnaeus 1758	WM	C	O



Order	Family	Common Name	Scientific Name	Status	Abundance Status	Feeding Guilds
Passeriformes	Muscicapidae (Chats, Old World Flycatchers)	Oriental Magpie-Robin	<i>Copsychus saularis</i> , Linnaeus 1758	R	C	O
		Indian Robin	<i>Saxicoloides fulicatus</i> , Linnaeus 1766	R	C	I
		Black Redstart	<i>Phoenicurus ochruros</i> , Gmelin, SG 1774	R	C	I
		Common Stonechat	<i>Saxicola torquatus</i> , Linnaeus 1766	WM	C	I
		Desert Wheatear	<i>Oenanthe deserti</i> , Temminck 1825	WM	UC	I
		Blue Rock Thrush	<i>Monticola solitarius</i> , Linnaeus 1758	WM	UC	I
		Red-breasted Flycatcher	<i>Ficedula parva</i> , Bechstein 1792	WM	C	I
		Tickell's-Blue Flycatcher	<i>Cyornis tickelliae</i> , Blyth 1843	R	C	I
		Grey-headed Canary-Flycatcher	<i>Culicicapa ceylonensis</i> , Swainson 1820	R	UC	I
	Stenostiridae (Fairy Flycatchers)					
	Nectariniidae (Sunbirds)	Purple Sunbird	<i>Cinnyris asiaticus</i> , Latham 1790	R	C	N
	Passeridae (Old World Sparrows, Snowfinches)	House Sparrow	<i>Passer domesticus</i> , Linnaeus 1758	R	C	G
	Ploceidae (Weavers, Widowbirds)	Baya Weaver	<i>Ploceus philippinus</i> , Linnaeus 1766	MM	C	G
	Estrildidae (Waxbills, Manias and Allies)	Scaly-breasted Munia	<i>Lonchura punctulata</i> , Linnaeus 1758	R	C	G
	Motacillidae (Wagtails, Pipits)	Western Yellow Wagtail	<i>Motacilla flava</i> , Linnaeus 1758	WM	C	I
		White Wagtail	<i>Motacilla alba</i> , Linnaeus 1758	WM	C	I
		White-browed Wagtail	<i>Motacilla maderaspatensis</i> , Gmelin, JF 1789	R	C	I
		Paddyfield Pipit	<i>Anthus rufulus</i> , Vieillot 1818	R	C	I
	Fringillidae (Finches, Euphonies)	Common Rosefinch	<i>Carpodacus erythrinus</i> , Pallas 1770	WM	UC	G
	Estrildidae (Waxbills, Munias and Allies)	Indian Silverbill	<i>Euodice malabarica</i> , Linnaeus 1758	R	C	G
	Emberizidae (Buntings)	Black-headed Bunting	<i>Emberizom elanocephala</i> , Scopoli 1769	WM	UC	G
		Striolated Bunting	<i>Emberiza striolata</i> , Lichtenstein 1823	WM	r	G

R—Residential | WM—Winter Migratory | MM—Monsoon Migratory | PM—Passage Migratory | C—Common | UC—Uncommon | r—Rare | C—Carnivores | O—Omnivores | H—Herbivores | G—Granivores | F—Frugivores | I—Insectivores | P—Piscivores | I—P—Insectivores & Piscivores | N—Nectarivores.



**Feeding Guild:** C—Carnivores | O—Omnivores | H—Herbivores | G—Granivores | F—Frugivores | I—Insectivores | P—Piscivores | I-P—Insectivores and Piscivores | N—Nectarivores.

The status is concerned, out of 122 species of birds, 97 were resident, 20 winter migrant, 4 summer migrant and 1 passage migrant species. The highest 79 species richness was recorded in January 2019 which is comparatively not common in other months. The winter migrant birds arrive from different states of India like Jammu and Kashmir, Arunachal Pradesh, and also from different countries like Siberia, Tibet, and different range of the Himalaya. Out of 25 migratory species, 20 were winter migratory species including Eurasian Hobby *Falco*

*subbuteo*, Desert Wheatear *Oenanthe deserti*, Blue Rock-Thrush *Monticola solitarius*, Eurasian Teal *Anas crecca*; four of them are monsoon migrants like Jacobin Cuckoo *Clamator jacobinus*, Common Hawk-Cuckoo *Hierococcyx varius* and the one passage migrant is Eurasian Roller *Coracias garrulous* which is observed during September and October.

According to their encounter rate, the total 122 bird species found in study area were classified including Yellow-eyed Babbler *Chrysomma sinense*, Indian Pitta *Pitta brachyuran*, Grey-headed Canary Flycatcher

*Culicicapa ceylonensis* were uncommon, and nine species (7%) such as Striolated Bunting *Emberiza striolata*, Red Collared-Dove *Streptopelia tranquebarica*, White-bellied Drongo *Dicrurus caeruleus* were rare.

Studies also focused on feeding guilds of birds with the help of direct observations as well as literature. Out of 122 species observed, 35% were insectivorous followed by 23% omnivorous, 17% carnivorous, 12% granivorous and rest of the 13% were frugivorous, piscivores, herbivorous, nectarivorous, and insectivorous-piscivores.

Conservation status: The River Tern *Sterna aurantia* is Vulnerable (VU), Painted Stork *Mycteria leucocephala* and Black-headed Ibis *Threskiornis melanocephalus* are Near Threatened (NT) according to IUCN Red List and other 119 species are under Least Concern (LC).

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## Occurrence of White Wagtail in the Suheli Par Island of Lakshadweep Archipelago, India

The White Wagtail *Motacilla alba* Linnaeus, 1758 is a small passerine bird belonging to the family Motacillidae of the order Passeriformes. It is distributed throughout Asia, Europe and parts of northern Africa (BirdLife International 2022). The bird is extremely variable, its head has a black-and-white pattern, and its plumage is composed of white, black, grey, yellow, and green feathers (Grimmett et al. 2011). It is primarily found in open country side near water habitation and is adapted to foraging in urban areas. Being an insectivorous bird, bare areas are often the preferred habitat for feeding (Dickinson 2003).

On 17 January 2022, a faunal expedition was conducted by the Zoological Survey of India, at the Suheli Par Island of Lakshadweep Archipelago, India. The Suheli Par Island (10.037°N, 72.281°E) is a very small island (2,100 m long), located about 65 km to the south-west of Kavaratti Island. The island is uninhabited



White Wagtail *Motacilla alba* on seashore of Suheli Par Island of Lakshadweep Archipelago. © M. Kamalakannan.

except for the forest and police security posts and therefore is naturally safeguarded. The coconut plantations are the main vegetation of this island. During the survey along the

seashore (10.043°N, 72.283°E), a total of six individuals of birds were sighted and photos captured while foraging. Based on the distinctive black and white plumage, and



characteristic behaviour of constantly bobbing up and down the tail, the bird was identified as White Wagtail *Motacilla alba*.

A single record of this species has been reported from Kavaratti Island of the Lakshadweep Archipelago which has been posted on social media by Krishnan (2017). Based on this record, Aju et al. (2021) also listed this species in the checklist of birds of the Lakshadweep Archipelago. This species has not been sighted or reported yet from Suheli Par Island of the Lakshadweep archipelago. Hence, we report the first record of White Wagtail *Motacilla alba* with photographic evidence from Suheli Par Island of Lakshadweep Archipelago. The present locality record of this species is about 65 km to the south-west of Kavaratti Island (the nearest and only known locality of this species) and extends the distribution range of this species in the Lakshadweep Archipelago. This bird record has also been considered as an additional or second record to the Lakshadweep Archipelago.

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## Isabelline Wheatear in Tiruchirappalli District of Tamil Nadu, India



Isabelline Wheatear.

The Isabelline Wheatear *Oenanthe isabelline* is a migratory insectivorous bird species belongs to the family Muscicapidae. The species has a wide distribution range, breeding in Northern Hemisphere and wintering in Africa and India (Cramp 1988; Zheng 2002; Birdlife International 2021). It is mainly found in arid, open vegetated country, dry plains, semi deserts and grasslands habitats. The diet consist of invertebrates, particularly insects such as beetles and ants and vegetable matter (Collar 2015). The Isabelline Wheatear is plain sandy-brown in colour, head and bill look rather large

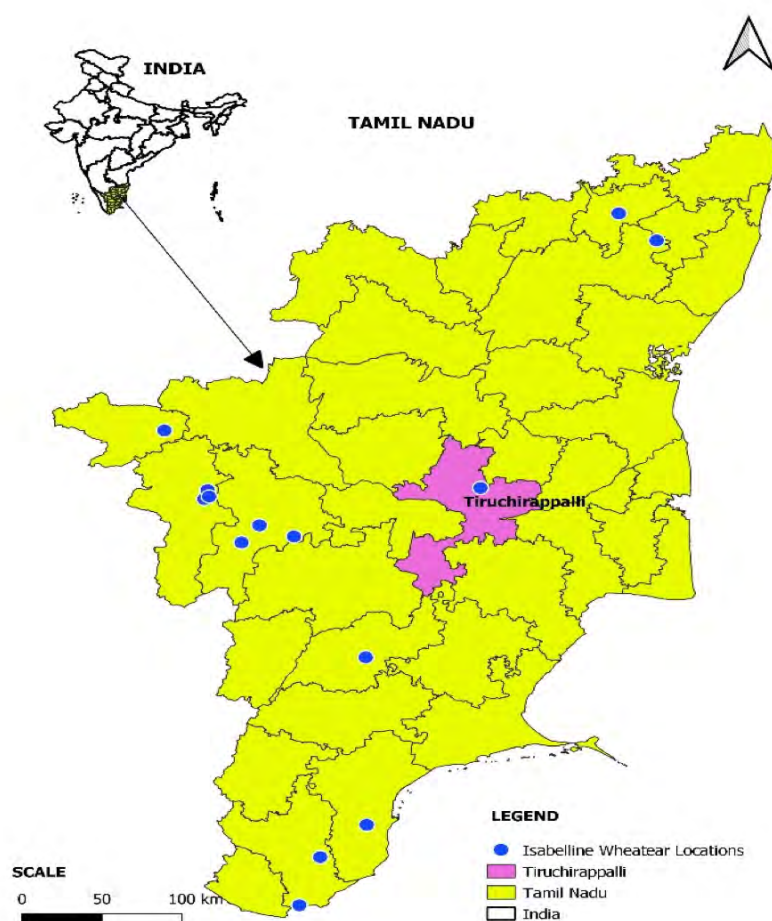
and have a long legs. The tail is shorter more white at base and sides. The wings sandy-brown with constrastingly dark alula (Grimmett et al. 2011).

It is considered as a rare winter migrant, previously reported from Sri Lanka (Kaluthota & Kotagama 2009), Konkan & Goa (Pande et al. 2003), Andhra Pradesh in 2003 (Pittie & Ulla 2006), Raichur District from Karnataka (Ghorpadé et al. 2011), Kannur & Kottayam districts of Kerala (Sashikumar et al. 2011), and Tirunelveli & Thoothukudi districts from Tamil



Table 1. Districts wise Isabelline Wheatear records in Tamil Nadu.

	Districts	Year	Number of locations	Number of observations
1	Coimbatore	2017, 2018, 2019	3	19
2	Madurai	2021	1	1
3	The Nilgiris	2019	1	1
4	Thoothukudi	2013	1	1
5	Tirunelveli	2011, 2012, 2016, 2019	2	4
6	Tiruppur	2018, 2020	4	7
7	Tiruvannamalai	2019	1	2
8	Vellore	2020	1	1
9	Tiruchirappalli	2021	1	1



(11.04548 N & 78.66909 E and elevation of 117 m). At 8.05 am, we observed a single bird perching on large stones. The bird colour, shape, size and patterns were observed.

The bird was photographed and later identified with the help of a field guide (Grimmett et al. 2011) as Isabelline Wheatear. This is the first ever record in Tiruchirappalli District, Tamil Nadu. Later, this first sighting was recorded and entered in the ebird checklist (<https://ebird.org/checklist/S97602461>).

#### Location of Isabelline Wheatear recordings in Tamil Nadu.

Nadu (Muthunarayanan et al. 2013). On 14 November 2021, we went for a bird watching at Omanthur village

in Tiruchirappalli District, Tamil Nadu. The surrounding village landscape comprises of grasslands and scrub habitats

The previous records of Isabelline Wheatear from Tamil Nadu are very few and mostly restricted to the northern, western, and southern districts of the state. There are nine districts reported to record the

bird as per the ebird portal including our record (Table 1).

From 2011 onwards Isabelline Wheatear is reported 37 times. Maximum observations are from Coimbatore district and the nearby Tirupur district. There are no details on its ecology & behaviour and publications are also very limited.

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## Observation of Hair-crested Drongo in Salem District, Tamil Nadu

The Hair-crested Drongo *Dicrurus hottentottus* also called Spangled Drongo, a resident bird from the Indian subcontinent belongs to the family Dicruridae (Grimmett et al. 2011). It has a broad tail with upward twisted corners and a long down-curved bill. The previous observation of Hair-crested Drongo report the bird to primarily feed on nectar (Pandey 1991), insects (Wang & Qian 1989; Zhao 2001). Zhao (2001) and Rocamora & Yeatman-Berthelot (2009) provided an anecdotal report that Hair-crested Drongos may eat snakes and small lizards. The IUCN Red List has categorized and evaluated the species as 'Least Concern'.

The Hair-crested Drongo was observed from Danishpet village (11.830907 N & 78.129174 E; elevation 368.52 m) in Salem District, Tamil Nadu on 18 December 2021 at 10.00 AM. While birding, we noticed a black colour bird on a Eucalyptus tree. We first thought it was a Bronzed Drongo because of its beak



Hair-crested Drongo (Spangled Drongo) recorded in Salem District, Tamil Nadu.

and the colour. But the feathers had a glossy sheen, and the tail feathers curled upwards and the bird also looked slimmer and we came to conclude that it is a Hair-crested Drongo by observing their tail structure over a record shot of the bird flying. The Hair-crested Drongo was observed and recorded for the first time in the Salem District as there are no previous documentary records for the bird in the region. The closest record of the species previously observed and reported is from Sulur Lake in Coimbatore District (The Hindu).

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## Vishal Ahuja's local - vocal conservation action

Vishal Ahuja is a conservationist who is leading the Chamba Sacred Langur project in the Chamba valley of Himachal Pradesh. Being an awardee of the 'Mud on boots' project by the Sanctuary Nature Foundation, he's working on the restoration of land for the conservation of Himalayan Langur, also known as Chamba Sacred Langur (*Semnopithecus ajax*) at Wildlife Information Liaison Development (WILD) and Zoo Outreach Organisation (Zooreach). On 9 November 2022, we, the RHATC 2022–23 Fellows had an opportunity to interact with Vishal and learn about his conservation journey.

Vishal grew up in the Chamba valley of Himachal Pradesh. Chamba is a threatened landscape that's located near the Ravi river in confluence with the Sal river. The main vegetation found here consists of oak, pine, and broadleaved forests. Vishal was 14 years old when he started hiking around the mountains of Chamba. Thus he was familiar with the landscape of Chamba from a very early age. During his bachelor's study, he met Dr. Vipin C. Rathore, a science educator. It was Dr. Rathore, who later informed Vishal about the opportunity to work on the project by WILD and Vishal happily took it.

The Chamba Sacred Langur project had a holistic approach as Vishal knew that local communities were also a part of the solution. The main issue to resolve was the negative interaction between the people

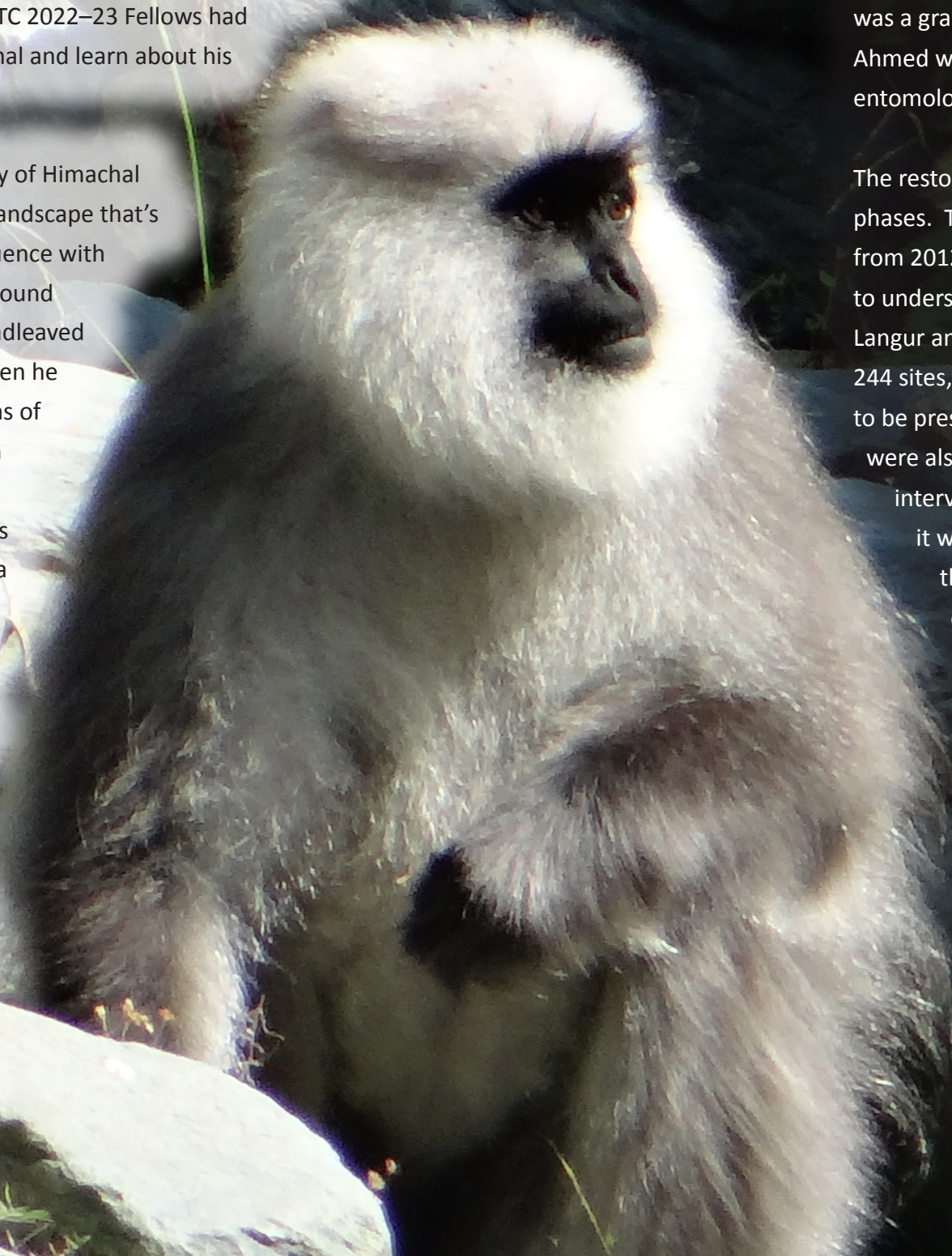
and animals like the langur, porcupines, and the Himalayan Black Bear that raided the crops as there were no fruit-yielding trees in the area. It was also necessary to make people realize the importance and the endemism of the Himalayan langur, which the local communities otherwise called 'Gaula'. Thus, having a purpose in mind, the project took its initial steps in 2012 with Vishal Ahuja, Martina Anandam, and Tariq Ahmed under the guidance of Dr. Sanjay Molur. While Martina Anandam was a graduate in primate conservation, Tariq Ahmed was a graduate in zoology and a trained entomologist.

The restoration project was unveiled in multiple phases. The first phase of the project was done from 2012 to 2014. In this phase, they tried to understand the taxonomy of the Himalayan Langur and their distribution. They surveyed 244 sites, out of which the langurs were found to be present in 124 sites. The conflict zones were also mapped based on the questionnaire interviews. Since Vishal was the local guy it was easier for him to interact with the local communities. It was also during this phase, the long-standing taxonomic uncertainty between the *Semnopethicus hector* and *Semnopethicus ajax* was resolved on the morphological basis. The team also conducted conservation education programs that included the Chamba workshop for children. The Himalayan langur conservation education program was conducted with the objective of fostering conservation sensitive behaviour and ecological awareness in schools.

Phase 2 of the project took place in 2014–16. Here, 51 villages were surveyed. The villagers said that 57% of the yield was lost due to crop raiding by the langurs and bears. While Black Bears and porcupines raided during the night, macaques and langurs raided during the day. The Black Bear and the macaques accounted for the highest percentage of crop damage done at 42% and 32%, respectively. The major crop raids were done on maize, barley and wheat. 30% of the villagers surveyed said wheat was least vulnerable to damage. This survey gave Vishal and his companions a clear picture of the situation that even the people are suffering, and hence they too are looking forward to a solution.

During phase 3 that took place from 2017 to 2019, vegetation sampling was done in Khajjiar-Kalatop wildlife sanctuary and other areas. Out of the 247 plant species that were identified to date, langurs, bears, and macaques were found to feed on 25 species. Since the land around consisted of monoculture plantations like paddy fields, tea, and coffee plantations, the team found that it was essential to restore the vegetation with native fruit-yielding trees. A list was also prepared on the native trees that would be planted.

With things in place, the Pilot project began in July 2020. 110 plants belonging to six species were planted during this time. The saplings were collected from the forest department nurseries. The winter plantation was done in February 2021. Of these saplings, 90% survived the winter. One of the things Vishal aimed for was to get an own nursery for the restoration project as getting the saplings from the forest department's nursery was a long journey and





time-consuming. The location for this was planned near a plantation around Khajjiar-Kalatop Wildlife Sanctuary. Once the saplings were planted, the main challenge was to prevent cattle grazing. This was crucial, because cattle grazing would mean all the efforts would be futile. To further strengthen conservation action, team activities were conducted by Zooreach in Chamba during April–May 2022. A book called ‘Achamba’ was created to educate the children about the Himalayan langur. The book was designed by Brenda de Groot. There were also awareness programs conducted with the female self-help groups, and different sessions were conducted with village heads and the wildlife forest guards. Vishal’s future plans mainly include education and outreach, and awareness on the importance of native species.

We the RHATC fellows got to learn a lot from Vishal’s talk. When Vishal said “restoration can take decades”, we understood that the spirit of conservation is patience and optimism. Without these two qualities, any conservation action would fail. The other thing we learnt from Vishal’s talk is that a conservation action needs to be planned in multiple phases. One simply cannot rush into action hoping that things would fall into place. It is also important that we take the local communities into trust, understand their share of problems, and work alongside them. Because if the local communities understand the cause for conservation, then they can serve as great allies.

We were greatly amazed when we got to know that Vishal is a multi-skilled person. He’s well



versed in playing seven musical instruments. Vishal is also skilled in identifying plants and owns a herbarium collection. People like Vishal are great examples of personalities one can look up to while pursuing a career in conservation.

#### **Acknowledgement:**

I’m grateful to Mr. Vishal Ahuja for sharing his journey and experiences in the conservation of Himalayan Grey Langurs in the landscapes of Chamba, Himachal Pradesh, and to RHATC Course 2022- 23, Zooreach Organization, for providing us an opportunity to interact with Vishal”.

**Melito Prinson Pinto**, RHATC Fellow, 2022–23, Zoo Outreach Organisation, Coimbatore, TN, India.



# The fascinating world of Sachin Rai

Our international trip started in the East African countries of Kenya and Tanzania. These countries generate a lot of revenue through tourism. And the land area that is protected is massive. For example, the protected area covering just Tsavo and Amboseli national park alone ranges around 25000 sq. km whereas even the largest national park in our country doesn't exceed 5,000 sq. km. The first animal we saw in the region was a large African elephant, which was dwarfed by the enormous acacia tree that it was standing beneath. Kenya even though a small country has a variety of habitats. Nakuru is a forested area whereas Masai mara and Serengeti are miles and miles of just grassland. In these regions, the wildebeests and the zebras are walking in a continuous loop throughout the year. They move in groups of hundreds, thousands, or even ten thousand. This is called the Great Migration. One fascinating fact about the migration of wildebeests is that there is no leader who leads the group. They walk in a straight line one behind the other but the one in the front is probably not even aware that there are so many others following him. In the entire stretch spanning about 18,000 sq. km, there are no rivers for about 15,000 sq. km. Only in the Mara region, which is north of the Serengeti, do they come across a river. And we saw their great migration at this point. When they reach the river, since there is no leader to guide them over the river, they keep moving back and forth on the riverbank, till one of them accidentally jumps or until someone unintentionally pushes someone else in. The heartbreaking part of this



Sachin Rai is an accomplished wildlife photographer who has won several prestigious awards and accolades for his work, including Sanctuary Asia Photographer of the Year and D J Memorial Award.



crossing is that not all of the animals make it to the other end of the bank because they are not accustomed to swimming. In a span of just 10 minutes, we saw at least 30-40 of them dropping dead right in the middle of the river. But on the other hand, there were a lot of vultures waiting nearby to feed on the carcass of these dead wildebeests. Toward the end of the day, we saw the silhouette of a mother and a calf rhinoceros in the golden hue of the setting sun. Interestingly, though there are two groups of rhinos in Africa, the black and the white rhinos, they are both grey in colour. One is a browser that eats only leaves and has a narrow-curved mouth adapted for this purpose while the other is a grazer that feeds on grasses and has a wide squarish mouth. For ease, the Danish people whose influence was more in Southern Africa during those times started calling the wide-mouth rhinoceros white rhinoceros and the other one black.

In Tanzania, we visited Ngorongoro park which is actually a caldera (a crater formed as a result of a volcanic eruption). So, we had to climb up to the rim of the volcano and then descend into the ginormous hollowed-out crater, which was home to a thriving population of animals ranging from antelopes to a wide variety of predators that feed on them. It resembles a true Garden of Eden.

Outside this is where the great migration ends. During the months of January to March, they reach this location, where they experience rain and this is where calving happens. Calving is the process where all the wildebeests plan their births during a span of 10 days and this is how they keep their populations intact. If the circumstances are not ideal, they can also postpone the birthing by 15-20 days.

It is breathtaking to see cheetahs sprint at breakneck speeds through the wild grasslands. They charge toward the entire herd of gazelles. And the gazelles being fast runners themselves, scatter at the sight of the cheetah darting at them. You blink your eye for a moment and you lose sight of the animal you are tracking because of the frenzied movement everywhere. So, it is either hit or miss for the cheetahs. Either way, it is an

absolutely stunning scene to watch. We also saw the lions in the Kopje landscape. Kopjes are formations of huge mountains of rocks and boulders. The landscape for The Lion King movie was inspired by these structures. The lions take shelter in these landscapes as there are no trees for shade elsewhere.

At Ethiopia, the roof of Africa we saw a lot of endemic species such as the Walia Ibex, black-breasted lapwing, the blue-winged goose, the nyala, and one of the stars of Ethiopia, the gelada baboons, the males of which have an hourglass-shaped marking on their front, then the Ethiopian wolf whose 99% diet is only rodents. These wolves are also called the gharials of the wolf world due to their long snout.

We then flew to the Madagascar Islands, the only land on earth where you can find lemurs. We saw an Indri peeking from behind a tree, which is the only lemur that behaves very much like the gibbons, in contrast to the other lemurs. Madagascar is also known for its chameleon and frog diversity. We came across the parson's chameleon which is about 1 and a half feet in length, the stump-tailed chameleon which is smaller than the little finger, the brown-leafed chameleon which is also not bigger than the size of a thumb and lots of bush frogs. We also saw a fossa, which is the sole predator on this island. It resembles a cartoon made by a school kid imitating a cross between a dog, a cat, and a mongoose. These creatures have a very eerie call and the male which wins over the other males in combat mates with the female on top of the tree for three days.

Borneo was the next destination on our itinerary. Even though the land appears green, the majority of the forests have been destroyed to make way for palm tree cultivation in that region. But whatever is left is still very pristine. We encountered the orangutans also known as the "man of the forest" by the local people due to their massive size. And they are incredibly

careful in plucking only the ripe figs and leaving the rest intact so they can come back and feed on them later when they become ripe. We saw the proboscis monkey. No reason has still been found for the enlarged size of the nose of these species apart from wooing a female. We also came across a massive female Malayan horned frog. Although the horn-like structures on top of its head are where the frog gets its name, this frog also croaks like a truck horn which was startling to hear in the

eaters, the curassow, and the beautiful agami heron. We also saw a massive sinkhole of about 60 ft depth and 50–60 m wide where the blue-green macaw birds breed on the inner walls of the well. Then we went to Costa Rica which is a stunning place for varieties of birds. We encountered keel-billed toucans, many species of hummingbirds, and poison dart frogs.

Our final destination was the peninsular Kamchatka area, which is located in the far eastern part of Russia. To get there, we had to take the longest domestic flight, which was a 9-hour nonstop flight from Moscow. There is a cabin here that can accommodate 16 individuals. People travel here to see the Kamchatka brown bears. You cannot stay more than three nights at this place. It is next to the massive Kurile Lake. The salmon lay eggs in the streams where the river originates and they die after laying the eggs. The fry when they hatch swim downstream and take a break at this lake before heading towards the sea again. And when the time comes for them to breed again the salmon come to this lake and develop their eggs before swimming upstream and laying them. The bears wait here to catch and eat the salmon.

We visited all of these places, witnessed all these amazing landscapes, and encountered all these fascinating animals in just an hour through Sachin Rai's incredible photographs which became more surreal due to the added fabulous storytelling by Sachin. He is the modern-day robin hood who charges people for taking them on wildlife photography tours but gives away his photos for free when it is being used for conservation and research purposes.

We also visited Pantanal in Brazil which has an amazing riverine system as it is a part of the Amazon rainforest. But much of the forest area has been converted to ranches leaving only about 10–500 m of forest stretch for wildlife. We came across a jaguar in the river, a giant otter, Ant

middle of the forest. Additionally, we encountered numerous other species like the white-crested hornbill, crested fireback, and cinnamon-horned frog.





Sachin worked as a web designer in an IT company for a long time before realising that wildlife photography was his true calling. He started photography with a film camera through which you could take only a limited number of shots and the reels had to be developed before you could see the pictures. So, you will have no idea how the picture has come until you see the developed version. He was intrigued by everything in wildlife and enjoyed watching anything from a small pratincole to a web-casting spider to a leaping frog. Taking pictures of all these helped him talk about his fascinating encounters with these creatures and share his passion for wildlife with everyone. He has been taking people on photography tours for over 14 years now. Over the years, these tours have not only helped him instigate people's interest in wildlife but it has also helped him draw their attention to the myriad challenges that these animals face. He looks for photos that could tell a story like the photograph of two tigers mating in a palace that had once served as a resting area for the king's hunting party. He also takes pictures that would help create an impact among people. He showed us a picture of a fox sitting in a ravine in Rajasthan. Then he explained how because people don't see the value of these habitats and simply view them as wastelands, this area has now been completely flattened.

He also gave us a brief lesson on photography techniques, including how to frame pictures and how to change the lighting. He talked about how anyone can shoot high-quality pictures with simply their mobile phone in the present age without the need for expensive equipment. He also discussed photography ethics. Our mere presence in the forest will cause disturbance to the habitants. He advised that before disturbing an animal, we should question its purpose. He photographs frogs for identification purposes, which has aided in research and the naming of a new species of frog. We should choose how much we disturb the animal based on the purpose of the photo. It is subjective to each person but generally speaking if you want to take a picture of an animal that has already been photographed numerous times, it is better to avoid distressing the animal by taking yet another photo and adding to the mountain of images that already exist.



We are in an era where we are witnessing the disappearance of so many incredible habitats along with their flora and fauna. Sachin does his part in conservation by taking pictures and sharing impactful stories with people. We should also endeavor to contribute our share in conservation in whichever way possible. Quoting Sachin, "Whatever we can enjoy, we should. Whatever we can protect, we should. And whatever we can conserve, we should."

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# Nilgiri Biosphere Nature Park - a narratively of successful restoration with the native species

## Field trip report to NBNP:

We visited the Nilgiri Biosphere nature park (NBNP) on 19 October 2022. We reached our destination at 10 am. Upon entering the park, Sanjay gave us an introduction to the park, its history, and its present state. The NBNP, established in 1986 by the Coimbatore zoological park and conservation centre (CZPCC), currently covers a total land of 70 acres. 450 species of plants have been planted among which, 285 species have established themselves in the park. The most amazing fact about the park is that it's one of the only two botanical gardens in Asia, to have more than 90% of native species, and is recognized to be so by Botanic Gardens Conservation International (BGCI), UK. We were also introduced to the park botanist Mr. Kandaswamy who guided us through the park.

## The concept of reforestation:

The first thing Sanjay explained to us was the concept of reforestation, and how removing an already established tree and trying to grow a new tree in its place is a bad idea. This is because a sapling consumes oxygen and releases carbon dioxide to the same extent we do. And it takes ages for the tree to grow and become carbon negative. Therefore, in the process, there would be more carbon dioxide added to the atmosphere than that would be consumed.

## *Ficus benghalensis* and the tribal deity:

A large *Ficus* tree was one of the first large native species we came across. Sanjay explained that the tree is 150 years old, and the stone beneath is a deity worshiped by the Irulas. We were amazed at how there are significant cultural differences in different parts of our country.

## The worth of a tree:

Next to the *Ficus* tree was a signboard saying how a tree is worth Rs. 1,39,75,840 by Prof. T.M. Das of the

University of Kolkata. A tree living for 50 years will generate Rs. 22,60,000 worth of oxygen, provide Rs. 44,83,340 worth of air pollution control, control soil erosion and increase soil fertility to the tune of Rs. 22,60,000, recycle Rs. 27,12,000 worth of water, and provide a home for animals worth Rs. 22,60,000. It was astounding for us to learn that this figure was without the inclusion of the value of fruits, lumber, or beauty derived from trees. So, the overall value of a tree in its lifetime is just unimaginable.

## The native, non-native, and the invasive:

As we continued walking, Sanjay explained to us the importance of native species and the risks posed by non-native species. We also understood that a non-native does not necessarily mean invasive. But an invasive species is a concern nevertheless in whatever ecosystem it is in. We also came to know that some of the non-natives in the park were planted by mistake, assuming that they were native. When you have scientific names such as *Tamarindus indica* for a non-native plant, such assumptions are obvious.

## The Butterfly garden:

When we entered the butterfly garden, we were amazed at the sight of countless butterflies just fluttering around. There were tigers which included the Plain Tiger (*Danaus chrysippus*), Common Tiger (*Danaus genutia*), Blue tiger (*Tirumala limniace*), Dark Blue tiger (*Tirumala septentrionis*) and Crows which included the Common Crow (*Euploea core*), and Double Banded Crow (*Euploea sylvestris*). Sanjay explained that the reason for such a high density of butterflies is because of the availability of their native host plants *Crotalaria retusa* and *Crotalaria longiceps*. Now that they are established, they are being pollinated by the butterflies. Sanjay also pointed out that some of the non-natives in the park have turned themselves into adapted hosts







for the butterflies. We also saw an artificial pond that was developed for turtles and frogs. A number of dragonflies and damselflies were seen hovering around the pond.

#### **Tales of the invasive snails:**

After we came out of the butterfly garden, we saw a giant African snail (*Lissachatina fulica*) on the ground. Sanjay explained that it is an invasive species. During World War II, they were brought in as a source of food on some Pacific Islands. But when their population increased, a carnivorous snail *Euglandina rosea* was introduced to control them. But the latter preyed upon the native Partula snails, causing the extinction of most of their species. This was moral for us to understand how taking decisions without proper scientific studies can lead to ecological disasters.

#### **Native trees, some non-native trees, and the biodiversity in the park:**

As we continued moving into the park, we came across a high variety of native trees. We saw the flame of the forest (*Butea monosperma*), the White Silk Cotton tree (*Bombax ceiba*), the Devil tree (*Alstonia scholaris*), *Sterculia foetida*, *Gnetum ula*, *Commiphora caudata*, *Hydnocarpus pentandrus*, *Hopea parviflora*, and many more. We also saw non-native species such as *Rauwolfia tetraphylla*, *Chrysophyllum cainito*, and *Spathodia campanulata*. Mr. Kandaswamy explained to us the characteristics of different trees and their medicinal uses. We also came across the highly diverse fauna of the park. We saw the hoof marks and pellets of wild ungulates, heard calls of forest bird species such as the Tickell's Blue Flycatcher, and marvelled at the wide variety of centipedes and millipedes, planthoppers, spiders, ant nests on trees, and a caterpillar that exactly mimicked a dry leaf. When we asked Sanjay what was the biggest management challenge of the park, we got to know that it is removing the invasive species manually.

#### **A group photo under the Holématthi:**

As we came across the Holématthi tree (*Terminalia*

*arjuna*), we decided to take a group photograph.

We felt happy as we hugged the giant tree but soon felt sad when we saw that people had scratched, and written their names on the tree just like they do any rocks, they would do.

#### **The Park nursery:**

Kandaswamy took us to the park's nursery where the different native species of saplings were grown. In this nursery, only the native species are grown, the saplings of which are supplied to different places.

#### **Ending the park tour with a sip of tea:**

After we came out of the nursery, we sat under a tree near the cafeteria. We were given given tea to refresh ourselves. Then we departed.

#### **Conclusion:**

The NBNP narrates the success story of a restoration project. It shows us how restoration is done in a scientific manner and keeping the native species as a priority. In return, this creates ideal habitats for the native fauna and aids in their conservation and helps reduce negative interaction with the wildlife.

#### **Acknowledgments:**

We are grateful to Dr. Sanjay Molur, Zoo Outreach Organization for taking us on a field trip to Nilgiri Biosphere Nature Park and explaining different ecological concepts, to Mr. Kandaswamy, Park Botanist for showing us around the Park and to Mr. Ravi Chandran, Zoo Outreach Organization for providing photographs.



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# ZOO'S PRINT

Communicating science for conservation

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We welcome articles from the conservation community of all SAARC countries, including Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka and other tropical countries if relevant to SAARC countries' problems and potential.

**Type** — Articles of semi-scientific or technical nature. News, notes, announcements of interest to conservation community and personal opinion pieces.

**Feature articles** — articles of a conjectural nature — opinions, theoretical, subjective.

**Case reports:** case studies or notes, short factual reports and descriptions.

**News and announcements** — short items of news or announcements of interest to zoo and wildlife community

## Cartoons, puzzles, crossword and stories

**Subject matter:** Captive breeding, (wild) animal husbandry and management, wildlife management, field notes, conservation biology, population dynamics, population genetics, conservation education and interpretation, wild animal welfare, conservation of flora, natural history and history of zoos. Articles on rare breeds of domestic animals are also considered.

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Articles should be typed into a Word document with no more than 800 words of text and 10 key References (Tables, Images with copyright information, and Videos are encouraged) and **emailed to [zp@zooreach.org](mailto:zp@zooreach.org)**. Include the names of one or two potential reviewers when submitting a publication.

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