

ZOO'S PRINT

Communicating Science for Conservation



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Cover photo (Black-Hooded Oriole) design by Latha G Ravikumar and G. Arul Jegadish,
Zoo Outreach Organization, Coimbatore

Fantastic Facts

Dawn Bat *Eonycteris spelaea* (Dobson, 1871)

Distinguishing characters: Another medium-sized fruit bat without a claw on the first finger. The dorsal pelage is velvety, almost black with the head and shoulders being slightly paler. Ventrally, the colour is greyish-brown. Females have sparse hair on chin and neck, while males have dark hairs. The tail is short, protruding from the interfemoral membrane. A pair of prominent glands are seen by the anal opening. The ears are narrow, rounded and uniformly dark coloured.

Body measurements:
The head-body length

is about 115mm, forearm length about 70mm.

Habit and habitat: A cave-dweller, it lives in association with other bat colonies, mainly with *Rousettus leschenaulti* and a few *Hipposideros* species. It prefers darker corners and crevices, if the caves are not of the subterranean type. It has been found in caves up to 1000m elevation in India. Due to its fruit eating habits, it is observed to forage in forests and gardens.

Distribution: This widely distributed species of Southeast Asia is poorly documented from South Asia with only a few known localities. Recently, this bat was found in Kalakkad-Mundanthurai Tiger Reserve, Tamil Nadu which increased its distribution range from the previously known caves in central Western Ghats of Karnataka to its occurrence in the southern-most range of the Western Ghats.

Dawn Bat
Eonycteris spelaea (Dobson, 1871)

LEAST CONCERN



Status: Although known from a few locations, it is likely that this bat is widespread occurring in undisturbed caves in South Asia. It is very susceptible to disturbances and human activities and tends to shy away from open areas in caves. It is categorised as Least Concern in South Asia.



Arbab Roy / Bat Conservation International

FRUIT BATS OF SOUTH ASIA

PART 3

Fantastic Facts

Lesser Dog-faced Fruit Bat

Cynopterus brachyotis
(Muller, 1838)

Distinguishing

characters: This bat is slightly smaller than *C. sphinx*, with smaller ears and no distinct white or pale margins. The muzzle is hairy, short and broad with splayed nostrils. The dorsal and ventral pelage are silky and greyish-brown. The sides of chin, shoulders, belly and inside thigh are orangish in males, and in females the belly is paler. The fingers are not seen as white or pale as in *C. sphinx*. The colour tends to darken and the body

size to decrease in populations of higher altitudes.

Body

measurements:

The head-body length is about 87mm, forearm length about 60mm, and weight about 25g.

Habit and

habitat: This is not a common bat, but where it occurs it is seen in forests and plantations up to about 1500m elevation. The species roosts in small-sized colonies usually under palm fronds.

Lesser Dog-faced Fruit Bat
Cynopterus brachyotis Vahl, 1797

LEAST CONCERN



Distribution: Very widely distributed in Southeast Asia, but is recorded from southern and northeastern India and Sri Lanka in South Asia. The reports of this species from Nicobar is more likely to be *C. sphinx* or a new species. It is likely that the population of Sri Lanka is a distinct subspecies *C. brachyotis ceylonensis*, while the Indian populations are of the nominate *C.b. brachyotis* subspecies.

Status: The species is categorised as Least Concern in South Asia assuming that its distribution is very wide and that it is not under any severe threat.



Arnab Roy / Juliet Vanitharani

Fantastic Facts

Short-nosed Fruit Bat *Cynopterus sphinx* (Vahl, 1797)

Distinguishing

characters: This fruit bat is similar to *C. brachyotis*, except for the whitish or pale ear margins, and has whitish or pale fingers on the wings. The muzzle is hairy, short and broad with splayed nostrils. The dorsal and ventral pelage are silky and greyish-brown. The sides of chin, shoulders, belly and inside thigh are orangish in males, and in females the belly is paler.

Body measurements:

The head-body length is about 100mm, forearm length about 70mm, weight about 30g.

Habit and habitat:

This is one of the commonest fruit bats seen in different habitats, including urban areas with fruiting trees such as papaya, Singapore cherry,

guava, mango, sapota and other fruits that are allowed to over-ripen on the tree and not plucked in time for human consumption. The species roosts in different sized colonies depending on the area, usually in pairs or in small numbers in urban areas under palm fronds. Although low fliers when feeding on garden fruits, they shy away from humans and do not attack anyone.



Arbab Roy / Bat Conservation International

Distribution: Very widely distributed throughout South Asia except Afghanistan. Four subspecies are recognized based on size and distribution. The nominate subspecies *C.s. sphinx* occurs in mainland South Asia and Sri Lanka except Bhutan where the smaller subspecies is *C.s. angulatus*. The subspecies from Andaman *C.s. andamanensis* and Nicobar *C.s. scherzeri* need further examination; the latter could even be a new species.



Status: The species is Least Concern in South Asia due to its wide distribution, high adaptability and due to lack of debilitating threats. The Indian subcontinent mainland and Sri Lankan taxa are also considered Least Concern. *C.s. angulatus* in Bhutan is Data Deficient because of few studies and lack of information. *C.s. andamanensis* and *C.s. scherzeri* are Data Deficient due to lack of confirmed taxonomic identity.

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by Sally Walker and Sanjay Molur

CHITAL

Photographic evidence of *Axis axis* after two decades in Manas National Park, Assam, India



Recent photograph of Chital from Manas National Park, India shows a picture of adult with a sub adult

IUCN Red List:
Least Concern
(Duckworth et al.
2015)

Mammalia
[Class of Mammals]

Cetartiodactyla
[Order of even-toed ungulates and cetaceans]

Cervidae
[Family of Deers]

Axis axis
[Chital]

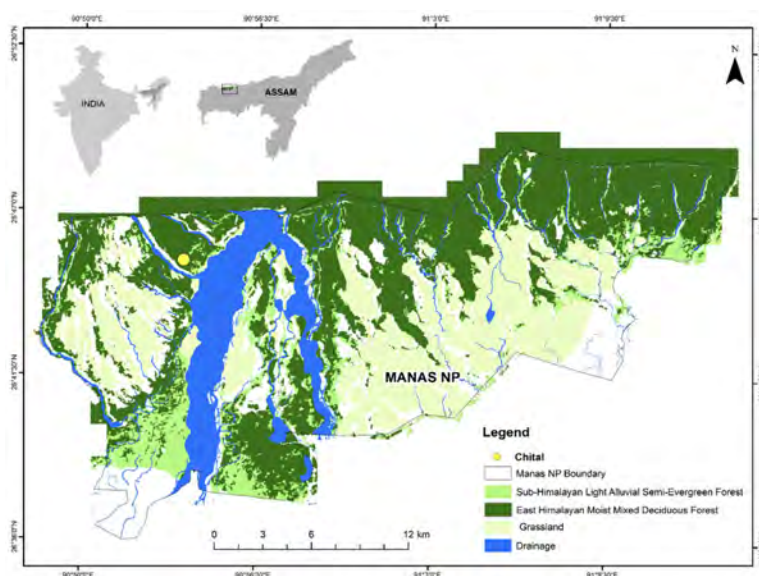
Species described by
Erxleben in 1777

Ungulates are primary consumers as they play an important role in the sustenance of higher trophic levels in an ecosystem and form the major bulk of prey base for large carnivores and also serve as important regulators of ecosystem at different spatial and temporal scales (Schaller 1967; Johnsingh 1983; Karanth & Sunquist 1995; Ramakrishnan et al. 1999; Biswas & Sankar 2002). The bulk of wild ungulate density in Indian forests is contributed by *Axis axis* (Khan 1995; Sankar 1994; Bagchi et al. 2003). The species act as ecosystem engineers or keystone herbivore which determines large carnivore density, community and structure in most of the habitat within its distribution limit (McShea & Rappole 1992; Stromayer & Warren 1997). The Chital is also a major prey for large and iconic predators like the tiger, leopard and dhole (Pocock 1941; Schaller 1967).

The Chital also known as Spotted Deer or Axis Deer is native to India, Nepal, Bhutan, Bangladesh and Sri Lanka (Grubb et al. 2005). The western boundary of the species is formed by drier forests of Gujarat (e.g., Sasan Gir) and Rajasthan (e.g., Sariska, Ranthambhore and Keoladeo Ghana) (Sankhala 1964). In the east, occurs in the Sunderbans of West Bengal and Bangladesh, in western Assam (Golapara and Kamrup districts as far east as the Dhunsiri River in Darrang District) and the forested valleys of Bhutan below 1,100m (Blanford 1898; Seidensticker 1976).

Global Distribution :

Native: Bangladesh, Bhutan, India, Nepal, Sri Lanka. Introduced: Andaman Islands in India, Argentina, Armenia, Australia, Brazil, Croatia, Moldova, Pakistan, Papua New Guinea, Ukraine, United States (California, Florida, Hawaiian Is., Texas), Uruguay (Duckworth et al. 2015)



Recent photograph of Chital from Manas National Park, India shows a picture of adult with a sub adult

In Bhutan, Chital is confined to Phibsoo Wildlife Sanctuary close to the West Bengal and Assam border (Gee 1964). It occurs sporadically throughout the peninsular plateau in the forests with low rainfall and below an altitude of 950m (Fletcher 1911). Sri Lanka is the southern limit, where it occurs while the bhabar-terai belt among the foothills of the Himalaya in India and Nepal forms the Northern limit (Gee 1964; Schaller 1967). It mainly inhabits moist and dry deciduous

forest areas (De & Spillet 1966; Sharatchandra & Gadgil 1975; Ables 1974; Mishra 1982). The species is considered as Least Concern according to IUCN Red List of Threatened Species and listed under schedule III of the Indian Wildlife (Protection) Act, 1972.

In India, the species is widely distributed across the country; however, there is lack of information available so far for the Chital presence in northeastern region. Camera traps (n=213) were deployed systematically in a 1X1 sq.km. grid for studying the ecology of clouded leopard at Manas National Park. The present communication reports first ever scientific evidence of Chital on 17 June 2017 at 04:47hr. The similar reports have been made recently by the Forest Department. Interestingly, there was no documentary evidence of the Chital for last two decades (Assam Forest Department pers. comm.). The Manas National Park is located at the foothills of the Bhutan Himalayas in the Bhabar area of western Assam (26.7460°N & 91.0203°E). The forest type where the species captured

through camera-trap was moist deciduous forest dominated by *Albizia procera*, *Terminalia bellirica* and *Bombax ceiba*. During the entire duration of camera trapping from April 2017 to January 2018, the authors managed to photograph the species only once.

Manas experienced a fifteen year-long ethnic and political conflict starting in the mid-1980s that disrupted ongoing conservation and management activities until fledgling peace was restored in 2003 (Goswami & Ganesh 2014). During the conflict, forest personnel abandoned the area, anti-poaching camps were destroyed, and arms meant for enforcing park protection were stolen and used by anti-government forces in their violent struggle (Goswami & Ganesh 2014). The violence that followed caused large scale damages to Manas and left the park vulnerable to logging, local hunting, and poaching of rhino, tiger, elephant and other herbivore animals, causing habitat degradation and rapid loss of wildlife (Hussain 1989; Rahmani et al. 1989; George 1994; Sarma et al. 2008). Prior to the conflict, Manas harbored good populations of tiger, rhino and other herbivorous species (Deb 1991). Conservation programmes such as rehabilitation of rhino and elephants were initiated by NGOs and state government (Berman et al. 2014). It might be possible that Chital population could have wiped out during the conflict. But due to different conservation programmes and stabilization of habitat, the presence of Chital have been reported after two decades. The revelation of Chital presence from the Manas National Park opens up scope for further studies and surfaces the need for conservation efforts and awareness to be focused on Panbari and adjoining ranges where efforts of its protection have to be strengthened further.

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BLISTER BEETLE

Beetle fauna and congregation of *Mylabris oculata* at the Prince Saud al-Faisal Wildlife Research Center Taif, Saudi Arabia



IUCN Red List:
Not Assessed

Blister Beetle congregation on *Acacia* tree at the PSFWRC, Taif in early July 2017 (Photo credit: M. Zafar-ul Islam)

Insecta

[Class of Beetles]

Coleoptera

[Order of Beetles and Weevils]

Meloidae

[Family of Blister Beetles]

Mylabris oculata

[Cape Mountain Rifles Blister Beetle]

Species described by
Thunberg in 1791

Beetles form the order Coleoptera, in the superorder Endopterygota are diverse insect group and important element that plays significant role in ecological phenomena (Stack 2015). Their first pair of wings are hardened into wings, elytra, a characteristic feature of Coleopterans. There are about 400,000 species of beetles (Hammond 1992), 40% of described insects and 25% of all known animal life forms (Rosenzweig 1995; Hunt et al. 2007; Bouchard et al. 2011).

Beetles have been recorded almost everywhere, including freshwater and coastal habitats, wherever vegetative

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greenery is found, from trees and their bark to flowers, leaves, and underground near roots, even inside plants, in every plant tissue, including dead or decaying ones (Gullan & Cranston 2014). Beetles play important roles in pollination, herbivory, granivory, predator-prey interactions, decomposition and nutrient cycling, and soil disturbances (Huffaker & Gutierrez 1999).

In Saudi Arabia, a total of 1,343 beetle species has been recorded (Al-Ahmadi & Salem 1999), of which details are catalogued in (Löbl et al. 2008). Blister beetles are members of a family of plant-feeding insects Meloidae that contains 2,500 species in the world, divided among 120 genera and four subfamilies (Bologna & Pinto 2001).

Southwestern Highland of Saudi Arabia is one of the biological hotspots of the world and the Prince Saud al Faisal Wildlife Research Center (PSFWRC) on the edge of these highlands (40km from mountains). It is a desert flat land with a few outcrops and plant growth mostly confined to depressions or wadis, though some plants with deep rooting-systems grow elsewhere. By early summer, *Acacia* trees start flowering and those attract beetles and other insects to the center.

The study site called Prince Saud al Faisal Wildlife Research Center (PSFWRC) is declared as Important Bird and Biodiversity Areas IBA identified by the BirdLife International (BirdLife International 2004), which is fairly flat, sandy/gravelly desert fringe at 1,450m on the edge of the north-east Asir foothills (South-west Highlands), c.40km south-east of Taif City in Makkah Province of Saudi Arabia (21°15'0"N & 40°42'0"E with an area of 3,000ha). There are a few gneiss inselbergs and dry wadis. The site is fenced where captive breeding of Asian Houbara, Arabian Oryx, Arabian Leopard, Red-necked Ostrich program is running since 1986. The site is previously overgrazed vegetation is rapidly recovered to grassland and scrub bush land. *Wadis* have many *Acacia iraqensis* trees and flowering in early summer and one has been dammed with some water usually present. Flora contains 269 species of plants belong to 54 families (Collenette 1998). The list contains grasses, shrubs and trees. Some of the Leguminosae species are *Acacia asak*, *A. ehrenbergiana*, *A. gerrardii*, *A. tortilis* and they flower by summer, especially after the rain in April.

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Methods

Species of beetles were recorded opportunistically, whenever they are sighted and some are photographed since last seven years. They are visible and some are easily located on flowering *Acacia* trees in the PSF Wildlife Center.

During summer months (March to September), most of the beetle species appears and some of the species congregates in large number within the Center premises, as flowering *Acacia* plants provide food and the site is not disturbed. During this time, we record the species and their congregations.

We took walking transects along the well-established trails in the Center and congregation could be seen on flowering *Acacia*.

Species such as Darkling Beetle, and the mealworms of it, and the larval form of the Mealworm Beetle *Tenebrio molitor* were recorded throughout the year. Like all holometabolic insects, they go through four life stages: egg, larva, pupa, and adult. These mealworms were fed to rear Houbara (Islam 2015).



Congregation of beetles are photographed by first author

Results

Based on opportunistic field search, the fauna of the beetles consists of the following at the PSF Wildlife Research Center:

1. Domino Beetle *Anthia duodecimguttata* (Carabidae family), a black beetle, with a characteristic pattern of ten white spots along the back, looking much like the dots on a domino piece and hence this remarkable little beetle carry this common name. They were observed mainly at night hunting other insects near the hard rocks,

sands, especially near the street lamps. The mating season is June.

2. Rufous Bombardier Beetles *Brachinus nobilis* from the family Carabidae, which are famous for the defense mechanism that gives them their name and when it is disturbed, ejects a hot noxious chemical spray from the tip of their abdomen with a

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popping sound. They could be seen near the water treatment area of the Center.

3. Beaded Runner *Calosoma imbricatum*

Klug could be seen in the night near the focused lamp light in early summer each year mainly near the acacia and other vegetated areas.

4. Miniature Diving Beetle *Gulgnotus major* Sharp would be seen near the stagnant water treatment plant at the site in summer.

5. Mottled Diving Beetle *Laccophilus pictipennis* Sharp would be seen near the stagnant water treatment plant at the site much longer than summer.

6. Diving Pill *Hyphydrus pictus* Klug was recorded in stagnant water in the swimming pool at the site in summer.

7. Short-legged Diving Beetle *Cybister*

tripunctatus Olivier could be seen in summer near the water treatment plant at the site.

8. Fawn Diving Beetle *Eretes sticticus*

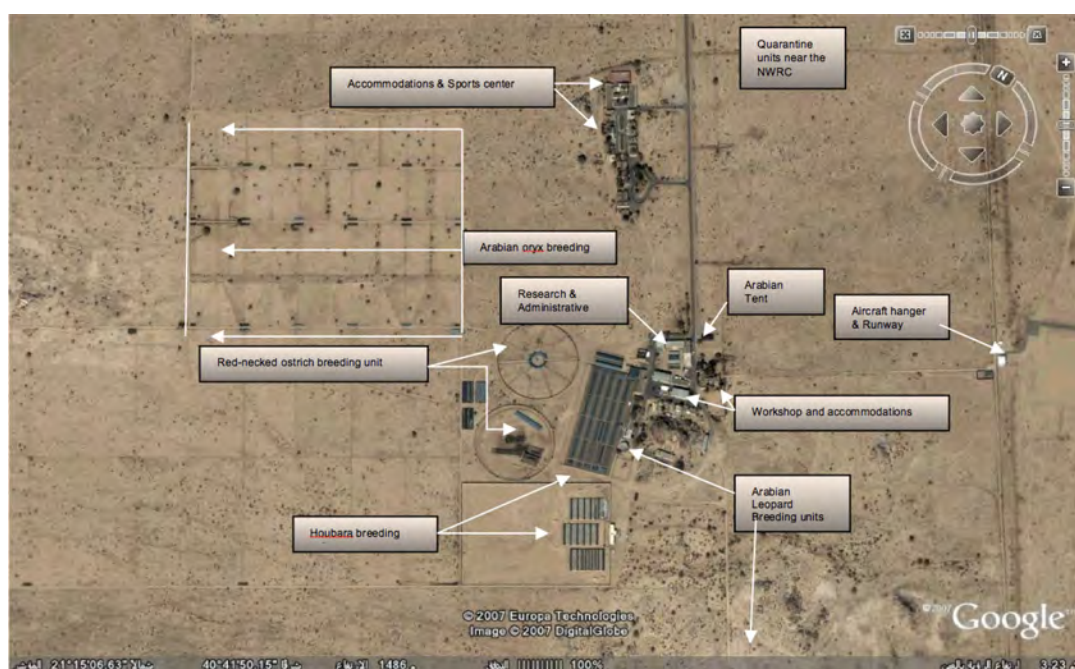
Linnaeus could be seen near the water treatment plant at the site in early summer.

9. Eleven-spot Ladybird *Coccinella*

undecimpunctata Linnaeus occurs in grasslands, with low-growing vegetation where it feeds on a variety of insects. Its bright colour warns predators of their bitter taste of pungent blood. Recorded in early summer months.

10. Seven-spot Ladybird *Coccinella*

septempunctata Linnaeus is one of the common beetle and seen in April after the rain.



Prince Saud al Faisal Wildlife Research Center in Taif, Saudi Arabia

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11. Grain Weevil *Sitophilus granarius*

Linnaeus is found in alfalfa field of the center, and seen near stock of the food pallet sacks.

12. Orange-legged Skip Jack *Aeloides*

grisescens Germar (Elateridae) is seen in winters and early summer. One picture was taken in early July 2017 at the site near residential area. It flicks in the air and land on its feet. It feeds on flower nectar of acacia and pollen of grass.

13. Gaudy Carpet Beetle *Antheranus*

flavipes Leconte (Dermestidae) could be seen near the human residential area in early winter or late summer.

14. Larder Beetle *Dermestes lardarius*

Linnaeus (Dermestidae) could be seen near the animals food store in early summer or late winter.

15. Carcass Beetle *Dermestes frischii*

Kugelann (Dermestidae) could be seen just outside the National Wildlife Research Center near the carcass of sheep in early summer.

16. Merchant Grain Beetle *Oryzaephilus*

mercator Fauvel (Silvanidae) could be seen near the animal food store of the Center in early summer.

17. Fake Flour Beetle *Opetroides*

punctulatus Brulle (Tenebrionidae) could be seen mainly in early winter near the residential area or near the animal's food

stock room.

18. Arabian Darkling Beetle *Pimelia arabica*

Klug (Tenebrionidae) is commonly seen in the center throughout the year.

19. Flour Beetle *Tenebrio molitor*

(Tenebrionidae) is seen near the mealworm section of the Center, where they are grown for houbara to feed.

20. Rust Red Flour Beetle *Tribolium*

castaneum Herbst (Tenebrionidae) is recorded near the mealworm breeding area of the Center.

21. Scarce Stalker *Ocnerna hispida* Forskal

(Tenebrionidae) could be seen near the pile of oryx dropping and sometime, ostrich breeding pen in early summer.

22. Short-legged Stalker *Thriptera crinita*

Klug (Tenebrionidae) could be seen near the vegetated rocky area in early summer.

23. Churchyard Beetle *Blaps kollari* Seldlitz

(Tenebrionidae) could be seen in the Center in the beginning of summer or in early winter near the vegetated rocky areas.

24. Pitted Beetle *Adesmia cancellata* Klug

(Tenebrionidae) could be seen in the center, especially near the Oryx dropping piles and vegetated areas in late winter and early summer.

25. Opossum Beetle *Mesostena puncticollis*

Solier (Tenebrionidae) could be commonly seen in the Center near the vegetated rocks and lamppost in the night.

Bugs R All

Invertebrate Conservation & Information Network of South Asia (ICINSA)

Newsletter of the

Congregation of Blister beetles

Since last seven years, *Mylabris oculata* has been observed in large congregation appears by end of June and stays throughout July. During this time *Acacia* flowers, where they congregate especially by evening and get active by sunrise. During the night they are also get attracted in the night near the lampposts within the Center.

Female blister beetles lay clusters of eggs in the soil in late summer. The small, active larvae that hatch from these eggs crawl over the soil surface entering cracks in search for grasshopper egg pods which are deposited in the soil. After finding an egg mass, blister beetle larvae become immobile and spend the rest of their developmental time as legless grubs. They pupate during the following summer and emerge as adults. Blister beetle numbers increase dramatically following a dry summer with high grasshopper populations (Townsend 2011).

Blister beetles receive their common name from the ability of their hemolymph to produce blistering on contact with human skin. Hemolymph is often exuded copiously by reflexive bleeding when an adult beetle is pressed or rubbed. Blisters commonly occur on the neck and arms, as the result of exposure to adult beetles attracted to outdoor lights at night. General handling of adults seldom results in blistering unless the hemolymph contacts the relatively thin skin between the fingers. Unless extensive, medical treatment beyond first aid for blistering on humans is probably not necessary (Townsend 2011).

Conservation of Beetles

Beetle's conservation is important in modern world as they are indicators of biodiversity richness of the area and they are large of the biodiversity in general. The key threats to beetles are loss of habitat and pesticide. Some of the species like ladybirds are liked by humans but beetles as a whole have a less positive image than other insect groups like the butterflies, while it is also thought most of the beetles as considered as pests.

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WHITE STORK

Sighting record of *Ciconia ciconia* (Linnaeus, 1758) in Mudumalai Tiger Reserve, Nilgiris, India



White stork recorded in the Nilgiris, Tamil Nadu (Photo credit: Sathyamoorthi)

IUCN Red List:
Least Concern
(BirdLife International,
2016)

Aves
[Class of Birds]

Ciconiiformes
[Order of Storks like
birds]

Ciconiidae
[Family of typical Storks]

Ciconia ciconia
[White Stork]

Species described by
Linnaeus in 1758

White Stork *Ciconia ciconia* (Linnaeus, 1758) usual winter migrants to India, are widespread in the country, generally occurring in low densities in their winter habitat (Ali & Ripley 1968). There are few sites with regular annual observations of numbers of these species in their wintering grounds (Pande et al. 2003). The White Stork is a large bird in the stork family Ciconiidae. Its plumage is mainly white, with black on its wings. Adults have long red legs and long pointed red beaks. It breeds from Europe to northwest Africa and westernmost Asia, and in southern Africa, and winters mainly in Africa south of the Sahara Desert (del Hoyo et al. 1992), though some birds winter in India (Ali et al. 2001). The White Stork has been rated as Least Concern by the IUCN (BirdLife International 2016).

Mudumalai Tiger Reserve

On 24 December 2013 the White Stork was recorded in Mudumalai Tiger Reserve, Nilgiris, Tamil Nadu followed by 13

February 2018 the second record was registered in this region. In Indian region previous records of White Stork was recorded in Maharashtra (Kurhade 2003; Pande et al. 2007; Kasambe et al. 2010) Karnataka (Sridhar 1990; Sant 1996; Venkateshwara 1998; Pande et al. 2007), Andhra Pradesh (Kannan 2008), Kerala (Praveen 1997; Jayson & Sivaperuman 2005) and Tamil Nadu (Manakadan 1994; Zarri & Rahmani 2005). There are very few records sporadically recorded from Tamil Nadu State especially five records from Koonthankulam Bird Sanctuary (since December 2016) and other records from Vijayanarayanam in Tirunelveli District and Urapanur Kanmai from Madurai District (eBird 2018). Literature survey revealed that a total of four genus and six

Global Distribution:

Native: Afghanistan, Albania, Algeria, Angola, Armenia, Austria, Azerbaijan, Bahrain, Bangladesh, Belarus, Belgium, Benin, Bosnia and Herzegovina, Botswana, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, China, Congo, The Democratic Republic of the Côte d'Ivoire, Croatia, Cyprus, Czech Republic, Denmark, Djibouti, Egypt, Eritrea, Estonia, Ethiopia, France, Gabon, Georgia, Germany, Ghana, Gibraltar, Greece, Guinea, Guinea-Bissau, Hungary, India, Iran, Islamic Republic of, Iraq, Israel, Italy, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Latvia, Lebanon, Lesotho, Libya, Liechtenstein, Lithuania, Luxembourg, Macedonia, the former Yugoslav Republic of, Malawi, Mali, Malta, Mauritania, Moldova, Montenegro, Morocco, Mozambique, Namibia, Nepal, Netherlands, Niger, Nigeria, Oman, Pakistan, Palestinian Territory, Occupied, Poland, Portugal, Qatar, Romania, Russian Federation (Central Asian Russia - Vagrant, European Russia), Rwanda, Saudi Arabia, Senegal, Serbia, Slovakia, Slovenia, Somalia, South Africa, South Sudan, Spain (Canary Is. - Present - Origin Uncertain), Sri Lanka, Sudan, Swaziland, Sweden, Switzerland, Syrian Arab Republic, Tajikistan, Tanzania, United Republic of, Thailand, Togo, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, United Arab Emirates, Uzbekistan, Western Sahara, Yemen, Zambia, Zimbabwe. Vagrant: Antigua and Barbuda, Congo, Finland, Gambia, Iceland, Ireland, Liberia, Norway, Saint Helena, Ascension and Tristan da Cunha, Sao Tomé and Príncipe, Seychelles, Sierra Leone, United Kingdom (BirdLife International, 2016).

species of storks were reported in the Mudumalai Tiger Reserve namely Painted Stork *Mycteria leucocephala*, Asian Openbill *Anastomus oscitans*, Woolly-necked Stork *Ciconia episcopus*, Black Stork *Ciconia nigra*, Black-necked Stork *Ephippiorhynchus asiaticus* and Lesser Adjutant *Leptoptilos javanicus* (Gokula & Vijayan 1996). The present record of White Stork is an additional record to migrating stork in Mudumalai Tiger Reserve which ensures preferable habitat for migrating storks in southern India.

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WHITE-RUMPED VULTURE

Nest features and nest tree characteristics of *Gyps bengalensis* (Aves: Accipitriformes: Accipitridae) in Moyar Valley of Tamil Nadu, India



IUCN Red List:
Critically
Endangered
(BirdLife
International,
2017)

Adult White-rumped Vulture brooding the nestling in Moyar Valley

Aves

[Class of Birds]

Accipitriformes

[Order of the diurnal
birds of prey]

Accipitridae

[Family of birds of prey]

Gyps bengalensis

[White-rumped Vulture]

Species described by
Gmelin in 1788

True tree nesting Gyps Vulture species under family Accipitridae in India are represented by two species-the White-rumped Vulture *Gyps bengalensis* and Slender-billed Vulture *Gyps tenuirostris*. Once White-rumped Vultures were commonest birds of prey species distributed throughout Indian subcontinent (Ali 1983). Nine species of vultures are recorded in India. The vulture numbers decreased markedly due to veterinary use of non-steroidal anti-inflammatory drug (NSAID) diclofenac in India (Green et al. 2004) and Pakistan (Oaks et al. 2004). Population of Gyps vultures endemic to South Asia decreased by more than 97% in early 1990's to 2012 (Cuthbert et al. 2015) leading to their categorization as Critically Endangered in the IUCN Red List of Threatened Species (BirdLife International 2017).

Few studies have been conducted on White-rumped Vulture to describe the structure of nests in favoured tree species in Himachal Pradesh (Thakur et al. 2012), Uttar Pradesh (Jha 2015). Ramakrishnn et al. (2014) described about nesting trees characteristics in the Segur Plateau of Nilgiri North Forest Division in Tamil Nadu. None of the studies have attempted to describe and compare actual nest trees with available trees. An attempt was made in the Nilgiri North Forest Division to determine the most important characteristics determining the choice of nesting trees. The aim of the study is to describe nest structure and to evaluate nest tree characteristics of White-rumped Vulture by comparing actual nest trees with randomly selected trees.

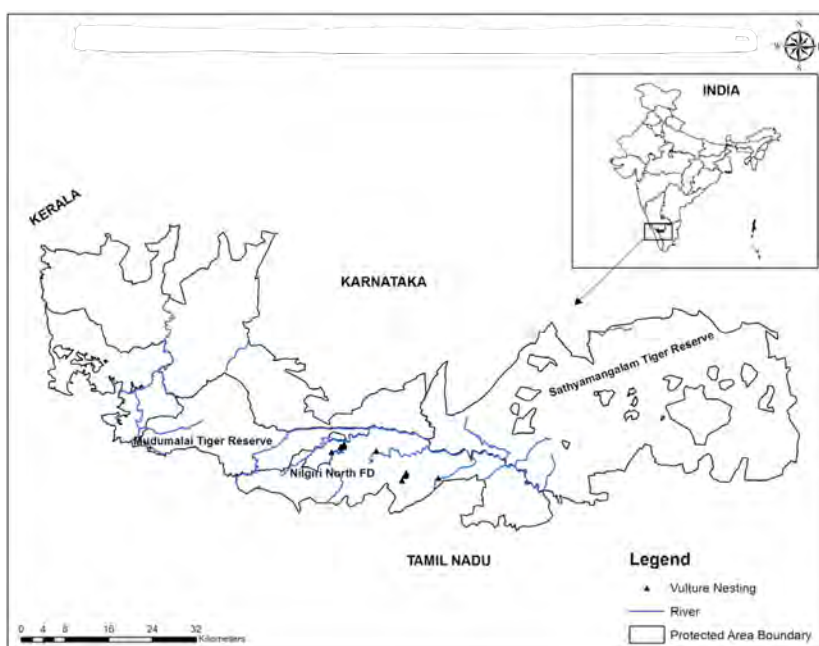
Global Distribution:

Native: Afghanistan, Bangladesh, Bhutan, Cambodia, India, Iran, Myanmar, Nepal, Pakistan.
(BirdLife International, 2017)

Study Area

The Moyar Valley is located between 11.70°N, 76.59°E and 11.47°N, 77.14°E bounded by the Nilgiri plateau to its southeast, Thalamalai plateau to the northeast, and Mudumalai Tiger Reserve to the west. The approximate length of the valley is 50km falling within the Tamil Nadu and Karnataka states. Mudumalai and Sathyamangalam Tiger Reserves of Tamil Nadu and Bandipur Tiger Reserve of Karnataka within the Moyar Valley have been declared as Protected Areas (PAs). The uniqueness of the landscape is its connection with the Western and Eastern Ghats. Elevations of the area ranges from 209–1950 m. Extremes of climate are experienced with temperature varying between 17°C and 37.5°C. During the northeast monsoon season, the eastern part of the Moyar Valley receives heavy rainfall and during the southwest monsoon the western part receives heavy rainfall. There is a 260m deep gorge called Moyar gorge located in

the eastern end of Nilgiri District, which separates the Segur and Mysore plateaus. The study area sprawling over 600sq.km covers parts of Masinagudi Range in Mudumalai Tiger Reserve, Segur Range, Nilgiri mountain, Eastern slope of the Nilgiri North Forest Division and Bhavanisagar Range of Sathyamangalam Tiger Reserve. Different types of the vegetation, healthy wild prey and predator base of the Moyar Valley, supports the six species of vultures (Venkitachalam 2018).



Map showing study area with White-rumped Vulture nest distribution in Moyar Valley

Methods

As many occupied locations by White-rumped Vulture territories as possible were located in the study area during the 2012 to 2014. The historical description of traditional nesting sites and territorial behaviour of breeding pairs were noted from high vantage points as well as by extensive exploratory surveys on foot (Fuller & Mosher 1987). A total of 31 nests were located in the occupied territories. Data on nest tree characteristics were collected during July and August of 2012 and 2014 after fledging. We recorded the following information to describe each nest trees such as species, trunk shape and canopy shape. The condition of the trees was described as good, medium or bad. The GBH was noted using dbh tape. Height of the nest tree, height of the nest above ground, and height of living canopy were measured. In order to compare nest tree characteristics within the same forest stand, the same numbers of non-nest trees were selected from neighboring areas.

Kruskal-Wallis Anova test was used to compare variable of nesting and non-nesting trees. The non-parametric chi-square test was used to test the association between variables. Appropriate data transformations were made whenever needed. For hypothesis testing $P < 0.05$, $P < 0.01$ and $P = 0.00$ were considered and these levels of significance were indicated at appropriate places. Statistical inferences were made by following Sokal & Rohlf (1995) and Zar (2003). All the statistical analysis were carried out using the Minitab statistical software (Version 12) and SPSS (Statistical Package for Social Science: Nie et al. 1975).



Full grown White-rumped Vulture juvenile on the nest in Moyar Valley

Results

The White-rumped Vulture nest ecology study was carried out in 2012 and 2014 to understand the nest features and nest tree characteristics in Moyar Valley. The loose colonies of White-rumped vulture have been found along the perennial rivers in the Nilgiri North Forest Division ($n=12$) followed by Mudumalai Tiger Reserve ($n=24$) of Moyar Valley. White-rumped Vulture breeding season starts from September to April and some of pairs breed up to till June. The White-rumped Vultures mostly preferred *Terminalia arjuna* (91.67%) followed by *Terminalia bellirica* (5.56%) and *Pterocarpus marsupium* (2.78%) for nest building. Altogether both nesting trees ($n=32$) and non-nesting trees ($n=82$) were attempted to study the nest features and nest tree characteristics. All the nests of White-rumped Vulture recorded were live tree species with few dry canopies. The Kruskal-Wallis ANOVAs statistics was used to investigate difference between the nest trees and non-nest trees. Difference could not be detected between nest trees and randomly selected trees

Table: Kruskal - Wallis ANOVAs for White-rumped Vulture nesting and non-nesting trees in Nilgiri North Forest Division, Tamil Nadu, India.

Variables	Nest tree (n = 32)	Non-nest tree (n = 83)	Kruskal-Wallis ANOVA		
			χ^2	df	P Value
Number of branches	8.47±0.70	6.02±0.34	8.096	1	0.004
Girth at breast height (m)	4.66±0.26	3.28±0.13	24.724	1	0.000
Tree height (m)	43.53±1.50	30.02±1.54	28.252	1	0.000
Canopy cover (%)	10.42±0.51	8.85±0.34	6.875	1	0.009
Distance to nearest water source (m)	19.78±10.06	15.71±3.71	1.156	1	0.282
GBH of Nest branch	43.31±3.02	27.43±1.12	21.873	1	0.000
Distance to human habitation (m)	1605.56±189.53	1967.07±107.82	3.042	1	0.081
Distance to road (km)	25.83±1.24	23.48±0.70	3.042	1	0.081

in terms of canopy cover, number of branches, distance to water source, road and human settlement. The structure of the nest trees was similar to random non-nest trees and there was a statistical significant difference between nest trees and randomly selected non nest trees in terms GBH of nest tree ($\chi^2 = 24.72$, $P = 0.000$), number of available branches ($\chi^2 = 8.09$, $P = 0.08$), tree height ($\chi^2 = 28.25$, $P = 0.000$), canopy cover ($\chi^2 = 6.87$, $P = 0.000$) and GBH of the nest branch ($\chi^2 = 21.8$, $P = 0.000$) (Table).

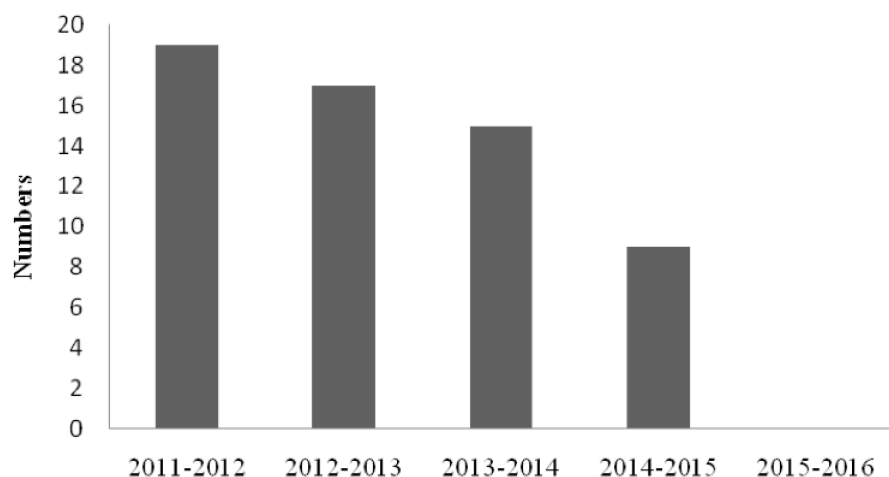
White-rumped Vulture usually constructs platform nests by using the twigs of the same nesting tree species as well other available tree species with and without needles. The nest placement of White-rumped Vultures was recorded according to the position within canopy of nesting trees. The majority of the nests were facing west direction followed by north, east, southeast, southwest, south and northwest directions. The twig size ranged between 4.3cm and 4.3cm long and 15mm diameter to 23mm diameter of twigs. Nests were lined with green leaves of *Terminalia* species, *Pongamia* species, *Lantana* species, various grass species and debris etc. Fresh nesting materials were added to the nest by adult vultures to increase the size of the nest and to provide a platform structure according to the growth of the nestling as the nestling will require for performing wing exercise, wing over leg exercise and jumping. Every breeding cycle the White-rumped Vultures repaired and reused the old nests by adding fresh nest materials.

Discussion

In India, White-rumped Vultures normally breed on the canopy of the trees such as *Ficus benghalensis*, *Ficus religiosa*, *Mangifera indica*, *Dalbergia sissoo*, *Acacia* sp and *Terminalia arjuna* (Ali & Ripley 1983). The study area constitutes various tree species, but most preferred trees for nesting of White-rumped Vultures were *Terminalia arjuna* followed by *Terminalia bellirica* and *Pterocarpus marsupium*. These trees generally have few thick

branches; an oval-shaped canopy and the tree height were comparatively taller than other available tree species in the Moyar Valley. In addition, open canopy could help the adult vultures for easily accessing their nests. The oval shape open canopy cover of the trees provides greater shelter from predator and inclement weather while, at the same time, provide support to the nests (Solonen 1982). Similar studies in African vultures revealed that there is a clear tendency for nest site selection within well foliated trees along with water course with the nest placed in a prominent fork like branches within the tree canopy (Irwin 1981; Mundy 1982; Mundy et al. 1992; Roche 2006). Thakur et al. (2012) reported that there is no direct observations and dependence of White-rumped Vulture species on water source at nesting sites of Kangra Valley in Himachal Pradesh. However, there is some definite role of water bodies in selection of nest sites as elucidated by Ali & Ripley (1983). Similarly, in the present study, although river flows along the breeding habitat in Moyar Valley, its role is not understood. The nesting orientations of the White-rumped Vulture were that maximum nest built on the west side of the tree canopy than the north side. The main meteorological factors that might influence nest orientation and reproductive success are temperature early in the breeding season, direct solar radiation during hotter days, and avoidance of other inclement conditions (Dimitris et al. 2000).

During nest building, White-rumped Vultures frequently added green twigs to their nests throughout the breeding season. Newton (1979) recorded similar observation on other raptors species and the maintenance of

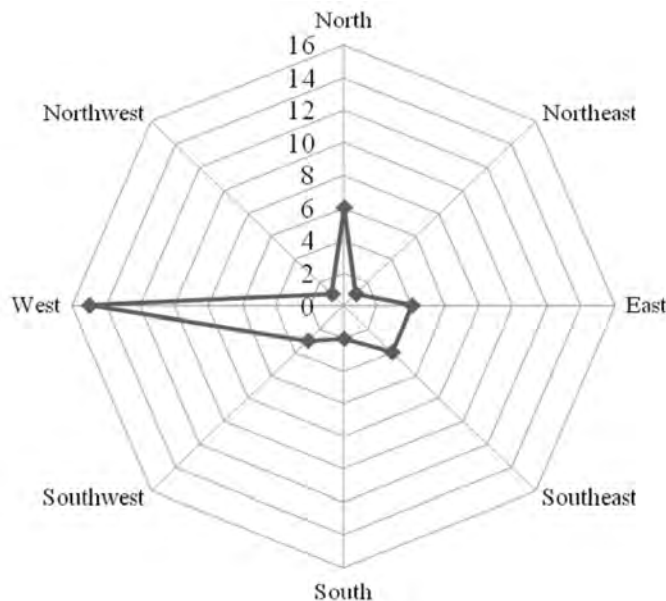


Number of White-rumped Vulture nests in Siriyur

optimum humidity have been suggested for this behaviour. The most widely acceptable explanation is that raptors bring green vegetation to their nests to advertise territory occupancy (Newton 1979). A further explanation is that the continual addition of nesting material increases the size of the nest to accommodate the increasing size and activity of the nestlings, particularly when they begin to exercise their wings (Newton 1979). Gyps vultures usually have a clutch of one egg or two eggs (Grossman & Hamlet 1964). Ali & Ripley (1983) reported a clutch of one egg and later on in rare cases a clutch of two eggs reported in Keoladeo National Park, Bharatpur in India (Prakash 1999). During the present study, a clutch of one egg was recorded throughout the study period.

The majority of the White-rumped Vultures have been breeding in the Nilgiri North Forest Division of Moyar Valley. There are number of villages in and around the study area who rear livestock for their livelihood for manure collection and milking purpose. These cattle also serve as a food source for vultures. The main threats for the White-

rumped Vulture species in the landscape are illegal usage of vulture killer, non-steroidal anti-inflammatory drugs such as diclofenac, aceclofenac, carprofen, flunixin, ketoprofen,



Orientation of White-rumped Vulture nests in relation to nest tree trunk

nimesulide and phenylbutazone on livestock by quacks, para-veterinarians, livestock inspectors and veterinarians. Other anthropogenic threats for vultures are farmers apply pesticides on leftover livestock carcasses to kill the wild predators such as tiger, leopard and dhole and in the process vultures also get killed in numbers (Venkitachalam 2016). In addition Mariamman temple festivals being celebrated in Siriyur during the peak White-rumped Vulture breeding season and due to these festivals a sharp decline of nest numbers was noticed in Siriyur. We recommend that for better management, the Nilgiri North Forest Division should be

declared as vulture sanctuary for securing last stronghold breeding populations of White-rumped Vultures in Tamil Nadu.

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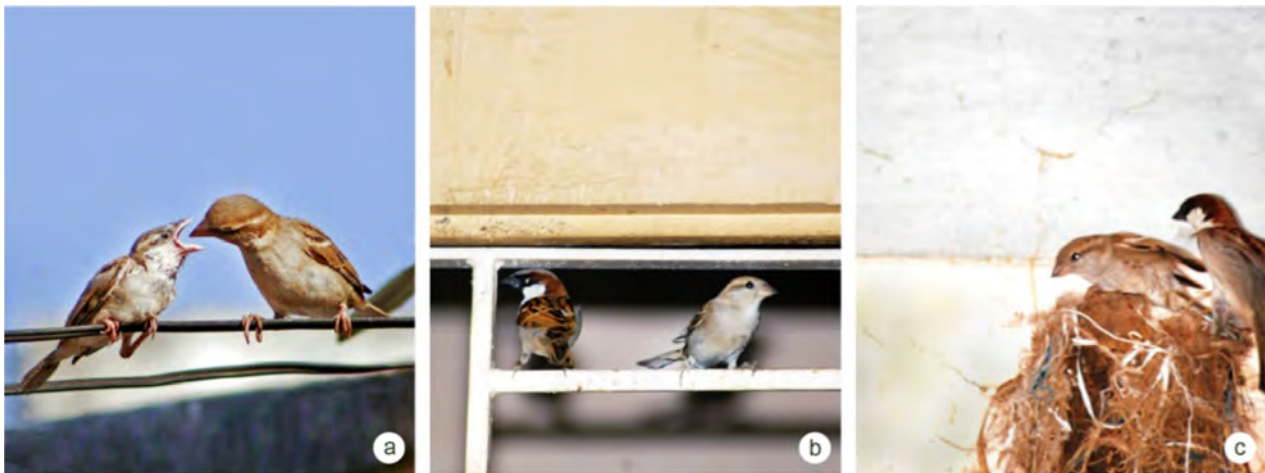
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HOUSE SPARROW

Recolonization by *Passer domesticus* (Aves: Passeriformes: Passeridae) populations in rural Arakkonam and Nemili taluks, Vellore District, Tamil Nadu, India



Passer domesticus and its nest in Arakkonam and Nemili Taluks. (a) A female feeding its fledgling, (b) Pair perching on grill gate, and (c) Pair perching on nest (Photo credit: M. Pandian)

IUCN Red List:
Least Concern
(BirdLife
International,
2017)

Aves
[Class of Birds]

Passeriformes
[Order of Passerine]

Passeridae
[Family of Old World
Sparrows]

Passer domesticus
[House Sparrow]

Species described by
Linnaeus in 1758

Passer domesticus (Passeriformes: Passeridae) a native of Eurasia, enjoys a cosmopolitan distribution and occurs plentifully in the Indian subcontinent (Ali & Ripley 1987). An individual would live for 12–13 years (Joshi 2009), and an adult bird would be 14–16 cm long and weigh 25–30 g. These birds are monogamous and show multiple broods. They are known to construct nests in concrete buildings, thatched roofs, and electrical metre boxes, which usually occur in human dominant landscapes. It is one such species, known to co-occur with humans from historic times, serves as a reliable indicator of environmental quality (Khera et al. 2010). There is decline of the species in many parts of the world and since mid 1970's in 47% of rural and 60% of the urban and sub urban populations have declined in UK (Robinson et al. 2005) however it is a Least Concern species. For roosting, House Sparrows prefer vegetation such as shrubs and in <5m tall trees. Easy availability

of food is also another important reason for the association of the species in specific locations (Dhanya & Azeez 2009).

These birds are non-migratory and they hardly travel 1–2 km for forage from their habitats. Breeding mostly occurs in February–September in India. *Passer domesticus* generally build either single or semi-colonial nests and nest building is most intense in January–May (Vincent 2005). They use a broad range of materials for nest building like grass, stalks, roots of plants, barks, inflorescences, threads, feathers, strings, yarn, wool, pieces of paper (Indykiewicz 1990). The composition of nest material may vary according to the local availability of the materials they use (Wimberger 1984).

Passer domesticus occurrence is lower at present than in the past and this is consistent across the country (Sudhira 2016). In India, their populations have been decreased considerably across Bengaluru (Rajashekara & Venkatesha, 2008), urban and suburban areas of Jammu region in Jammu & Kashmir (Singh et al. 2013), Delhi (Khera et al. 2010), and Bandel region, urban, suburban and rural areas in West Bengal (Bhattacharya et al. 2011; Ghosh et al. 2010). In view of the growing concern over the decline of this bird population in India in general, the present study aims to record its population dynamics, and occurrence of active nests as measured in villages of Arakkonam and Nemili Taluks in Vellore District in northern Tamil Nadu.

Global Distribution:

Native: Afghanistan, Asia, China, Europe, Germany, France, Indian subcontinent such as India, Pakistan, Bangladesh, Nepal, Sri Lanka & Andaman, Middle East, Myanmar, North Africa, North East Africa, Russia, Saudi Arabia, United Arab Emirates, United Kingdom.

Introduced: Australia, Brazil, British Indian Ocean Territory, Canada, Chile, Japan, Maldives, Mauritius, Mexico, New Zealand, South Sandwich Islands, United States, Uruguay, Venezuela, Vietnam, Virgin Islands, U.S., Zimbabwe (BirdLife International, 2017)

Materials and Methods

Study Area: Arakkonam (13°04'N & 79°40'E) and Nemili (12°35'N & 78°30'E) Taluks occur in the eastern part of Tamil Nadu, 70km from Vellore town (12°15'N & 13°15'N and 78°15'E & 79°50'E) and 71km west from Chennai (13°05'N & 80°17'E) covering 828km² with a human population of 504,000 (Vellore 2017). The present study was undertaken in 153 villages in both Arakkonam and Nemili Taluks. The principal occupation of residents here is agriculture followed by weaving. The altitude of the area is 81m. The average annual rainfall of the district for the past 20 years (1997–2016) is 1,037.8mm. The monthly minimum mean temperatures are: min. 22.4°C, max. 34.1°C.

With help from a few local people (six high school teachers and other informants [six]), we could identify 1,715 houses occurring in 153 villages with *P. domesticus* populations. The houses were surveyed between 0600 and 0900 hours and 1500 and 1800 hours over two months (February–March 2017). Then residents (adults) of those houses were interviewed using a questionnaire for details such as types of houses preferred for

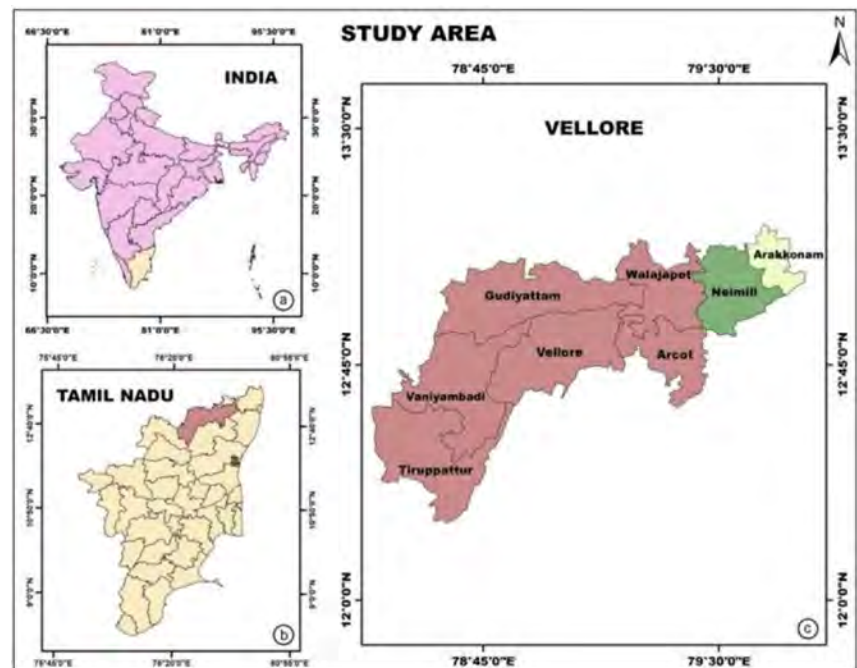
nesting by the bird, numbers of active nests, numbers of *P. domesticus* observed in the vicinity of nests and houses, whether the birds built nests in the natural crevices in the houses or in the artificial man-made structures like nest boxes, pots were enumerated. The number of birds visiting nests, roosts in houses during nights, age of nests, their re-use patterns and materials used for construction of nests were ascertained by direct observation for 30–60 minutes using binoculars.

The numbers of mobile phone towers in the villages were verified and listed. Senior citizens, former civic representatives, farmers, and womenfolk, were interviewed and recorded in data sheets and tracked details of past *P. domesticus* populations, their population trends over the last 30 years were also recorded. Photographs and videos were taken without disturbing the nests and birds. ANOVA (analysis of variance) was applied to determine

whether *P. domesticus* in the study area built their nests equally across all the nesting substrates (type of houses) available. One-way Analysis of Variance (ANOVA) was used to test for differences in means of variance between the number of *P. domesticus* individuals with respect to the types of nesting sites which are classified into seven categories namely concrete flat-terraced house, tile-rooftop house, thatched-rooftop house, thatched sheds, shops, street lamp post and trees. Chi-Square test was used to determine any significant differences between the utilization of habitat types and the age of the nests to determine which habitat type(s) were preferred by the birds using SPSS (Statistical Package for Social Sciences). Test of significance was assessed at $p < 0.05$. Collected data were tabulated, analyzed and given as graphical representations.

Results and Discussions

A total of 1,903 active nests were observed in human habitations. A total of 6,452 individuals of *P. domesticus* were encountered in the vicinity of the nesting sites in the human habitations (Table 1).

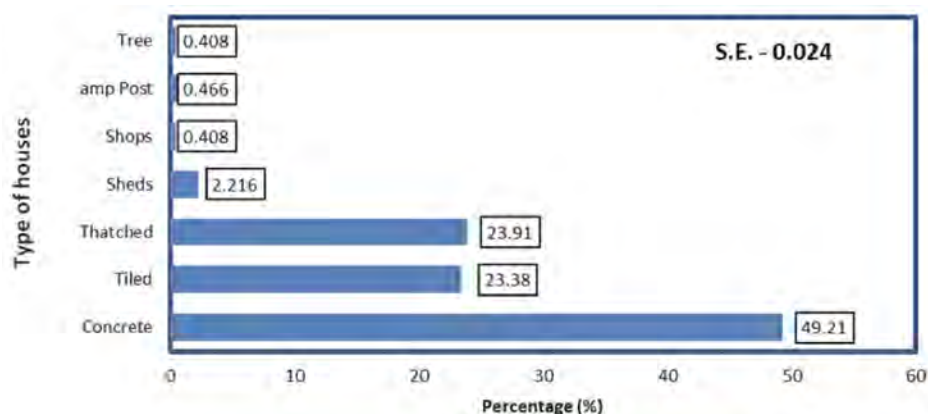


Study area map: (a) India map showing Tamil Nadu (colonial white), (b) Tamil Nadu map showing Vellore District (pink colour), and (c) Vellore District map showing Arakkonam (light green colour) & Nemili (green colour) Taluks.

Table 1: Details of types of houses, number of nests and house sparrows observed in the study area.

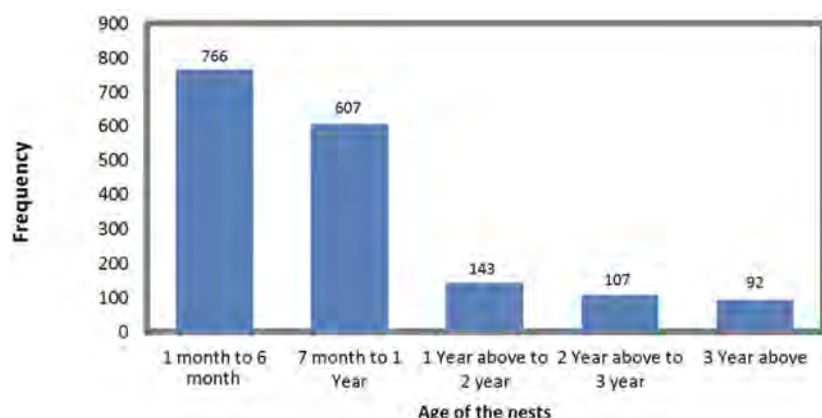
Type of houses	Number of houses that include nests	Total number of nests found	Total number of sparrows observed in the vicinity of nesting sites
Concrete flat- terraced houses	844	934	3278
Tiled-rooftop houses	401	449	1432
Thatched-rooftop houses	410	456	1501
Thatched sheds	38	39	156
Shops	7	7	23
Street lamp posts	8	11	41
Trees	7	7	21
Total	1,715	1,903	6,452

Passer domesticus populations built nests in the natural nesting sites such as crevices in the buildings, domestic electrical appliances, lamp posts and trees. Apart from that they also built nests in the artificial nesting sites in the houses such as human made nest boxes and pots placed by the house holders. A total of 1225 nests were found in the natural nesting sites such as crevices, holes in the walls, structures attached to walls, roofs, electric appliances and trees. The remaining 490 nests were observed in the human made artificial nest boxes and pots. 49.2% of nests were found in concrete flat-terraced houses, 23.4% and 23.9% of nests were in the tile-rooftop and thatched-rooftop houses respectively. It attributes that nearly 50% of the nests were observed in the concrete flat-terraced buildings and next to that sparrows preferred tile-rooftop (23.4%) and thatched-rooftop (23.9%) houses equally. Another observation of this study is that only 0.4% of nests were found in the shops. For nesting shops, street lamp posts and trees were least preferred compared to concrete-flat terraced/ tile-rooftop/thatched-rooftop houses. Interactions with the householders also



Percentage of nesting sites preferred by *Passer domesticus* in the study area.

revealed that 80.1% of active nests were less than one year old i.e., constructed during the current breeding season and the remaining 20% nests were more than one year old. It



Frequency of age of the nests constructed by *Passer domesticus* in the study area.

also revealed that the House Sparrow populations increased considerably in the past few years.

The types of houses (nesting sites) preferred by the birds and age of the active nests varied significantly ($\chi^2 = 45.330$, $df=4$, $P<0.0005$).

This means that *P. domesticus* have significantly changed their preference for nesting substrates over the years,

with the concrete flat-terraced houses the most preferred. Concrete flat-terraced houses were used significantly more followed by thatched-rooftop and tile-rooftop houses.

Table 2: Association between types of nesting sites (houses) and the age of nests of *Passer domesticus*.

			Age of nests					Total
			1 month to 6 months	7 months to 1 Year	1 to 2 Years	2 to 3 Years	Above 3 Years	
Type of house	Concrete	Count	360	314	79	54	37	844
		% of total	21.0%	18.3%	4.6%	3.1%	2.2%	49.2%
	Tiled-roof	Count	176	144	23	21	37	401
		% of total	10.3%	8.4%	1.3%	1.2%	2.2%	23.4%
	Thatched-roof	Count	199	130	37	29	15	410
		% of total	11.6%	7.6%	2.2%	1.7%	0.9%	23.9%
	Thatched sheds	Count	22	13	0	2	1	38
		% of total	1.3%	0.8%	0.0%	0.1%	0.1%	2.2%
	Shops	Count	2	4	0	0	1	7
		% of total	0.1%	0.2%	0.0%	0.0%	0.1%	0.4%
	Street lamp posts	Count	3	2	2	0	1	8
		% of total	0.2%	0.1%	0.1%	0.0%	0.1%	0.5%
	Trees	Count	4	0	2	1	0	7
		% of total	0.2%	0.0%	0.1%	0.1%	0.0%	0.4%
Total		count	766	607	143	107	92	1715
		% of total	44.7%	35.4%	8.3%	6.2%	5.4%	100%

Maximum number of nests (39.3%) having less than one year age were found in concrete flat-terraced houses followed by 19.2% nests in thatched-rooftop and 18.7% nests in tile-rooftop houses (Table 2).

From the Table 3, we infer that there is a significant difference between the number of sparrows observed (counted) with respect to types of the houses at 5% level. A total of 759 nests and 2,412 birds in 68 villages in Arakkonam Taluk and 1144 nests and 4,040 birds were observed in Nemili Taluk. When analyzing the proportions of total number of houses in the study area with respect to the number of houses having nests, sparrows preferred 2.48% to thatched-rooftop houses, followed by 1.91% to tiled-rooftop houses and 1.17% to concrete flat-terraced houses. Regarding shops, sparrows preferred only 0.13% for selecting as nesting sites (Table 4). The study also revealed that the observation of 1,903 active nests and 6,452 House Sparrows in 154 villages covering two Taluks attributes that the birds are successfully breeding in these rural areas. Observations of 80.1% of nests were built recently, i.e., less than one year old also corroborated that the sparrows are breeding actively for the past two years. Cavitt et al. (1999) have observed that the nests build by the sparrows may be reused during the same season as well as in successive breeding seasons. Similarly 19.9% of nests were found for more than one year have been reused by the sparrows in the successive breeding seasons.

Suarez-Rodriguez et al. (2013) reported the usage of anthropogenic materials like cigarette butts as nesting materials. Similarly the study also revealed that birds used paddy hays, grasses, coconut fibers, fibers from barks, strings, feathers of fowls and other anthropogenic materials like pieces of papers, yarns and polythene. Martin & Fitzgerald (2005) observed high behavioral plasticity in sparrows and hence, these species may readily identify and utilize unfamiliar resources available in the area like lamp posts and trees for nest construction. Study further revealed that the sparrows utilized all available sites in the houses for construction of nests including 0.57% nests (n=11) in lamp posts and 0.36% nests (n=7) in trees. Even after the installation of mobile phone towers, these

Table 3: Details of significant difference between the number of House Sparrows observed and the type of houses (ANOVA) in the study area.

Types of house	N	Mean	Std. Error	F Value	Significance Value	Result
Concrete flat-terraced	844	3.88	0.09	545.49	0.00	Most Significant
Tiled- roof top	401	3.57	0.13			
Thatched-roof top	410	3.66	0.12			
Shops	7	3.29	0.95			
Street lamp post	8	5.13	0.89			
Tress	7	3.76	0.95			

Table 4: Proportions of houses selected by House Sparrows for constructing nests in Arakkonam and Nemili Taluks.

	Type of houses	Total number of houses in the study area (*)	Total number of houses have nests	Proportions of houses have nests
1.	Concrete houses	72,383	844	1.17%
2.	Tiled houses	21,037	401	1.91%
3.	Thatched houses	16,471	410	2.48%
4.	Thatched sheds	4,450	38	0.85%
5.	Shops	5,233	7	0.13%
Source (*): www.vellore.nic.in				

birds recolonize and survive. Hence, the exact impacts of radiation from the mobile phone towers on the survival of *P. domesticus* are to be studied in detail.

Conclusion

The survey conducted in 153 villages in Arakkonam and Nemili Taluks revealed that 1,903 active nests and 6,452 sparrows were observed. Sparrows have been breeding successfully in the rural villages by utilizing the available habitats to build nests. 49.2% of nests were found in concrete houses. 80.1% of nests were built less than one year period. It proves that its population has started to increase for the past three years. The remaining 19.9% nests are being reused by the birds during the successive breeding seasons. Interview with 153 senior citizens, farmers and former civic representatives revealed that the Sparrow populations had started to decline after 1980's and disappeared during 1990's but its population started increasing since 2013. Sparrows breed even in villages (116) having mobile phone towers. Impacts of radiations from mobile phone towers on the survival of birds are to be studied in detail. Creating safe nesting sites, feeding birds and awareness among the rural folk have to be created for making conducive atmosphere for successful breeding in the villages. They adapted to changing the architecture of houses by utilizing the available sites in the houses and constructed nests. Adopting organic farming due to awareness on the impact of insecticides, availability of nesting sites, food grains, insect fauna, householders' care on the nests, generate fauna while rearing cattle have facilitated to grow the sparrow population in rural areas. Efforts should be taken to create awareness among the general public about the needs to save sparrows and create more nesting sites in the newly constructed houses, buildings, besides placing artificial nest boxes. Efforts may also be taken to citizens of Vellore district to create awareness, conduct surveys, provide nesting sites at all public buildings, schools and colleges adjoining to the study area to conserve sparrows.

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Captive elephant conservation welfare: Training and consultation workshop for mahouts and *cawadi*

B.A. Daniel and N. Kalaivanan

Zoo Outreach Organization conducted a training and consultation workshop for mahouts of private elephant holders in Tamil Nadu 13-14 July 2018. The main objective of the workshop was to improve the welfare of privately-owned captive elephants in Tamil Nadu State through the training of elephant handlers about husbandry management and animal care, and to create a network of private elephant handlers. This workshop was conducted at the museum of Srinivasan Services Trust (of TVS Groups; collaborator), Irattai Thirupathi, Thoothukudi District sponsored by the International Elephant Foundation. The programme was attended by a group of 24 private elephant owners, mahouts and *cawadi* (second mahout). It is worth mentioning here that Zoo Outreach Organization conducted its first full-fledged Mahout training programme in 1995. For full details see <https://zooreach.org/Networks/Education/Mahout%20Training.pdf>

Major activities carried out to achieve the above objectives include formation of a database of mahouts/cawadis/ managers so as to have interaction and communication in the future and to plan future programmes; assessment of the welfare of the elephant handlers, their interests and future requirements; a reference and reading material available in vernacular language for elephant handlers to understand scientific aspects of elephants, management and husbandry practices that they should follow; two day training and consultation workshop for the private elephant owners and elephant handlers that helped the organizers and also for them to meet in person and discuss various elephant welfare related issues with an aim to solve them in the near future and; a post workshop visit to their respective places to see the elephants in their facility and also to do first round of survey to the participants.

Dr. Daniel explaining objectives of the training



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Before conducting the training programme, the authors paid multiple visits to private and temple elephant facilities in Madurai, Ramanathapuram, Viruthunagar, Thirunelveli, Toothukudi, Sivagangai, Theni and Kanyakumari districts. The main purpose of the visit was to fulfil two project requirements, viz., 1. to meet and talk with the elephant owners, managers, mahouts and cawadi before the workshop and to invite them, and 2. to see the elephant holding areas. During the visit it was realized that private elephant holders who are keeping about 45 elephants in the state required priority assistance.

It is always a challenge to conduct this kind of training/workshop with the elephant handlers since the biggest impediment is in gathering the elephant handlers all at one time leaving their elephants. This was possible since the elephant handlers were keen to attend the meeting and they had to leave the elephants under the care of either the cawadi or in some cases mahouts stayed with their elephants allowing cawadi to attend the workshop. This is one of the major reasons why all mahouts and cawadis could not able to attend the



Dr Kalaivanan demonstrating foot care and management

programme. Other than the organizers from ZOO, veterinarians Dr. S. Shanmugasundaram and Dr. N. Kalaivanan were invited as the resource persons for the programme. Dr. Poothalingam, Veterinarian at Srivaikundam and ACF Swaminathan (Rtd), in-charge of SST Unit at Navathirupathi were invited as the guests for the inauguration of the two-day programme.

The topics addressed and discussed during the training were: the problems faced by the mahouts in their elephant work, welfare of elephant handlers and elephant welfare efforts; finding solutions to improve the welfare and management of private elephants in TN; discussion to create an informal network with colleagues locally and identify future initiatives to promote elephant and mahout welfare.

On the day of the training programme and before the inauguration the participants were requested to fill in a questionnaire that had two parts. The first part of 35 fields was the bio data of the elephant handlers, and the second part of 18 fields was to



A mahout sharing his experience

know more about their elephants. The age of the participating elephant handlers ranged from 22-52 years and the literacy ranged from 5th standard to graduation. Some of them had more than 30 years of experience as mahouts.

During the inauguration B.A. Daniel the PI of the project welcomed the gathering and explained the objectives of the workshop. Kalaivanan briefed the gathering about the agenda and activities in detail. The veterinarian S. Shanmugasundaram during his presentation at different times of the day spoke about the elephant characteristics, care and management and also shared some of his personal experiences that he had with captive elephants. He also elaborated on the important 107 sensitive points on an elephant's body with its location and number: limbs 44 (11 on each limb), lower abdomen 3, chest 9, back 14, neck 12, head 25; that inspired lot of discussion among the participants. While speaking about care of elephants he highlighted eight important points that elephant handlers should remember and eight golden rules that they should follow.

Topics on animal and mahout welfare, common elephant health issues and management were covered by Kalaivanan. He listed common ailments of captive elephants, explained the causes of it and necessary treatment for the ailment.

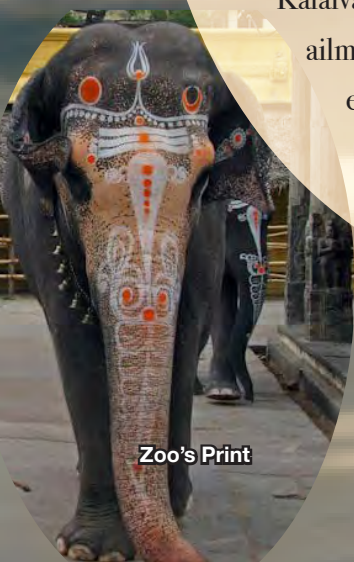
One important common issue for captive elephants is foot care hence more importance was given and discussed in detail.

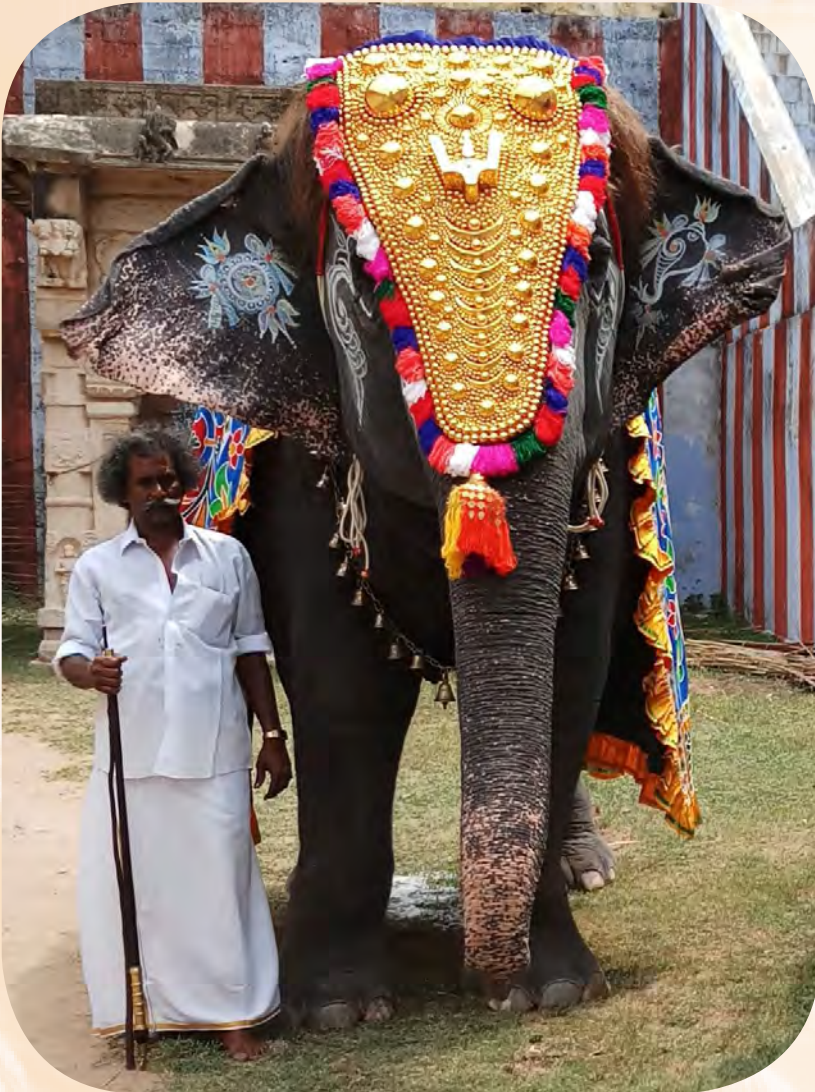
The entire process and treatment of foot rot was demonstrated to all the mahouts with the temple elephant Kumuthavalli of Srivaikundam temple at Alwarthirunagari.

Towards the end of the training a discussion was conducted to prioritize some of the major future activities. Some major recommendations of the programme are: to create a network of private elephant owners and handlers; to provide more training inviting mahouts covering all districts; to compile a book on traditional medication for the treatment of ailing elephants; to conduct regular medical health check up for elephants such as deworming, vaccination and other necessary medication; health check up for mahouts; develop a mobile application for daily monitoring elephant management; to provide training for local



One of the participating mahouts interacting with Dr Kalaivanan





Thanks to Mr. C.D. Sridharan PCCF (Rtd) and Srinivasan Services Trust for their constant encouragement and for providing facilities at Rettaithirupathi and also for their support for their assistance during demonstration. The first author would like to thank Ms. Heidi Riddle, USA, for her constant encouragement, Mr. Swaminathan ACF (Rtd) for his support and assistance during the planning and execution of the project and to the Veterinarian Dr. Poothalingam for his encouragement. Thanks are due to International Elephant Foundation for the financial support.

veterinarians about elephant treatment and; to help private elephant holders towards completion of various upcoming government regulations.

The participants received certificate of appreciation for taking part in the programme. A copy of the list of participants was also given to them.



Visit to Kaziranga National Park

My visit to Kaziranga National Park in the month of April, 2018 was memorable and amazing. I am sharing about the visual treat I experienced during my jeep safari. It was evening and I was very excited to capture wild animals with my DSLR camera. Binoculars were mounted to view far off birds and rhinos. The weather was pleasant and the driver was kind enough to stop anywhere seeing my excitement. I was very eager to see a rhino as I haven't seen other than in pics. Just in few yards on my right side I saw flock of pelicans

in a lake and chirping sound of all other birds mesmerized me. Then the innocent faced Rhino was grazing on the green pastures. I felt so happy and excited.



Indian Rhinoceros (*Rhinoceros unicornis*)

Once we moved, few meters away, the driver stopped the vehicle. I couldn't believe myself what was happening. A majestic elephant completely soaked in mud, the leader of the herd, was crossing us. The leader, a female elephant, made sure that all of them are following her and are safe. She moved slowly and was alert. Followed by her were all the little ones moving with the herd. Watching the tiny ones playing and moving step by step was so cute!!!. They were happy, joyful and yes of course naughty... Their parenting, caring and protective nature was clearly visible. I got struck for a minute whether to capture, record or just observe them. They were nearly 14 elephants. They knew that they were passing by other species (*Homo sapiens*). They knew that there were people watching them. A very astonishing fact was the last elephant was so cautious. It made sure that entire herd crossed safely and stopped in the middle of the road for few minutes to take further steps.

All the safari vehicles on both sides stopped and did not disturb them. I could hear a lot of people clicking photos and murmuring sound. Yes... At that moment I felt human beings behave so civilized and well mannered. But are we fair to them always? Do all of us think before we hurt them? No.....Not yet!!! Its high time that each one of us realize the importance of nature and other species which are major part of our ecosystem. Every common man need to involve in taking step to conserve nature and do a bit to nurture the natural habitats. Illegal and malpractices happening need to be dealt with highest level of punishment. Pouching of innocent pachyderms and other criminal activities against these animals need to be curbed. Conducting tourist sight seeing by elephant safari and captivating elephants should be banned legally. They are wild...Let them live WILD!!.

Submitted by Visalia Raj, Bengaluru. Email: visaliaraj@gmail.com

The author is a school student based at Bengaluru, Karnataka. She is passionate about wildlife conservation

“Celebrating 25 years of Action for Biodiversity” at Deogarh in Lalitpur, Uttar Pradesh

Indian Biodiversity Conservation Society celebrated the International Day for Biological Diversity on May 22nd 2018 in collaboration with Forest Department Lalitpur and Deogarh, Manav Organization from Lalitpur, Bharat Scout Guide, Sarthak Pragati Prayaash Society from Jhansi, Wild Geo Excursion from Tikamgarh, Paryavaran Jeev Seva Sansthan from Gonda and Society for Scientific Research from Barabanki. This year's theme was “Celebrating 25 Years of Action for Biodiversity”

We together arranged a Bird watching event at Deogarh. The program was well publicized in press and social media. This had resulted more participation



Students enjoying bird watching

of around 200 persons including the students, local people, forest department staff and NGO members. Eight teams were formed with 25 participants including two bird experts. The event started at 5:30 am and ended at 11:30 am.

The main aim of this event was to bring the people

closer to the nature and its biodiversity that is simply miraculous. Most of the participants had never experienced such a field activity before. They were full of enthusiasm and amused to see the bird diversity. Generally bird watching is considered as an activity that is carried out during the winters, but bird watching in summer is altogether a different experience where we get to see more raptors and summer migrants as well. We also focused on terrestrial birds apart from the water birds.



Team members looking out for bird species with the experts

Submitted by Sonika Kushwaha and Akhilesh Kumar, Indian Biodiversity Conservation Society, Jhansi, U.P. Email: ibcsforall@gmail.com



Rescue of a fledgling of Long-billed vulture (*Gyps indicus*)

The checklist prepared included more than 80 bird species that is reasonably excellent for the summer bird watching. The participants were in extremely high spirits to get the glimpses of the master scavengers i.e. the vultures during the bird watching. The other raptors seen included, collared scop's owl, spotted owlets, shikra, osprey, Bonelli's eagle, crested serpent eagle, barn owl. Besides the raptors, other beauties included small pratincole, river tern, painted



Bird expert preparing the checklist simultaneously

spurfowl, tawny-bellied babbler, dusky crag martin, paradise flycatcher, painted stork and other common birds. The event was concluded with the distribution of participant certificates.

The event was marked by the rescue of a fledgling of long-billed vulture (*Gyps indicus*)



Participation certificate distribution

that had fallen down from the cliffs while learning to fly. It was found lying on the rocks with an injured wing, and it was taken to the Deogarh forest office. After first aid it was shifted to Lalitpur facility for further treatment.

Mr. Abhishek Namdev, Mr. Pushpendra Singh Chauhan, Mr. Devendra Kumar, Dr. Rajeev Kumar Niranjana, Mr. S.D. Pal, Mr. Patel, Mr. Shivam Yadav and Mr. Feroz made the event successful with their dedicated efforts.

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.

Source: Zoos, breeding facilities, holding facilities, rescue centres, research institutes, wildlife departments, wildlife protected areas, bioparks, conservation centres, botanic gardens, museums, universities, etc. Individuals interested in conservation with information and opinions to share can submit articles ZOOS' PRINT magazine.

Manuscript requirements

Articles should be typed into a Word format and emailed to zooreach@zooreach.org. Avoid indents, all caps or any other fancy typesetting. You may send photos, illustrations, tables.

Articles which should contain citations should follow this guideline: a bibliography organized alphabetically and containing all details referred in the following style: surname, initial(s), year, title of the article, name of journal, volume, number, pages.

Editorial details

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