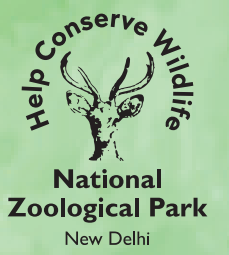




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NATIONAL ZOOLOGICAL PARK - *A Birding Site* 2020



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A Birding Site



**NATIONAL
ZOOLOGICAL PARK**

A Binding Site



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BACKGROUND

The National Zoological Park is a modern zoo right in the heart of capital. It is a home to large number of species of birds, reptiles and mammals which live in an environment that in many ways resemble their natural habitat. The National Zoological Park not only provides a home for endangered species, but also helps them to breed well in captivity. There are about 450 varieties of flora in Delhi Zoo including around 150 tree species and plants of medicinal importance that are being documented time and again. The zoo has a history of wildlife conservation research with large number of internships, PhDs and other researches. The zoo has invariably kept documenting its floral diversity, free ranging fauna and avian species inside its premises. The practice of publishing data in the form of books and manuals such as *Plants of the National Zoological Park, 1983*, *History of National Zoological Park, 1986*, *Tress of National Zoological Park, 2008* and *Animals of National Zoological Park, 2009*. NZP has recently published book titled, “Enrichment efforts of captive animals” on the enrichment activities undertaken in the zoo for its animals and this is another effort in the same direction.

The National Zoological park provides wide range of habitats and hosts a large number of birds every year. It is one of the largest breeding sites of Painted Storks in India. Time to time efforts have been made to document the free ranging avian diversity of National Zoological Park. This handbook is written keeping in mind the usefulness of recording bird species for learners, researchers and bird watchers with the aim of encouraging more researches in the zoo premises.

This endeavor will help in recognizing NZP as a birding site in urban landscape.





National Zoological Park





Chapter-1

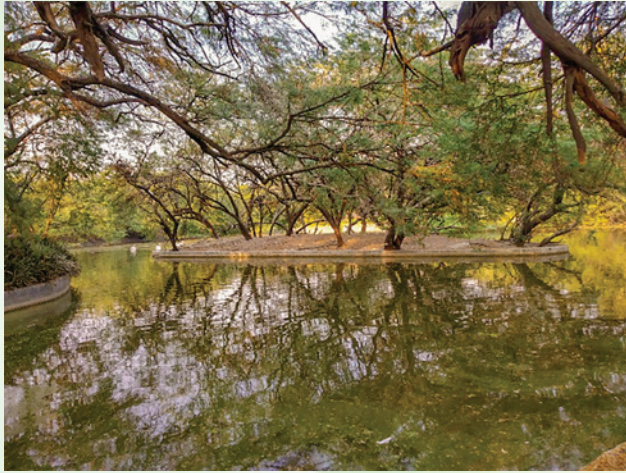
NZP AS BIRDING SITE

National Zoological Park, New Delhi was established in the year 1959. The main idea was to provide a healthy recreation to the people along with conservation education. The wilderness area of NZP attract birds in large numbers. More than 100 different species of migratory and resident Birds have been reported in the zoo premises. A big network of water channels in the zoo attracts many waterfowls during winter months, which is an added attraction for zoo visitors and bird watchers as well. National Zoological Park supports small grasslands, many woodlands, Waterbodies, islands etc. These diverse habitat types and vegetation supports various avifauna.

Bird-plant interaction is one of the interesting topics to study. These two different groups mutually benefit each other and ensure the survival of both. The interaction between plants and birds is necessary in maintaining a healthy ecosystem. Many avian species are dependent upon certain species of plants for their needs of nesting, foraging and roosting. They feed on seeds, fruits, and nectar, use branches and leaves for making and supporting their nests and in return they provide services like pollination, seed dispersal and feeding upon insect pests. National Zoological Park is rich in floral diversity, with more than 405 sp of different categories of flora has been documented so far from the premises. The different floral assemblages create small patches of grasslands, shrubland and woodland areas that includes native and exotic varieties of some of the most beautiful and rare shrubs and trees which supports population of large number of birds in these ecosystems. Trees like Banyan and silk cotton attracts hundreds of birds like Yellow footed green pigeon, grey hornbill, barbet etc. during flowering and fruiting seasons.

Apart from this National Zoological Park has many ponds in out of which 2 major ponds are in the middle of the park which are connected to enclosures through moat channel system. The ponds have islands which contains variety of trees like *Prosopis cineraria*, *Prosopis juliflora* etc. that supports population of large number of aquatic avian species like Great White Pelican, Spot Billed Duck, Little Grebe, Eurasian Coot, Heron, Little Egret, Pond Heron, Painted Stork etc.





WETLAND ECOSYSTEM



WOODLAND ECOSYSTEM



ISLAND ECOSYSTEM



SAVANNAH ECOSYSTEM



1.1 Fig Tree: A Site for Bird Assemblage

Fig trees are mostly found in tropics and some of the species are the largest in terms of area covered in which most famous and common is Banyan tree. Banyan tree is a symbol of Indian age old wisdom and has an immense conservation value. A big and old banyan tree is an ecosystem in itself it supports a number of species of animals and birds. There are documented records of assemblage of more than 60 species of birds on a single Banyan or Fig tree. They also support primates, squirrels and other frugivorous mammal species. Ficus genus represents all the figs and Banyan trees worldwide. These Ficus trees have a unique kind of inflorescence which is called Hypanthodium, formed by an enlarged, fleshy, hollow receptacle with multiple ovaries on the inside surface. This inflorescence looks more like a fruit than flower and it's a general perception that nobody can see the flower of fig because it never opens. Each one of the 750-plus species of Fig trees hosts a species of wasps which is unique to that particular species of tree and the pairs have been evolving together for more than 60 million years. These wasps pollinate the female flowers and complete their lifecycle inside the inflorescence. To pollinate, a female wasp enters into a ripe fig and lay the eggs inside, the newly hatched male and females mate and then wingless male chew the opening to the fruit and then die. Female wasps comes out and then find out another fruit to lay the eggs.

National Zoological Park houses twelve species of fig trees, these are located on multiple places, on every 30 to 50 meters, a careful look around will show one or another form of fig trees. The most common and attractive one is banyan tree. Some of them are very large and have long hanging roots. they are the perfect sites for large number of assemblage of birds. There are three places where one can see a big and old Banyan tree in the zoo. One is near the Marsh Crocodile and Siamese Crocodile enclosure in beat no. 9, another one is near Nursery and the third one is near the director's office. During the fruiting season one can see various birds feeding on figs, birds like Yellow footed green pigeon, Common myna, Bank myna, Grey hornbill, Brown headed barbet, Copper-smith barbet and other frugivorous birds visit this tree quite regularly. Seeing a big flock of Yellow-legged green pigeon is rewarding site for even a seasoned birdwatcher.





A site for bird assemblage



A big and one of the oldest Banyan tree near Nursery



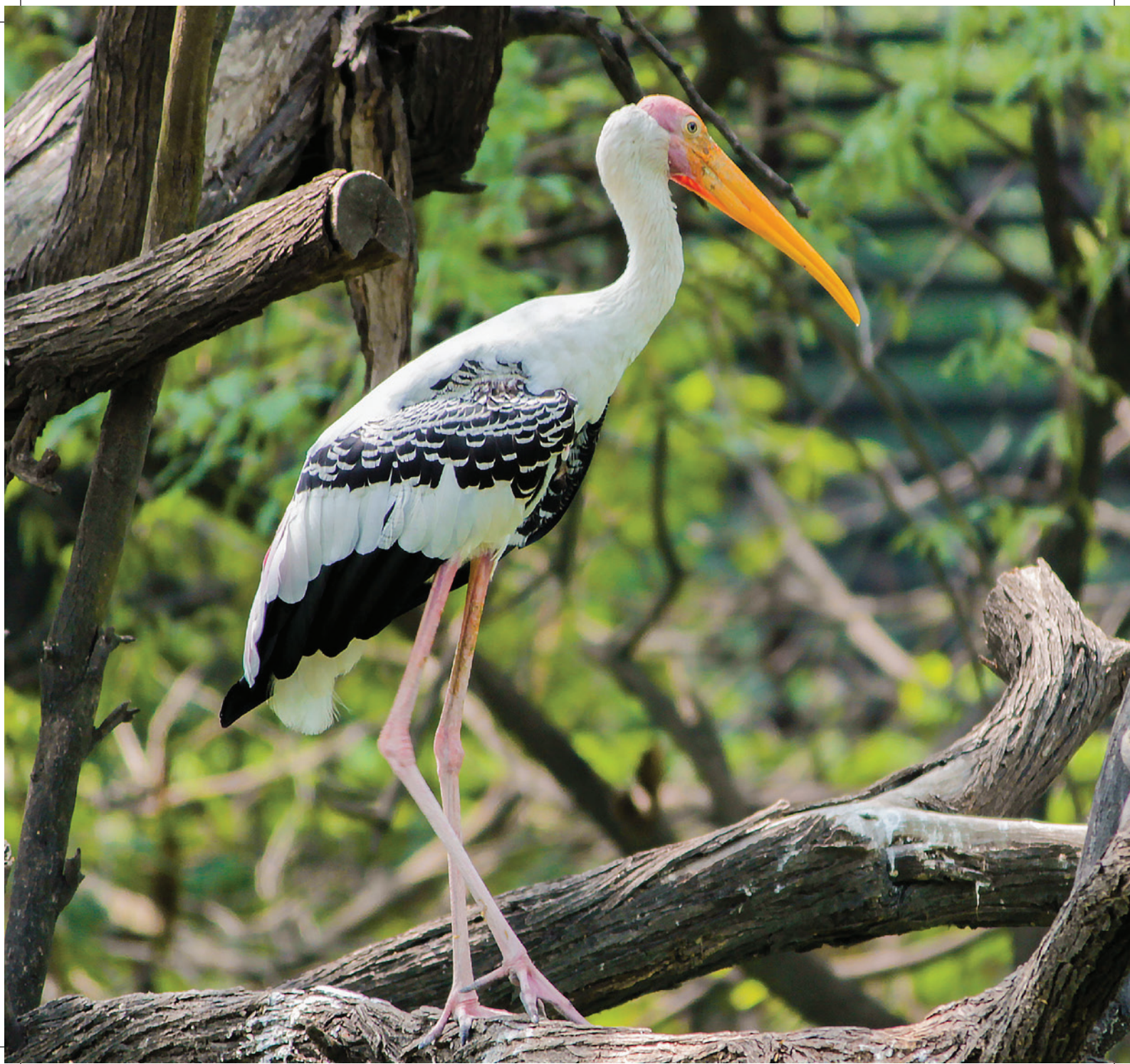
The canopy cover of a single large banyan tree near Nursery



1.2 Some Sighting Locations

Although the zoo location is such that large number of birds can be sighted everywhere inside the campus however, few places are such that where specific birds are sighted more frequently. List of such locations are provided below:

S.NO.	BIRD NAME	ENCLOSURE/ BEAT NO.
1.	Black Redstart	Near Beat no 2
2.	Black Kite	Black Buck, Rhino and Barasingha Enclosure
3.	Rose Ringed parakeet	Asian Elephant, Beat no 12
4.	Grey Hornbill	Hippopotamus Enclosure
5.	White Wagtail	Hippopotamus Enclosure, Pond near Director's office
6.	Gray Wagtail	Hippopotamus Enclosure, Pond near Director's office
7.	White Throated Kingfisher	Pond 1, Pond 2, Siamese and Marsh Crocodile enclosure
8.	Common Kingfisher	Pond 1, Pond 2
9.	Painted Stork	Pond 1, Pond 2
10.	Spot Billed Duck	Pond 1, Pond 2, Hippopotamus Enclosure, Pond near Beat no 15
11.	Great White Pelican	Pond 1, Pond 2
12.	Little Cormorant	Pond 1, pond 2
13.	Indian Cormorant	Pond 1, Pond 2
14.	Little Grebe	Pond 1, Pond 2
15.	Eurasian Coot	Pond 1, Pond 2
16.	Little Egret	Pond 1, Pond 2
17.	Intermediate Egret	Pond 1, Pond 2
18.	Pond Heron	Pond 1, Pond 2
19.	Gray Heron	Pond 1, Gharial Enclosure, Pond Near Beat no 15
20.	White Breasted Waterhen	Pond 1, Pond 2
21.	Red Avadavat	Near Beat no 1
22.	Black Rumped Flameback	Near Pond 1, Beat no 1, Beat no 6
23.	Common Moorhen	Pond 1, Pond 2





Chapter-2 BREEDING & NESTING OF FREE RANGING BIRDS IN NZP

National Zoological Park provides green space in the middle of Urban Hub that supports nesting and breeding of various free ranging birds. Some of the bird species that are not found frequently in other parts of the city can be seen using the ground of National Zoological Park for their different needs. Following is an account of avian species that can be largely seen nesting and breeding in NZP.

2.1 Painted Stork (*Mycteria leucocephala*)



Kingdom : Animalia
Phylum : Chordata
Class : Aves
Order : Ciconiiformes
Family : Ciconiidae
Genus : Mycteria
Species : leucocephala

The Painted Stork (*Mycteria leucocephala*) is a large wader bird with heavy yellow bill & long neck. It is listed as Near Threatened by the IUCN (International Union for Conservation of Nature), though it is widely distributed across India with a general trend of declining population. They have got their name due to presence of very distinctive pink tertiary feathers in the adults. The species belongs to Ciconiidae family and is widespread across India, where it has colonial nesting pattern and construct platform stick nest, placing its platform nests on trees growing on islands in marshes, village tanks, urban water bodies and park. They forage in flocks in shallow waters along with rivers, lakes, ponds or other water bodies. They submerge their partially open beaks into the water & wipe them from side to side to sense the small fishes or any other prey in water. As they move along, they keep stirring the water using their feet to dislodge the hiding prey. They are colonially nesting birds who nests in trees frequently along with other aquatic birds. Birds that nest colonially get benefits from increased protection against predators. It also helps them to better utilize food supplies, by following more successful foragers. They feed mainly on small fishes. They also feed on frogs and occasionally on snakes. They feed mainly during the day but may also forage in evenings or even at night in unusual conditions. Having well fed they use to stand still near the shore for long time. Flock sizes can be over 50 birds in general conditions however, it is commonly observed that flocks in agricultural landscapes are small with less than 5 individuals. They produce feeble moaning sounds and another sound of bill clattering at the nest. This species is generally considered as residential migrant in nature & makes only short distance movement in response to changes in weather, food availability or for breeding purposes.

Since 1960, the National Zoological Park, New Delhi has been an important breeding ground for wild painted storks in Delhi region). The Delhi Zoo is a major breeding ground for Painted Storks for much of northwestern India. Records indicate that, until 1970s, Delhi zoo was the only breeding ground for Painted Storks for Delhi region (10,000 sq. km). Presence of large number of painted storks in the zoo also attracts number of researchers in the zoo. Several studies have been done on Painted storks in NZP including continuous monitoring during nesting season using camera traps. But Painted storks are only one of the several other breeding colonial water birds. As the zoo has two concrete-lined, shallow water ponds with area around 0.8 ha of each. These ponds have two islands of approximately 0.01 ha each. These islands are planted with new world mesquite *Prosopis juliflora* trees. These trees are largely utilized by Painted storks for nesting in large numbers. Little Cormorant, Intermediate Egret, Little Egret, Pond Heron etc. also nests in these ponds of National Zoological Park. The breeding season of *Mycteria leucocephala* begins in the winter months shortly after the monsoons. The adults regurgitate fish that they have caught to feed the





chicks and these fishes meant for juveniles are typically smaller than 20 cm. Nest survival is considered higher for the nests initiated early in the monsoon season. They typically lay one to five eggs with early breeders having larger clutches. The incubation period is about a month while the fledging period is approximately two months. There is occasional predation of chicks by Eagles, Kites and Crows. Although, NZP have seen increase in the Kites and Crow population in the area which are significant predators of Painted stork eggs and chicks. However, the number of painted storks and their nest were counted to a record high this year in the zoo. This year in Oct-Nov, total number of painted stork nests was surveyed to be around 220 with 354 chicks and approx. 450 adults. Sufficient feed is provided in the zoo ponds that played a major role in breeding of storks in such large numbers. Ponds are regularly cleaned to prevent algal growth and healthy fish population is maintained. National Zoological Park is one of the best breeding sites for such Near Threatened avifauna with special reference to Painted storks. Large nesting of Painted Stork at National Zoological Park will be helpful to take steps towards the conservation of such diversified and major nesting site with abundance of food resources and different tree species right in the middle of urban hub of the country.



National Zoological Park



Painted Stork Pond
Pond 1

Great White Pelican Pond
Pond 2

100 m

Google Earth

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2.2 Black Kite (*Milvus migrans*)



Kingdom : Animalia
Phylum : Chordata
Class : Aves
Order : Accipitriformes
Family : Accipitridae
Genus : *Milvus*
Species : *migrans*

The black kite (*Milvus migrans*) belongs to the family Accipitridae, which also includes raptors and is thought to be the world's most abundant species in the family Accipitridae. Unlike other members of the group, black kites are more expected to scavenge. The kites are widely distributed through tropical and temperate areas of Eurasia. Various subspecies are recognized. Black kites are medium sized predators, they are considered as most numerous and successful birds of prey of the world. They are an opportunistic feeder and can be seen in a large congregation near the dumping sites of big cities. They are the major bird of prey in city of Delhi. They nest mainly on trees but sometimes their nest has been observed upon man-made structures also. They are found in varied habitats from fully natural to completely urban environment. This makes them the most adoptable to exploit human-modified ecosystem. In India, the species is strongly associated with human settlements and act as the main avian predator of the urban ecosystem. National Zoological Park being situated close to the Yamuna River and dotted with many trees is a perfect nesting ground for this bird.

During the walk inside zoo one can see them quite frequently either circling in the sky or perching on a tree in large numbers. Their population is in constant rise inside National Zoological Park where they are nesting in large numbers.

The breeding season of *Milvus migrans* in India begins in winter months of January-February and therefore the young ones fledge before monsoons. The nest maybe a rough platform of twigs and rags placed on a tree. The nesting sites are reused by Kites in subsequent years. Nest placing and orientation is done considering wind & rainfall. The male often copulates with the female after pairing. The unguarded females may also be approached by other males, and extra pair copulations are also reported. Males that return from a foraging trip frequently copulates on returning, as it increases the chances of their sperm fertilizing the eggs. Both the male and female have been observed to take part in nest building, incubation and caring of chicks in nests. The typical clutch size reported is 2 or 3 eggs. The incubation period in Black Kites is around 30–34 days. The chicks of Black Kites stay in the nest for around two months. Siblings show aggression towards each other and frequently the weaker chick is killed. The parent Kites guard their nests from the sky and dives aggressively at intruders if any.







2.3 Indian Peafowl (*Pavo cristatus*)



Kingdom : Animalia
Phylum : Chordata
Class : Aves
Order : Galliformes
Family : Phasianidae
Genus : Pavo
Species : cristatus

The Indian peafowl (*Pavo cristatus*) is a peafowl species native to the Indian subcontinent and is the national bird of India. Though now it has been introduced to many other foreign countries. It is listed as “Least Concern” by IUCN. It is well celebrated in Hindu and Greek mythology. In ancient times, their possession was indicative of wealth. The males are brightly coloured, having a predominantly blue fan-like crest and are widely known for their long train of tail feathers bearing Colourful eyespots. These stiff feathers are raised and forms a semicircle and peacocks keeps trembling them in display during the courtship producing a ruffling sound. The long train feathers of the males grow only after the second year of their life. Fully developed trains are observed in birds older than four years. These feathers advance each February and are moulted at the end of August but the moulting of the flight feathers may be spread out across the year. Peahens lack this train, and have a duller brown plumage.



Pavo cristatus lives mainly on the ground in open forests or on land under cultivation where they forage for grains, seeds. They also prey on small rodents, insects, earthworms, lizards and occasionally on snakes. They forage in small groups that are called as “musters” usually having a cock and 3-5 peahens. They make very loud calls especially in the breeding season that makes their presence detectable. Also, their calls are indication of any predators nearby.

Peacocks are polygamous, they may mate with several females and the breeding season is spread out but appears to be dependent on the rains. Peafowls usually reach sexual maturity at the age of 2 to 3 years old. Males may display even in the absence of females. When a male is displaying, females do not appear to show any interest and usually continue their foraging. The males make their breeding territory in



a common area called “Lek”. Peahens may walk through the lek to choose a male. Subsequently after mating females lay 3-8 eggs and incubates them for about 28 basic days until they hatch. Commonly they build nest as a slight scrape in the ground lined using dry leaves, twigs, sticks etc. The chicks follow the mother around after hatching. The young chicks climb on their mothers back and the female carries them in flight to a safe tree branch. The wilderness area in NZP provides a suitable habitat to fulfil peafowls nesting, roosting and foraging requirements. The park has large area of woodlands where musters can be well observed.



2.4 Rose Ringed Parakeet (*Psittacula krameri*)



Kingdom : Animalia
Phylum : Chordata
Class : Aves
Order : Psittaciformes
Family : Psittaculidae
Genus : *Psittacula*
Species : *krameri*

The Rose Ringed Parakeet (*Psittacula krameri*) is a medium sized parrot of the family Psittacidae. It is sexually dimorphic. The adult males have a red and black colored ring on neck due to which they are also called as Ring Necked Parakeet, while the females and immature birds of both sexes either show no neck rings, or display a pale grey colored ring.



Both sexes have very distinctive green feather colour in the wild. The captive bred Parakeets have multiple colour mutations including blue, violet and yellow. Rose Ringed Parakeets on average measures 40 cm in length, including the tail feathers that make a large portion of their total length. In wild, *Psittacula krameria* is very vociferous chattering species with prominent whistling and squawking calls. Captive individuals can be taught to speak in human languages. They are reported to be herbivorous and non-migratory species.

It has disjunct native ranges in Africa and South Asia but is now introduced into many parts of the world where the feral populations have established themselves. It has become a popular pet species. They are bred in captivity for the exotic pet trade. The species is categorized as “least concern” by IUCN because its population appears to be increasing, but its popularity as a pet and unpopularity with farmers have reduced its numbers in some parts of its native range. It is also one of the few parrot species that have successfully adapted to living in the disturbed habitats, it has withstood the incursion of urbanisation and resultant deforestation. These parakeets have proven themselves capable of living in a variety of climates outside their native range, and are even able to survive low winter temperatures of Northern Europe. They usually feed on cereal grains, buds, fruits, vegetables, nuts, berries, and seeds and in winters they like peas. Wild flocks also fly several miles to forage in farmlands and orchards, causing extensive damage.

The Indian Rose Ringed Parakeets form pairs from September to December. They do not have life mates and often breed with another partner during the following breeding season. During colder months, they select and defend nesting sites and avoids competition for sites with other birds. Feeding on winter pea crops provide the females with nutrients necessary for egg production. From April to June, they care for their young. Fledglings are prepared to leave the nest before onset of monsoon.







Chapter-3 BIRDS HOUSED IN NZP

3.1 Aspects of Captive Management

Housing

When one talks about birds in captivity, it will be well to begin with study of proper housing conditions. They are planned from the very beginning for the comfort of birds. Housing is one of the most important aspects for keeping birds in the zoo. In an up-to-date setting, birds must not only be healthy but also be housed in the most “natural” environment possible. In National Zoological Park, aviary is designed in such a way that they resemble their natural habitat. It not only keeps birds stress free but also engaged in their normal routine activities in the wild. Most tropical and Sub-tropical aves specially the smaller birds need temperature-controlled exhibits for winter and some specific warm spots having proper sunlight and in summers, shade is ensured in enclosures by planting more plants. Most of the bird species as recorded are not only highly dependent on photoperiod for their reproductive cycle, but also other physiological issues like molting. Keeping in mind this requirement of avian species, all the cells in NZP are designed and positioned in a manner that they receive adequate amount of sunlight in all seasons. Flooring is something of primary importance in a birdhouse. When bird management in captivity is planned, two most important things that must be kept in mind regarding flooring are that the Avian species have evolved with multiple anatomical and functional variations of the feet like webbing, talons, feet for wading etc. that require the appropriate caging materials in captivity and second that the Birds are bipedal; therefore, injury or damage to one foot can place hundred percent of the weight on the second foot which can be very painful for them esp. for smaller birds. Keeping in mind the footing requirements of the birds, species specific perching material is provided in every enclosure and flooring is of mud with partial area cemented. Live plantation and dead tree are placed. Some non-flying species like ratites do not need a roof. Also, some birds have limited ability to fly so they can be stored in open enclosures. NZP houses Emu and Rhea in open area. The birds move and forage freely in the large area consisting of Trees, shrubs and grasses. Zoo have Biological assistant who takes care of all the perching, roosting, nesting requirements of the birds.



Water delivery systems is provided in most bird exhibits. The food and water easily become contaminated by bacteria, fungi and protozoa especially during summer months and can be the source of serious health problems. Therefore, regular cleaning and sanitation is done for the enclosures. In general, hygiene is the most important issue. Good cleaning and disinfection procedures are conducted regularly to avoid spreading pathogens. Rats and other pests are regularly controlled in the enclosures.

Nesting

Nesting materials and nests are provided for reproduction and may be a stimulus for breeding activity. Although some exceptions do occur like macaw, cockatiel and most other psittacines do not breed without a nest box therefore, wooden nest boxes of desirable size are provided in their enclosures to encourage their reproductive behavior. Nest Hygiene is regularly undertaken in National Zoological Park, as nests can easily become dirty with excrement from the offspring therefore the nests are cleaned on daily basis. Consequently, selection of bedding material is important. Paral (Paddy husk), dry bushes and leaves, wood shavings are used as nest bedding materials allowing the liquid feces to drop through and ensuring better ventilation. The offspring leaving the nest for the first time after weaning is a risky situation for young birds, and fractures or other traumatic injuries can occur. Therefore, nests are designed to minimize the risk of fledglings flying into wire mesh or other dangerous structures of the cage. To help prevent such accidents, tree branches are placed in front of the nest a few days before fledging.

Diseases

Identification and listing of old and senile birds who have completed 2/3rd of their lifetime were undertaken in National Zoological Park to be able to take better care of them. Necessary supplements are being provided to them along with regular feed and extra care is taken of them. Aviaries and exhibits are inspected daily in the morning by animal keepers. The keepers fill their observations regarding the behavior, health, stool, urine, feed etc. in the keeper register which is then checked and signed by veterinary officer, biological assistant, zoo ranger and head keeper. If found any abnormality in any individual immediate action is taken and, if required, samples are collected for laboratory evaluation. Some viral diseases tend to be more species-specific than bacterial or fungal diseases. In parrots, psittacine circo virus, avian polyoma virus or Pacheco's disease are some of the examples. Other viral diseases are specific to bird groups and encountered in zoo settings are avian poxvirus infections and



herpes virus infections (HV). Routinely disinfection, sanitation and vaccination are done for every bird to prevent diseases. Zoo carry out the seasonal care of the animals by conducting summer drills, monsoon management and winter care drill for its birds. Currently, zoo has implemented winter care measures for its animals. All the ventilated areas and openings in enclosures of pheasants and small birds are closed and covered with tart, paddy straw is placed in pheasants and dry grass in smaller bird cells.

Quarantine

Quarantine guidelines have been established by the Central Zoo Authority. Quarantine measures include all birds that are newcomers to the collection from other zoos or from wild. All newcomer birds are subjected to a minimum of 30 days in quarantine period. Old aviary which is currently out of use is used to keep birds in quarantine. Birds are integrated into the collection and housed in the normal aviary after they complete their prescribed quarantine period in the absence of any detectable disease or infection. Special attention is paid to the behavior and feeding of new animals in the first weeks of quarantine. Food and water is supplied in a manner equivalent to the birds' former feeding conditions at the earlier facility. Changes to the food and feeding schedule is made gradually to avoid stress to the birds. A separate keeper is there for the quarantined birds who do not go to any other animal enclosure and takes bath before going home or other human areas to avoid disease transmission.

Nutrition

As each species have different diet requirements. It is important for all professionals of zoo such as biologists, zoo ranger and Veterinarians to work collectively to customize the most appropriate diet for a given species. Therefore a food committee headed by Director NZP comprising of members from above mentioned professionals is formed.

Behavioral Considerations

In National Zoological Park particular attention is given to the choice of animals occupying neighboring cages due to potential incompatibility among species or individuals and aggressive or challenging behavior during the breeding season. This is particularly true for some parrot species which seems to be affected by the presence of other pairs of the same species. Male macaws are protective of



their partners during the breeding season, and a neighboring male of the same species may affect the mating behavior of the pair and create a stressful situation that can compromise breeding success. On the other hand, parrot families such as white cockatoos appear to benefit from the presence of conspecific birds. If they are housed to allow visual and vocal contact, they will display and call to each other, and this situation might contribute to breeding success. Sound knowledge of the natural behavior of the species is helpful when choosing the most suitable species to be neighbors. The neighboring bird species in the zoo are chosen so that one of the species is not stressed, the prey and predator species must not be placed adjacent. An incorrect choice can create a stressful situation for the animals and leads to the abnormal appearance and behavior of the birds. In most circumstances, a stressed bird becomes sick as well.

3.2 Captive Breeding

Captive breeding is breeding of wild animals in captive conditions such as zoological parks. Various animals when housed in proper social groupings and given due care by providing nutritious food, habitat etc breeds well. The excess individuals are often released in wild habitat following all the protocols or given to other zoological parks in exchange of other desirable species.

Painted Stork (*Mycteria leucocephala*)

Kingdom : Animalia
Phylum : Chordata
Class : Aves
Order : Ciconiiformes
Family : Ciconiidae
Genus : Mycteria
Species : leucocephala

The Painted stork (*Mycteria leucocephala*) is a long-legged large wader bird with heavy yellow bill & long neck. The species belongs to Ciconiidae family and is widespread across India, where it has colonial nesting pattern and construct platform stick nest, placing its platform nests on trees growing on islands in marshes, village tanks, urban water bodies and park. Like most other common water birds, Painted Stork forages in a watery area less than 25 cm deep and very active in the morning and late



evening. This species is generally considered as Residential Migrant. During the breeding season, they show local migration and choose appropriate breeding sites near the water bodies. Wetlands near the colony site greatly impacts nest survival as they contain the food reserves exploited by Painted Stork, to which several foraging flights are made during the course of the day. It is listed as Near Threatened by the IUCN, though it is widely distributed across India with a general trend of declining population. In National Zoological Park, apart from high breeding of free ranging Painted storks, the breeding in captive Painted storks is also observed to be very high. The Painted Storks in NZP are housed in walk in aviary which is covered with Net of large mesh size. Facility of flowing water and Ponds are provided inside the enclosure. Enclosure is enriched with 3 large sized poles over which sitting platforms made of bamboos are provided. In breeding season, wooden baskets are tied over these platforms to facilitate egg laying and incubation. Nesting materials like twigs, branches, dry leaves are spread in the enclosure. Feed consisting of small fishes is provided at 2-3 places inside enclosure. The National Zoological Park houses about 80 number of Storks and can potentially contribute to supplement their population in wild.



3.3 List of Birds Housed in NZP

S.NO.	COMMON NAME	SCIENTIFIC NAME
1.	Common Grey Hornbill	<i>Ocyrceros birsostris</i>
2.	Great Indian Hornbill	<i>Buceros bicornis</i>
3.	Indian Peafowl	<i>Pavo cristatus</i>
4.	Indian Peafowl (color mutation)	<i>Pavo cristatus color_mutation</i>
5.	Kalij Pheasant	<i>Lophura leucomelanos</i>
6.	Eurasian Spoonbill	<i>Platalea leucorodia</i>
7.	Egyptian Vulture	<i>Neophron percnopterus</i>
8.	Grey Heron	<i>Ardea cinerea</i>
9.	Black Headed Ibis	<i>Threskiornis melanocephalus</i>
10.	Indian Red Jungle Fowl	<i>Gallus gallus murghi</i>
11.	Brahminy Kite	<i>Haliastur indus</i>
12.	Black Kite	<i>Milvus migrans</i>
13.	Spotted Munia	<i>Lonchura punctulata</i>
14.	Barn Owl	<i>Tyto alba</i>
15.	Brown Fish Owl	<i>Ketupa zeylonensis</i>
16.	Indian Greater Horned Owl	<i>Bubo virginianus</i>
17.	Rose Ringed Parakeet (color mutation)	<i>Psittacula krameri color_mutation</i>
18.	Alexandrine Parakeet	<i>Psittacula eupatria</i>
19.	Rose Ringed Parakeet	<i>Psittacula krameri</i>
20.	Black Francolin	<i>Francolinus francolinus</i>
21.	Great White Pelican	<i>Pelecanus onocrotalus</i>
22.	Painted Stork	<i>Mycteria leucocephala</i>
23.	Budgeriger	<i>Melopsittacus undulatus</i>
24.	Cockatiel	<i>Nymphicus hallandicus</i>



S.NO.	COMMON NAME	SCIENTIFIC NAME
25.	Bare Eyed Cockatoo	<i>Cacatua sanguinea</i>
26.	Common Emu	<i>Dromaius novaehollandiae</i>
27.	Australian Zebra Finch	<i>Taeniopygia castanoitis</i>
28.	Blue & Yellow Macaw	<i>Ara ararauna</i>
29.	Military Macaw	<i>Ara militaris</i>
30.	Sun Parakeet	<i>Aratinga solstitialis</i>
31.	Grey Parrot	<i>Psittacus erithacus</i>
32.	Edwards Pheasant	<i>Lophura edwardsi</i>
33.	Golden Pheasant	<i>Chrysolophus pictus</i>
34.	Lady Amherst Pheasant	<i>Chrysolophus amherstiae</i>
35.	Silver Pheasant	<i>Lophura nycthemera</i>
36.	Greater Rhea	<i>Rhea americana</i>
37.	Black Swan	<i>Cygnus atratus</i>
38.	Ring Necked Pheasant	<i>Phasianus colchicus</i>
39.	Grey Francolin	<i>Francolinus pondicerianus</i> <i>pondicerianus</i>
40.	Eurasian Collared Dove	<i>Streptopelia decaocto decaocto</i>
41.	Comb Duck	<i>Sarkidiornis sylvicola</i>



3.4 Glimpses from Zoo Aviary







White Peafowl (*Pavo cristatus*)



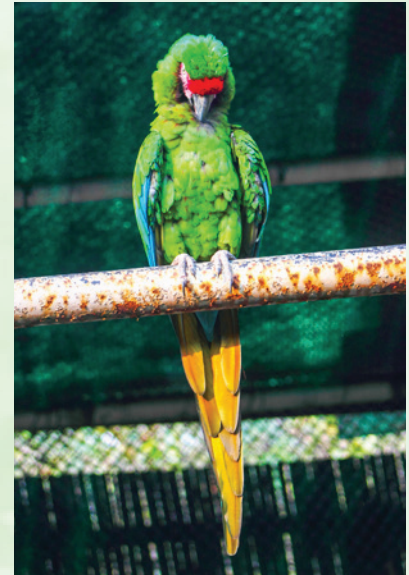
Silver Pheasant (*Lophura nycthemera*)



Lady Amherst (*Chrysolophus amherstiae*)



Painted Stork (*Mycteria leucocephala*)



Military Macaw (*Ara militaris*)



Great Indian Hornbill (*Buceros bicornis*)



Indian Spoonbill (*Platalea leucorodia*)



African Gray Parrot



Golden pheasant (*Chrysolophus pictus*)



Cockatiel (*Nymphicus hollandicus*)



Knob-billed Duck (*Sarkidiornis melanotos*)



Emu (*Dromaius novaehollandiae*)





Alexandrine parakeet (*Psittacula eupatria*)



Brown Fish Owl (*Bubo zeylonensis*)



Blue and Yellow Macaw (*Ara ararauna*)



Egyptian vulture (*Neophron percnopterus*)





Great Horned Owl (*Bubo virginianus*)



Brahminy kite (*Haliastur indus*)



Barn Owl (*Tyto alba*)





Chapter-4 CONSERVATION BREEDING OF BIRDS IN NATIONAL ZOOLOGICAL PARK

Captive breeding which is also known as "captive propagation", is the process of maintaining population of plants or animals in a controlled environment such as Zoological Parks. It is sometimes employed to help species that are being threatened by human activities. In some instances a captive breeding program can save a species from extinction and in that case it is called as Conservation Breeding. The conservation breeding is fully planned programmes and is a science of conserving an Endangered species by preventing its population collapse in the wild. An endangered species is the one who is facing very high risk of becoming extinct in near future and requires immediate action to propagate its population in wild. The eliminative factors can be habitat loss, fragmentation, poaching, over fishing, pollution, predation, disease, illegal trade, climate change and parasitism etc. The aim of the Conservation Breeding is to conserve the genetic diversity of the species and reintroducing the population into wild to establish its self-sustaining population in natural habitat. The zoological parks play a major role in conserving a species through ex-situ conservation breeding programme and Species Recovery Programmes which are based on the guidelines of Central Zoo Authority, MoEF&CC, Government of India and on policies of International organisations.

Many factors are considered for planning a successful conservation breeding program. It includes genetic, ecological, behavioral, and ethical aspects. Proper pedigree and bloodline analysis are done for deciding best mating pairs. Nutritious feed and sound housing conditions are maintained for healthy stock. Most successful attempts involve the cooperation and coordination of many institutions.

The National Zoological Park is participating zoo for 5 species namely, Asiatic Lion, Royal Bengal Tiger, Red Jungle Fowl, One Horned Rhino and Sangai Deer. NZP is leading in conservation breeding of Thamin deer and has successfully propagated its population in captivity and stocked its population in other zoos also. In future, these zoos can function as repositories of the founders for many species and as base for the survival of the species toward self sustainable population.



Red Jungle Fowl (*Gallus gallus*)



Kingdom : Animalia
Phylum : Chordata
Class : Aves
Order : Galliformes
Family : Phasianidae
Genus : Gallus
Species : gallus

Captive birds are known to breed readily when provided with nesting materials and platforms. Being participative zoo in conservation breeding of Red Jungle Fowl NZP has maintained 12 on display cells and off display cells. The off display cells are meant only for the purpose of mating in Red Jungle Fowl. The nutritious feed consisting of crushed boiled eggs, mixed dana and seasonal fruits such as mausambi in winters is provided in the cubicles at around 11-12 am and each enclosure contains water pots that are routinely filled by the keepers. The enclosures are made in a natural habitat having plantations, branches to roost, hiding spaces, dry leaves and twigs are purposely spread on the ground to provide them desirable flooring to sit. The floor of enclosure is made of mud and seeds are spread on the floor to encourage foraging behavior. The pheasant is kept in each enclosure in ideal social grouping to keep stress away and prevent any abnormal behavior. Regular enrichments are provided in the enclosures to maintain a healthy population stock.



Chapter-5 SALIM ALI BIRD COUNT

Dr. Salim Ali is one of the most renowned and famous ornithologists of India. His work on Indian birds has been recognized worldwide. His book on Indian Birds is a handy reference guide for bird identification in the field for bird watchers interested in Indian Birds. Salim Ali was the first Indian to conduct systematic bird surveys across India and wrote several bird books that popularized ornithology in India. To recognize his service in the field of ornithology, he is conferred with Padma Bhushan and Padma Vibhushan awards from Government of India. To celebrate his birth anniversary on 12th Nov, a bird count has been organized at many places and IBA's of India. Taking forward it's commitment towards the conservation and awareness on free ranging birds, National Zoological Park, New Delhi has participated in the 'Salim Ali Bird Count' from 5th Nov to 12th Nov 2020. Expert birdwatchers from Delhi participated in the National Zoological Park bird count.



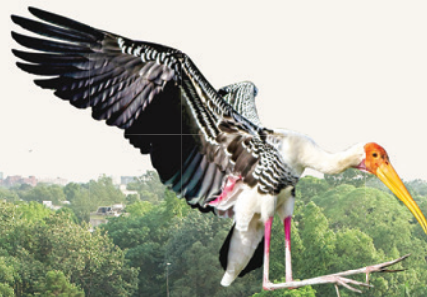
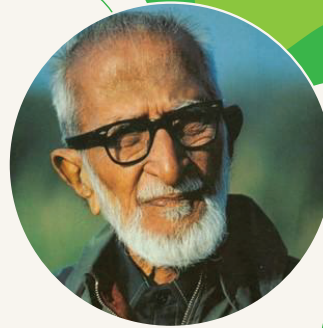


National Zoological Park
celebrates the birth anniversary of
Dr. Salim Ali by participating in

SALIM ALI BIRD COUNT

5-12 November 2020

NZP is one of the largest breeding ground of
Painted Stork and has been witnessing presence
of more than 100 birds time to time.



YOU CAN ALSO OBSERVE
AND RECORD BIRDS IN
YOUR CHOSEN AREA



5.1 Team Members

The survey was conducted in all 8 days by National Zoological Park team, comprising of Sh. Ramesh K. Pandey, Director NZP, Priyanka Chaudhary, Education Assistant, Vibhav Srivastava, Education Assistant and Parvez Khan, Intern.

NZP team was joined on 7th Nov 2020, the 3rd day of survey by members of Central Zoo Authority, Dr. Sonali Ghosh, Deputy Inspector General (Head Quarter), Dr. Devender Thakur, Evaluation and Monitoring Officer and Mr. Lakshminarasimbha R., Scientific Officer, CZA and ace birders from University of Delhi Dr. Asani Bhaduri, Assistant Professor, Dr. Nawin Tiwary, Assistant Professor, University of Delhi.





5.2 Objectives

- To prepare checklist of birds of National Zoological Park, New Delhi.
- To understand seasonal changes in bird species in National Zoological Park, New Delhi.
- To understand long-term change in bird populations in National Zoological Park, New Delhi.
- To promote bird conservation and
- To create awareness through the involvement of a large number of volunteer observers in survey work.

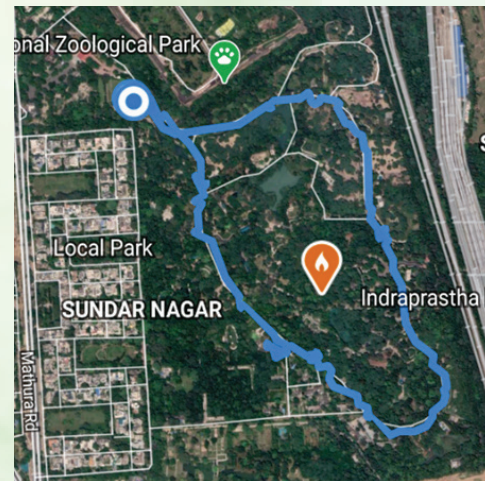
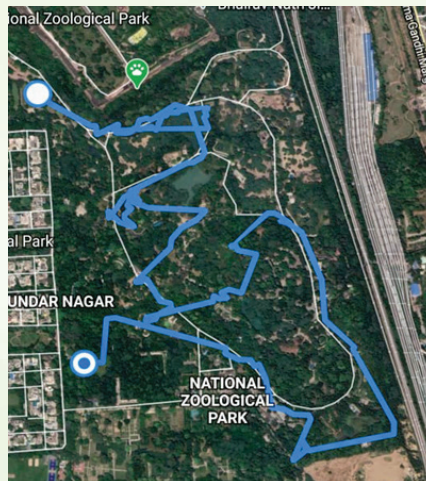
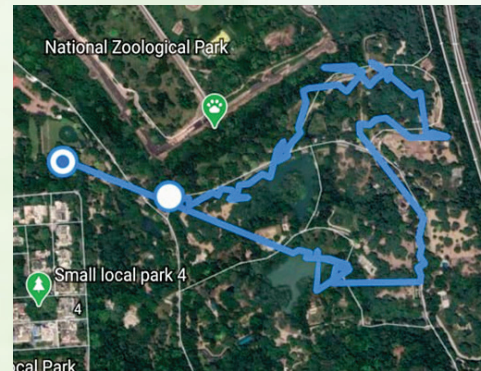


5.3 Methodology

Almost 5 km path was travelled daily for 5 days and bird species and their numbers were listed in Mobile App of TheCornellLab called “e-Bird.” The list at the end of survey was submitted at the App. Finally, all the lists were combined to obtain final bird checklist of National Zoological Park in November month. Data was analysed using MS Excel 2010.

Materials Used:

1. Cannon camera EOS 550D with lens Cannon zoom lens 75-300.
2. Binocular of Olympus with 10X50
3. Book: Birds of Indian Subcontinent by Grimmett & Inskipp
4. Mobile App e-Bird
5. Mobile App Internet of Birds



5.4 Results

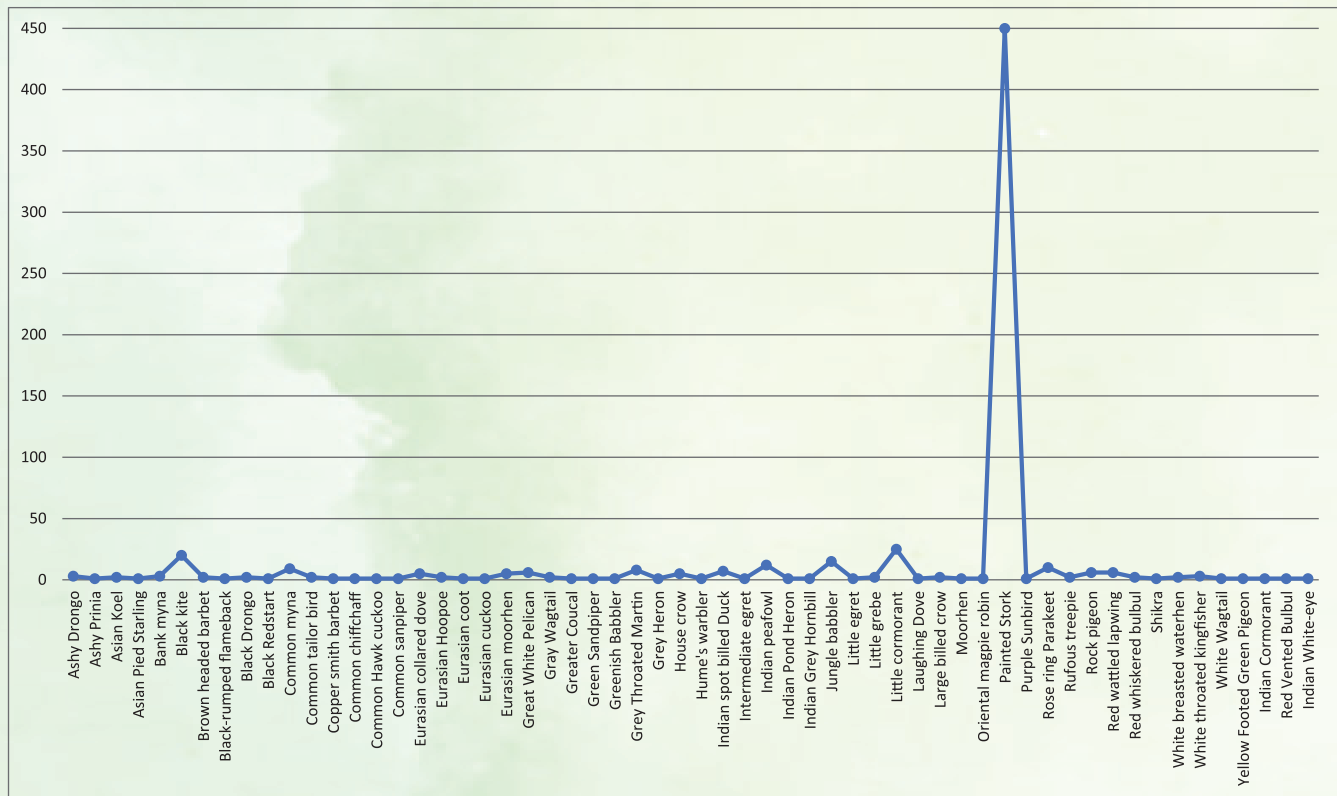
Following species are found in the zoo during salim Ali bird count event.

S.No.	Common Name	Scientific Name	Status
1	Ashy Drongo	<i>Dicrurus leucophaeus</i>	Least Concern
2	Ashy Prinia	<i>Prinia socialis</i>	Least Concern
3	Asian Koel	<i>Eudynamys scolopaceus</i>	Least Concern
4	Asian Pied Starling	<i>Gracupica contra</i>	Least Concern
5	Bank myna	<i>Acridotheres ginginianus</i>	Least Concern
6	Black kite	<i>Milvus migrans</i>	Least Concern
7	Brown headed barbet	<i>Megalaima zeylanica</i>	Least Concern
8	Black-rumped flameback	<i>Dinopium benghalense</i>	Least Concern
9	Black Drongo	<i>Dicrurus macrocercus</i>	Least Concern
10	Black Redstart	<i>Phoenicurus ochruros</i>	Least Concern
11	Common myna	<i>Acridotheres tristis</i>	Least Concern
12	Common tailor bird	<i>Orthotomus sutorius</i>	Least Concern
13	Copper smith barbet	<i>Megalaima haemacephala</i>	Least Concern
14	Common chiffchaff	<i>Phylloscopus collybita</i>	Least Concern
15	Common Hawk cuckoo	<i>Hierococcyx varius</i>	Least Concern
16	Common sandpiper	<i>Actitis hypoleucos</i>	Least Concern
17	Eurasian collared dove	<i>Streptopelia decaocto</i>	Least Concern
18	Eurasian Hoopoe	<i>Upupa epops</i>	Least Concern
19	Eurasian coot	<i>Fulica atra</i>	Least Concern
20	Eurasian cuckoo	<i>Cuculus canorus</i>	Least Concern
21	Eurasian moorhen	<i>Gallinula chloropus</i>	Least Concern
22	Great White Pelican	<i>Pelecanus onocrotalus</i>	Least Concern
23	Gray Wagtail	<i>Motacilla cinerea</i>	Least Concern
24	Greater Coucal	<i>Centropus sinensis</i>	Least Concern
25	Green Sandpiper	<i>Tringa ochropus</i>	Least Concern
26	Greenish Warbler	<i>Phylloscopus trochiloides</i>	Least Concern
27	Gray Throated Martin	<i>Riparia chinensis</i>	Least Concern
28	Grey Heron	<i>Ardea cinerea</i>	Least Concern



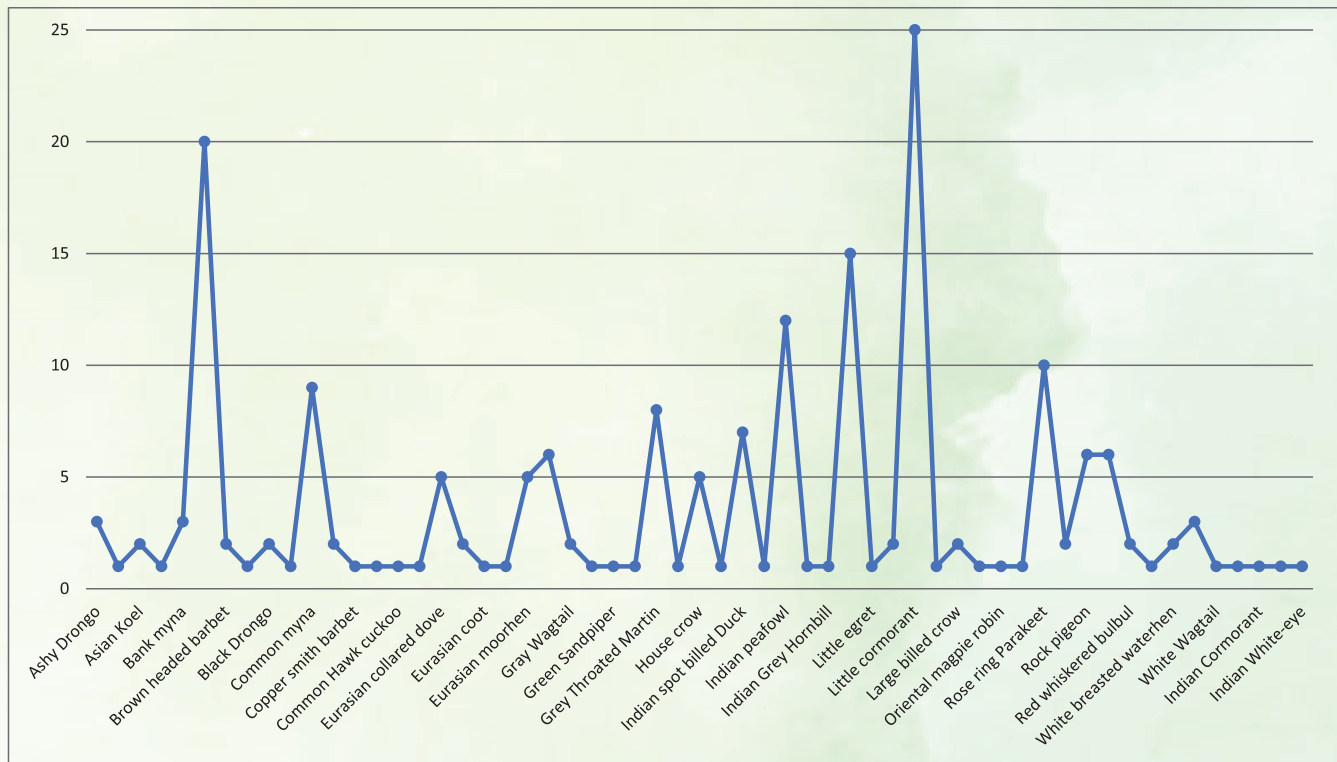
S.No.	Common Name	Scientific Name	Status
29	House crow	<i>Corvus splendens</i>	Least Concern
30	Hume's warbler	<i>Phylloscopus humei</i>	Least Concern
31	Indian spot billed Duck	<i>Anas poecilorhyncha</i>	Least Concern
32	Intermediate egret	<i>Ardea intermedia</i>	Least Concern
33	Indian peafowl	<i>Pavo cristatus</i>	Least Concern
34	Indian Pond Heron	<i>Ardeola grayii</i>	Least Concern
35	Indian Grey Hornbill	<i>Ocyrceros birostris</i>	Least Concern
36	Jungle babbler	<i>Turdoides striata</i>	Least Concern
37	Little egret	<i>Egretta garzetta</i>	Least Concern
38	Little grebe	<i>Tachybaptus ruficollis</i>	Least Concern
39	Little cormorant	<i>Microcarbo niger</i>	Least Concern
40	Laughing Dove	<i>Spilopedlia senegalensis</i>	Least Concern
41	Large billed crow	<i>Corvus macrorhynchos</i>	Least Concern
42	Moorhen	<i>Gallinula chloropus</i>	Least Concern
43	Oriental magpie robin	<i>Copsychus saularis</i>	Least Concern
44	Purple Sunbird	<i>Cinnyris asiaticus</i>	Least Concern
45	Painted stork	<i>Mycteria leucocephalus</i>	Near threatened
46	Rose ring Parakeet	<i>Psittacula krameri</i>	Least Concern
47	Rufous treepie	<i>Dendracitta vagabunda</i>	Least Concern
48	Rock pigeon	<i>Columba livia</i>	Least Concern
49	Red wattled lapwing	<i>Vanellus indicus</i>	Least Concern
50	Red whiskered bulbul	<i>Pycnonotus jocosus</i>	Least Concern
51	Shikra	<i>Accipiter badius</i>	Least Concern
52	White breasted waterhen	<i>Amaurornis phoenicurus</i>	Least Concern
53	White throated kingfisher	<i>Halcyon smyrnensis</i>	Least Concern
54	White Wagtail	<i>Motacilla alba</i>	Least Concern
55	Yellow Footed Green Pigeon	<i>Treron phoenicoptera</i>	Least Concern
56	Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	Least Concern
57	Red Vented Bulbul	<i>Pycnonotus cafer</i>	Least Concern
58	Indian White-eye	<i>Zosterops palpebrosus</i>	Least Concern
59	Red Avadavat	<i>Amandava amandava</i>	Least Concern



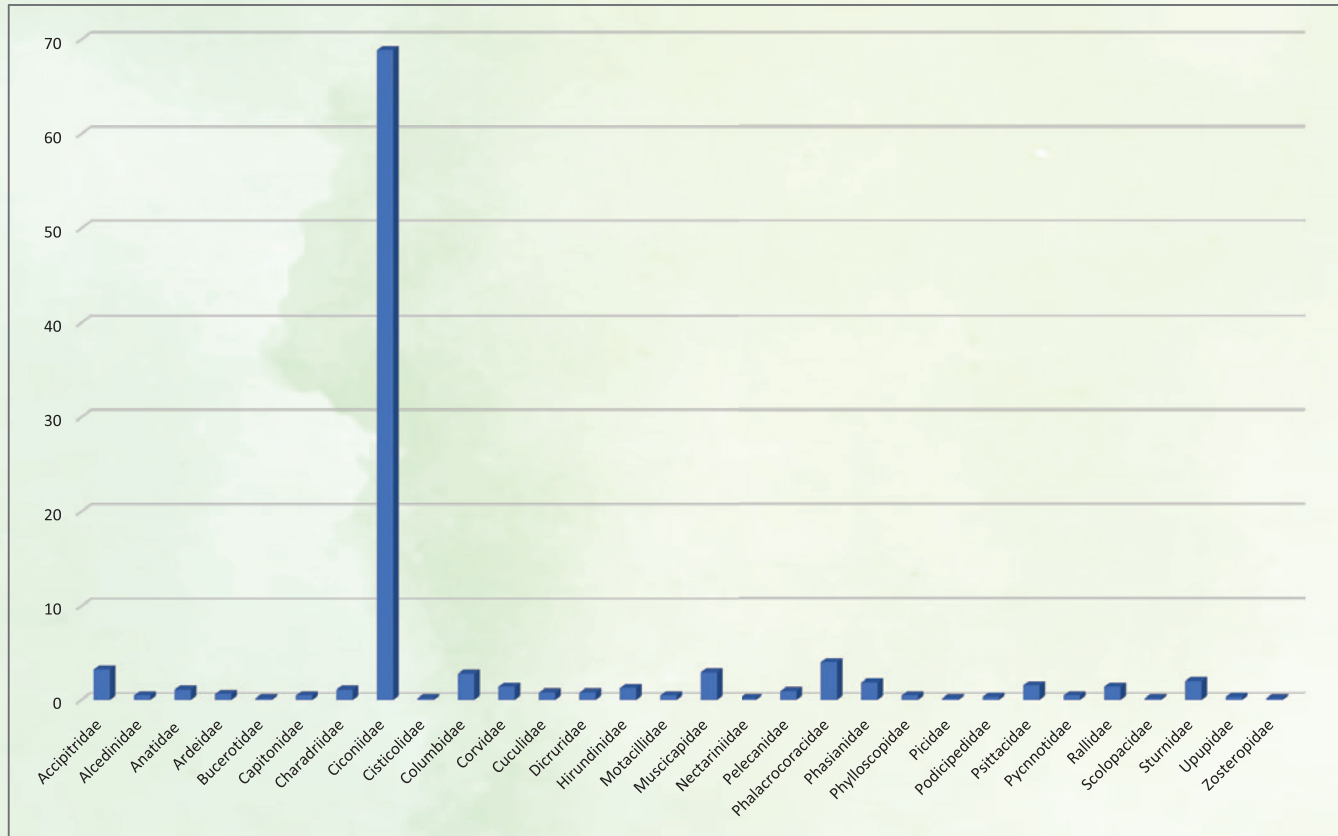


Graph showing Number of different species observed in NZP during the survey



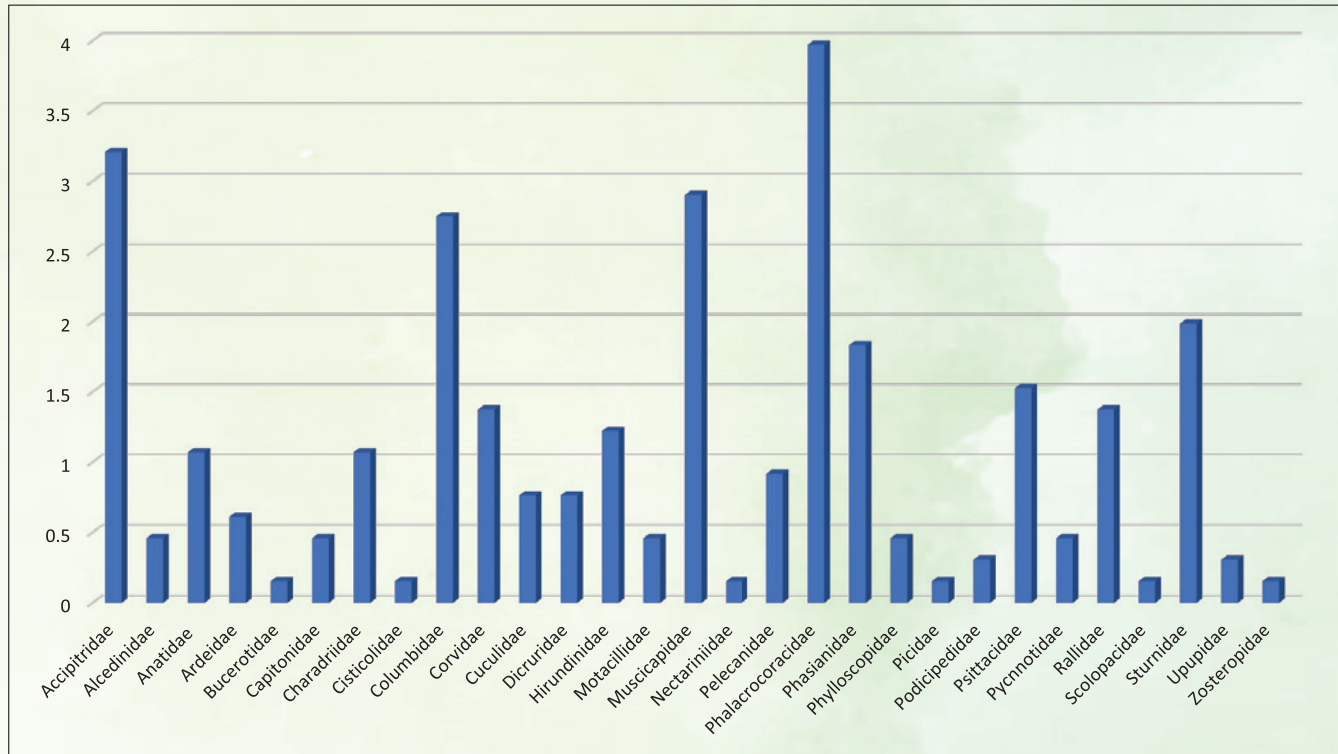


Graph showing Number of different species observed in the Zoo. Painted Stork which are found in very high numbers in the zoo and observed to be 451 during the survey has been excluded from the above graph for comparing the other common species



Graph showing percentage of bird families present in the zoo during the survey.





Percentage of bird families present in the zoo. The highest percentage is of Ciconiidae (Painted Stork) family, which is present in 68.8% is excluded from the above graph to effectively compare the presence of other avian families.





Chapter-6 SPECIAL FEATURES OF NZP



Partial Abino Jungle Babbler (Argya striata)





Kingdom : Animalia
Phylum : Chordata
Class : Aves
Order : Passeriformes
Family : Leiothrichidae
Genus : Argya
Species : striata

Normal Jungle Babbler (Argya striata)

The Jungle babbler (*Turdoides striata*) is a member in the family called "Leiothrichidae". These birds are gregarious in nature that forage in small groups of six to ten birds, a habit that has given them the popular name of "Seven Sisters". Jungle babbler is a common resident bird in most parts of India and are found in large numbers inside National Zoological Park. However, one of the Jungle Babbler among them is partial albino and is observed many times in the zoo premises foraging with other normal Babblers. A genetic mutation which interferes with the production of the melanin pigment results in Albinism. It is an inherited genetic condition that reduces the amount of melanin pigment formed in the body, feathers and eyes of birds. In birds, this alteration causes the absence of color in the feathers and other body parts. Unlike humans, animals without melanin may have other pigments, so they may still have some color. This means that a "true albino" bird may not necessarily be all white, and plumage patterns typical of the species, such as a mask or wingbars, may remain detectable. True albino birds are rare in nature because without protective pigments in the eyes, they may become blind. Also, feathers wear out more quickly without pigments to provide structural support.



Partial albinos are much more common, and most birders eventually see at least a few of these individuals. The term partial albino describes a bird that is paler than normal, or a bird with irregular patches of pure white feathers. There are several different causes of partial albinism, it can be genetic, occur during development, happen as the bird ages, or after injury when new feathers lack pigments and it is a useful general term as it can be impossible to determine why a bird is showing pale plumage without a genetic analysis. Birds with partial albinism may retain plumage patterns typical of the species, such as a mask or wingbars.

Some of the reasons that lead to partial albinism in birds are Hypomelanism, Leucism, age or injury. Hypomelanism is a genetic mutation that causes a partial lack of melanin. A hypomelanistic birds are paler than normal where melanin is expressed in the plumage. Leucism is not a genetic mutation, but rather describes defects in pigment cells that are caused during development. This may result in full leucism, where there is a reduction in all types of pigment. The bird with full leucism will appear paler than normal. Leucistic birds can also show irregular patches of white. This condition is referred to as partial leucism, and the birds displaying it are referred to as “pied” or “piebald” because the development of the eyes occurs separately from other areas of the body, eye color in leucistic bird is not affected and tends to be normal in color. Sometimes with age or after an injury, white patches shall appear on the body. A feather may regrow after an injury and lack pigment. This will give the animal a partial leucistic appearance.





Chapter-7 BIRD CHECKLIST OF NATIONAL ZOOLOGICAL PARK

S.No.	Family	Common Name	Scientific Name
1	Acanthizidae	Grey warbler	<i>Gerygone igata</i>
2	Accipitridae	Black Kite	<i>Milvus migrans</i>
3		Shikra	<i>Accipiter badius</i>
4	Alcedinidae	Common Kingfisher	<i>Alcedo atthis</i>
5		Lesser Pied Kingfisher	<i>Ceryle rudis</i>
6		White-breasted Kingfisher	<i>Halcyon smyrnensis</i>
7	Anatidae	Comb Duck	<i>Sarkidiornis melanotos</i>
8		Common Teal	<i>Anas crecca</i>
9		Paintail Duck	<i>Anas acuta</i>
10		Shoveller	<i>Anas clypeata</i>
11		Spotbilled Duck	<i>Anas poecilorhyncha</i>
12		Whistling-Duck	<i>Dendrocygna javanica</i>
13	Apodidae	Asian palm swift	<i>Cypsiurus balasiensis</i>
14	Ardeidae	Little Egret	<i>Egretta garzetta</i>
15		Large Egret	<i>Casmerodius albus</i>
16		Cattle Egret	<i>Bubulcus ibis</i>
17		Median Egret	<i>Mesophoyx intermedia</i>
18		Indian Pond-heron	<i>Ardeola grayii</i>
19		Grey Heron	<i>Ardea cinerea</i>
20		Night Heron	<i>Nycticorax nycticorax</i>
21	Bucerotidae	Grey Hornbill	<i>Tockus birostris</i>
22	Capitonidae	Blue Throated Barbet	<i>Megalaima asiatica</i>



S.No.	Family	Common Name	Scientific Name
23		Brown Headed barbet	<i>Megalaima zeylanica</i>
24		Coppersmith Barbet	<i>Megalaima haemacephala</i>
25	Charadriidae	Common Sandpiper	<i>Tringa hypoleucos</i>
26		Red-wattled Lapwing	<i>Vanellus indicus</i>
27		Stone Curlew	<i>Burhinus oediconemus</i>
28		Yellow-wattled Lapwing	<i>Vanellus malabaricus</i>
29	Ciconiidae	Black necked Stork	<i>Ephippiorhynchus asiaticus</i>
30		Painted Stork	<i>Mycteria leucocephala</i>
31		White Stork	<i>Ciconia ciconia</i>
32		White necked stork	<i>Ciconia episcopus</i>
33	Cisticolidae	Ashy Prinia	<i>Prinia socialis</i>
34	Columbidae	Blue Rock Pigeon	<i>Columba livia</i>
35		Domestic Pigeon	<i>Columba livia domestica</i>
36		Eurasian collared dove	<i>Streptopelia decaocto</i>
37		Laughing Dove	<i>Spilopedlia senegalensis</i>
38		Indian Ring Dove	<i>Streptopelia decaocto</i>
39		Little Brown Dove	<i>Streptopelia senegalensis</i>
40		Red Turtle Dove	<i>Streptopelia tranquebarica</i>
41		Spotted Dove	<i>Streptopelia chinensis</i>
42		Yellow-legged Green Pigeon	<i>Treron phoenicoptera</i>
43	Coraciidae	Indian Roller	<i>Coracias benghalensis</i>
44	Corvidae	Rufous treepie	<i>Dendrocitta vagabunda</i>
45		House Crow	<i>Corvus splendens</i>
46		Jungle Crow	<i>Corvus macrorhynchos</i>
47	Cuculidae	Asian Koel	<i>Eudynamys scolopacea</i>
48		Greater Coucal	<i>Centropus sinensis</i>
49		Common Hawk Cuckoo	<i>Hierococcyx varius</i>
50		Eurasian Cuckoo	<i>Cuculus canorus</i>
51		Pied – crested cuckoo	<i>Clamator jacobinus</i>



S.No.	Family	Common Name	Scientific Name
52	Dicruridae	Black drongo	<i>Dicrurus macrocercus</i>
53		Ashy Drongo	<i>Dicrurus leucophaeus</i>
54	Hirundinidae	Grey Throated Martin	<i>Riparia chinensis</i>
55	Estrildidae	Scaly -breasted munia	<i>Lonchura punctulata</i>
56		Red Avadavat (Red Munia)	<i>Amandava amandava</i>
57	Hirundinidae	Swallow	<i>Hirundo rustica</i>
58	Laniidae	Bay backed Shrike	<i>Lanius vittatus</i>
59	Meropidae	Green bee-eater	<i>Merops orientalis</i>
60	Motacillidae	Grey Wagtail	<i>Motacilla cinerea</i>
61		Large Pied Wagtail	<i>Motacilla maderaspatensis</i>
62		Yellow headed wagtail	<i>Motacilla citreola</i>
63		White Wagtail	<i>Motacilla alba</i>
64	Muscicapidae	Ashy Wren Warbler	<i>Prinia socialis</i>
65		Blue throat	<i>Erithacus svecicus</i>
66		Common Babbler	<i>Turdoides caudatus</i>
67		Indian Robin	<i>Saxicoloides fulicata</i>
68		Jungle Babbler	<i>Turdoides straita</i>
69		Jungle Bannler (Albino)	<i>Turdoides straita</i>
70		Magpie Robin or Dhyal	<i>Copsychus saularis</i>
71		Streaked Faintail warbler	<i>Cisticola juncidis</i>
72		Tailor Bird	<i>Orthotomus sutorius</i>
73		Black Redstart	<i>Phoenicurus ochruros</i>
74		Yellow – eyed Babbler	<i>Chrysomma sinense</i>
75		Taiga Flycatcher	<i>Ficedula albicilla</i>
76	Nectariniidae	Purple Sun bird	<i>Nectarinia asiatica</i>
77	Oriolidae	Eurasian Golden Oriole	<i>Oriolus oriolus</i>
78	Passeridae	House sparrow	<i>Passer domesticus</i>
79	Pelecanidae	White or Rosy pelican	<i>Pelecanus onocrotalus</i>



S.No.	Family	Common Name	Scientific Name
80	Phalacrocoracidae	Darter or snake bird	<i>Anhinga rufa</i>
81		Indian Cormorant	<i>Phalacrocorax fuscicollis</i>
82		Little Cormorant	<i>Phalacrocorax niger</i>
83	Phasianidae	Grey Partridge	<i>Fracolinus pondicerianus</i>
84		Indian Peafowl	<i>Pavo cristatus</i>
85	Phylloscopidae	Hume's Warbler	<i>Phylloscopus humei</i>
86		Common chiffchaff	<i>Phylloscopus collybita</i>
87		Greenish Warbler	<i>Phylloscopus trochiloides</i>
88	Picidae	Black-rumped flameback	<i>Dinopium benghalense</i>
89		Yellow Fronted Pied Woodpecker	<i>Picooides mahrattensis</i>
90	Ploceidae	Baya Weaver	<i>Ploceus philippinus</i>
91		Red Munia	<i>Estrilda amandava</i>
92		White Throated Munia	<i>Lonchura malabarica</i>
93	Podicipedidae	Little grebe	<i>Tachybaptus ruficollis</i>
94	Psittacidae	Alexandrine Parakeet	<i>Psittacula eupatria</i>
95		Plum headed parakeet	<i>Psittacula cyanocephala</i>
96		Rose Ringed Parakeet	<i>Psittacula krameri</i>
97	Pycnonotidae	Red-vented Bulbul	<i>Pycnonotus cafer</i>
98		Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>
99		White cheeked Bulbul	<i>Pycnonotus cafer</i>
100	Rallidae	Moorhen	<i>Gallinula chloropus</i>
101		Eurasian coot	<i>Fulica atra</i>
102		White-breasted Waterhen	<i>Amaurornis phoenicurus</i>
103	Recurvirostridae	Black-winged stilt	<i>Himantopus himantopus</i>
104	Strigidae	Barn Owl	<i>Tyto alba</i>
105		Jungle owlet	<i>Glaucidium radiatum</i>
106		Spotted Owlet	<i>Athene brama</i>
107	Scolopacidae	Green Sandpiper	<i>Tringa ochropus</i>



S.No.	Family	Common Name	Scientific Name
108	Sturnidae	Bank Myna	<i>Acridotheres ginginianus</i>
109		Brahminy Starling	<i>Sturnus pagodarum</i>
110		Common Myna	<i>Acridotheres tristis</i>
111		Pied Starling	<i>Sturnus contra</i>
112		Rosy Starling	<i>Pastor roseus</i>
113	Threskiornithidae	Black- headed ibis	<i>Threskiornis melanocephalus</i>
114		Red-naped ibis	<i>Pseudibis papillosa</i>
115	Upupidae	Eurasian Hoopoe	<i>Upupa epops</i>
116	Zosteropidae	Indian white eye	<i>Zosterops palpebrosa</i>







PICTURE PLATE: COMMON BIRDS OF NZP



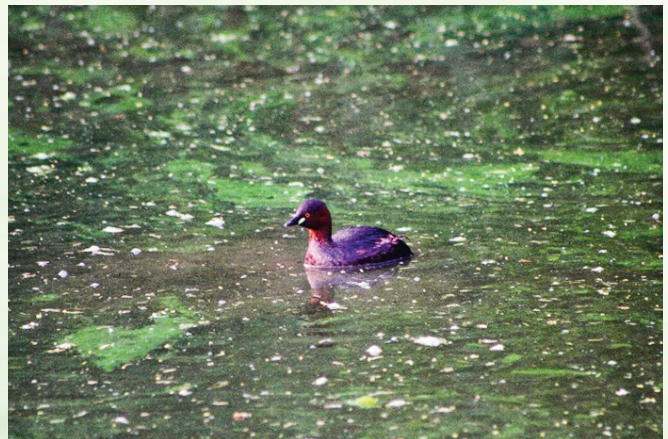
Alexandrine Parakeet (*Psittacula eupatria*)



Rose Ringed Parakeet (*Psittacula kramera*)



Red Wattled Lapwing (*Vanellus indicus*)



Little Grebe (*Tachybaptus ruficollis*)





Eurasian Collared Dove (*Streptopelia decaocto*)



Rufous Treepie (*Dendrocitta vagabunda*)



Asian Koel Female (*Cuculus canorus*)



Pond Heron (*Ardeola grayii*)



Black Redstart (*Phoenicurus ochruros*)



White Wagtail (*Motacilla alba*)



Yellow Footed Green Pigeon (*Treron phoenicoptera*)



Oriental Magpie Robin (*Copsychus saularis*)



Grey Heron (*Ardea cinerea*)



Black Rumped Flameback (*Dinopium benghalense*)



Rock Pigeon (*Columba livia*)



Intermediate Egret (*Mesophoyx intermedia*)



Spotted Owlet (*Athene brama*)



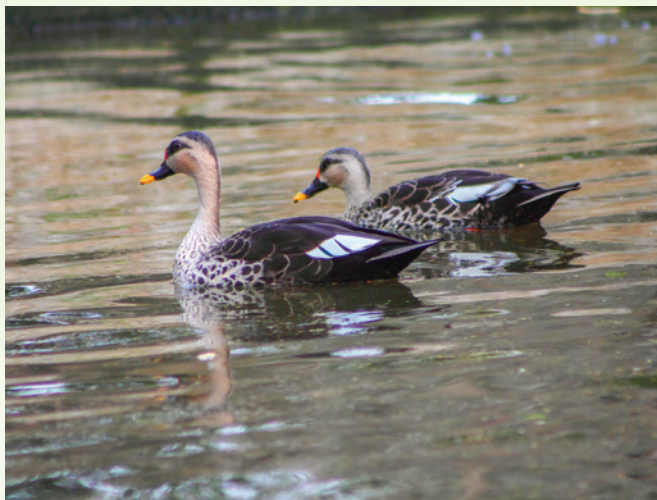
Red Vented Bulbul (*Pycnonotus cafer*)



White Throated Kingfisher (*Halcyon smyrnensis*)



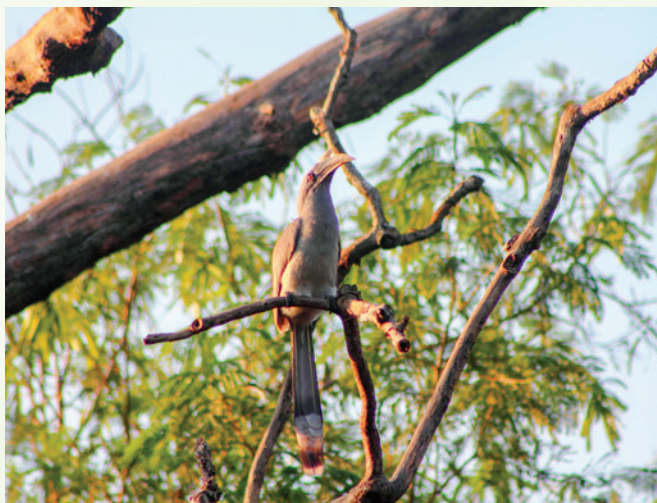
Brown Headed Barbet (*Megalaima zeylanica*)



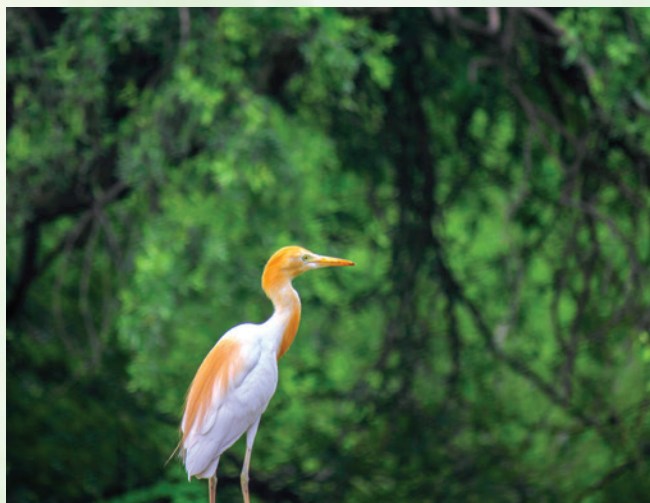
Spot Billed Duck (*Anas poecilorhyncha*)



Brahminy Starlings (*Sturnus pagodarum*)



Indian Grey Hornbill (*Tockus birostris*)



Cattle Egret (*Bubulcus ibis*)



Asian Koel Male (*Cuculus canorus*)



Common Hoopoe (*Upupa epops*)



Black Necked Stork: Juvenile (*Ephippiorhynchus asiaticus*)



Black Headed Ibis (*Threskiornis melanocephalus*)



Common Kingfisher (*Alcedo atthis*)



Eurasian Coot (*Fulica atra*)



Copper Smith Barbet (*Megalaima haemacephala*)



Snake Bird (Darter) (*Anhinga rufa*)



Greater Coucal (*Centropus sinensis*)



Indian Robin (*Saxicoloides fulicata*)



Golden Oriole (*Oriolus oriolus*)



Green Bee-Eater (*Merops orientalis*)





Indian Roller (*Coracias benghalensis*)



Pied Kingfisher (*Ceryle rudis*)



Jungle Owlet (*Glaucidium radiatum*)



Large Grey Babbler (*Turdoides malcolmi*)



Painted Stork (*Mycteria leucocephala*)



Grey Partridge (*Fracolinus pondicerianus*)



Lesser Whistling Duck (*Dendrocygna javanica*)



Eurasian Turtle Dove (*Streptopelia turtur*)



Yellow Wattled Lapwing (*Vanellus malabaricus*)



Rosy Starling (*Pastor roseus*)



Purple Sunbird (*Nectarinia asiatica*)



Red Naped Ibis (*Pseudibis papillosa*)



Stone Curlew (*Burhinus oedicnemus*)



Oriental White Eye (*Zosterops palpebrosus*)



Wolly Necked Stork (*Ciconia episcopus*)



Common Tailorbird (*Orthotomus sutorius*)





Common Moorhen (*Gallinula chloropus*)



Great White Pelican (*Pelecanus onocrotalus*)



Plum Headed Parakeet (*Psittacula cyanocephala*)



Indian Peafowl (*Pavo cristatus*)



Shikra (*Accipiter badius*)



Common Myna (*Acridotheres tristis*)



Chapter-8

LIST OF ZOO FLORA

SNo.	List of Plants	SNo.	List of Plants
1	Black Babool (<i>Acacia nilotica</i>)	2	The Baobab or Monkey Bread Tree (<i>Adansonia digitata</i>)
3	Red Sandal Tree (<i>Adenanthera microsperma</i>)	4	Bael (<i>Aegle marmelos</i>)
5	Queensland Kauri (<i>Agathis robusta</i>)	6	Maharukh (<i>Ailanthus excelsa</i>)
7	East Indian Walnut (<i>Albizia lebbek</i>)	8	Safed Siris (<i>Albizia procera</i>)
9	Chattin or Shaitan Wood (<i>Alstonia scholaris</i>)	10	Kadam (<i>Anthocephalus chinensis</i>)
11	Jack Fruit Tree (<i>Artocarpus heterophyllus</i>)	12	Monkey Jack (<i>Artocarpus lakoocha</i>)
13	Neem (<i>Azadirachta indica</i>)	14	Hijal (<i>Barringtonia actungula</i>)
15	The Purple Bauhinia (<i>Bauhinia purpurea</i>)	16	Kachnar (<i>Bauhinia variegata</i>)
17	Red Silk Cotton (<i>Bombax ceiba</i>)	18	The Paper Mulberry (<i>Broussonetia papyrifera</i>)
19	India Red Pear (<i>Bursera serrata</i>)	20	Flame of Forest (<i>Butea monosperma</i>)
21	Pink-Puff (<i>Calliandra haematocphala</i>)	22	Bottle Brush (<i>Callistemon viminalis</i>)
23	Bengal Current (<i>Carissa congesta</i>)	24	Fish-Tail Palm (<i>Caryota urens</i>)
25	White Sapote (<i>Casimiroa edulis</i>)	26	The Java Cassia (<i>Casia agnes</i>)
27	Indian Laburnum (<i>Cassia fistula</i>)	28	Kassod Tree (<i>Cassia siamea</i>)
29	Scrambled Egg Bush (<i>Cassia surattensis</i>)	30	Beefwood (<i>Casuarina equisetifolia</i>)
31	Kharik (<i>Celtis tetrandra</i>)	32	Floss Silk Tree (<i>Chorisia speciosa</i>)
33	Chittagong Wood (<i>Chukrasia tabularis</i>)	34	Colville's Glory (<i>Colvillea racemosa</i>)
35	Lassora (<i>Cordia dichotoma</i>)	36	Barna (<i>Crateva adansonii</i>)
37	Music Tree (<i>Crescentia alata</i>)	38	Crozier Cycas (<i>Cycas circinalis</i>)
39	Sissoo (<i>Dalbergia sissoo</i>)	40	Peacock- Flower (<i>Delonix regia</i>)
41	Bis Tendu (<i>Diospyros cordiafolia</i>)	42	Gab Persimmon (<i>Diospyros malabarica</i>)
43	The Luck Bean Tree (<i>Drypetes roxburghii</i>)	44	Golden Cane Palm (<i>Dypsis lutescens</i>)



SNo.	List of Plants	SNo.	List of Plants
45	Charmror (<i>Ehretia laevis</i>)	46	Indian Gooseberry (<i>Emblca officinalis</i>)
47	East Indian Rosebay (<i>Ervatamia divericata</i>)	48	Corky Coral Tree (<i>Erythrina suberosa</i>)
49	Forest Red Gum (<i>Eucalyptus tereticornis</i>)	50	Jadi (<i>Ficus amplissima</i>)
51	Banyan Tree (<i>Ficus benghalensis</i>)	52	MakhanKatori (<i>Ficus benghalensis</i>)
53	Benjamin Fig (<i>Ficus benjamina</i>)	54	Anjir (<i>Ficus carica</i>)
55	Assam Rubber Tree (<i>Ficus elastica</i>)	56	Laural Fig (<i>Ficus microcarpa</i>)
57	Fig (<i>Ficus palmata</i>)	58	Gular (<i>Ficus racemosa</i>)
59	Pipal (<i>Ficus religiosa</i>)	60	Pilkhan (<i>Ficus virens</i>)
61	Quick Stick (<i>Gliricidia sapium</i>)	62	Silver Oak (<i>Grevillea robusta</i>)
63	Kat Saguan (<i>Haplophragma adenophyllum</i>)	64	Papri (<i>Holoptelia integrifolia</i>)
65	Jacranda (<i>Jacranda mimosaeifolia</i>)	66	Cucumber Tree (<i>Kigelia Africana</i>)
67	Golden Rain Tree (<i>Koelreuteria paniculata</i>)	68	Indian Lilac (<i>Lagerstroemia indica</i>)
69	Jarul (<i>Lagerstoremia reginae</i>)	70	Horse Tamarind (<i>Leucaena leucocephala</i>)
71	Chinese Fan Palm (<i>Livistona chinesis</i>)	72	Mahua (<i>Madhuca longifolia</i>)
73	Laurel Magnolia (<i>Magnolia grandiflora</i>)	74	Aam (<i>Mangifera indica</i>)
75	Khirmi (<i>Manilkara hexandra</i>)	76	Persian Lilac (<i>Melia azedarach</i>)
77	Moulmein Rosewood (<i>Milletia peguensis</i>)	78	Bullet Wood (<i>Mimusops elengi</i>)
79	Kadam (<i>Mitragyna parvifolia</i>)	80	Drum Stick Tree (<i>Moringa oleifera</i>)
81	Aino Mulberry (<i>Morus australis</i>)	82	Kamini (<i>Murraya paniculata</i>)
83	Kaner (<i>Nerium oleander</i>)	84	Coral Jasmine (<i>Nyctanthes arbor-tristis</i>)
85	Golden Champak (<i>Ochna obtusata</i>)	86	African Weeping Wattle (<i>Peltophorum africanum</i>)
87	Cliff Date Palm (<i>Phoenix rupicola</i>)	88	Wild Date Palm (<i>Phoenix sylvestris</i>)
89	Himalayan Long Needle Pine (<i>Pinus roxburghii</i>)	90	Madras Thorn (<i>Pithocellobium dulce</i>)
91	White/Cuban Fangipani (<i>Plumeria obtusa</i>)	92	Red Plumeria (<i>Plumeria rubra</i>)
93	Mast or Cemetery Tree (<i>Polyalthia longifolia</i>)	94	Karanja (<i>Pongamia pinnata</i>)



SNo.	List of Plants	SNo.	List of Plants
95	Khejri (<i>Prosopis cineraria</i>)	96	Vilayati Babul (<i>Prosopis juliflora</i>)
97	Peach (<i>Prunus persica</i>)	98	Guava (<i>Psidium guajava</i>)
99	Kanak Champa (<i>Pterospermuma cerifolium</i>)	100	Buddha'a Coconut (<i>Pterygota alata</i>)
101	Anar (<i>Punica granatum</i>)	102	Royal Palm (<i>Roystonea regia</i>)
103	Indian Willow (<i>Salix tetrasperma</i>)	104	Chandan (<i>Santalum album</i>)
105	Kusum (<i>Schelichera oleosa</i>)	106	Sita Asoka (<i>Sarca asoca</i>)
107	Mahogany (<i>Switenia maogani</i>)	108	Jamun (<i>Syzygium cumini</i>)
109	Trumpet Tree (<i>Tabebuia argentea</i>)	110	Pink Trumpet Tree (<i>Tabebuia avellanedae</i>)
111	Imli (<i>Tamarindus indica</i>)	112	Montezuma Bald Cypress (<i>Taxodium mucronatum</i>)
113	Yellow Bel (<i>Tecoma stans</i>)	114	Teak of Marwar (<i>Tecomella undulata</i>)
115	Teak (<i>Tectona grandis</i>)	116	Arjuna (<i>Terminalia arjuna</i>)
117	Bahera (<i>Terminalia bellirica</i>)	118	Pili Kaner (<i>Thevetia peruviana</i>)
119	Ber (<i>Ziziphus mauritiana</i>)	120	Spiny Bamboo (<i>Bambusa bambos</i>)
121	Hedge Bamboo (<i>Bambusa multiplex</i>)	122	Giant Bamboo (<i>Dendroclamcus giganteus</i>)
123	Lathi Bans (<i>Dendroclamcus strictus</i>)		





BIBLIOGRAPHY

Ali and Ripley (1983). Handbook of the Birds of India and Pakistan. Oxford University Press Oxford, New York. p.93-94.

Anonymous, (1986). History of National Zoological Park

Birdlife International, (2001). Threatened Birds of Asia: The Birdlife International Red Data Book. Birdlife International, Cambridge.

Desai, J.H. (1971). Feeding ecology and nesting of Painted storks *Ibis leucocephalus* at Delhi Zoo. International Zoo Yearbook 11: 208-215.

Frederick, P. C. and M. W. Collopy. (1989). Nesting success of five Ciconiiform species in relation to water conditions in the Florida Everglades. Auk 106: 625-634.

Ganguli, U. (1975). A guide to the birds of Delhi area, New Delhi: Indian Council of Agricultural Research.

Grimmett, R., Inskipp, C, Inskipp, T. (2011). Birds of Indian Subcontinent, Oxford University Press, Second Edition.

Meganathan, T., Urfi, A.J. (2009) Inter-colony Variations in Nesting Ecology of Painted Stork (*Mycteria leucocephala*) in the Delhi Zoo (North India), Waterbirds: The International Journal of Waterbird Biology, Vol. 32, No. 2, pp. 352-356

Salim, A, (1979). The book of Indian Birds, Oxford University Press, Eleventh Edition.

Singh, D.N, Bisht, N.S. (2009). Animals of the National Zoological Park.

Singh, D.N., Naithani, H.B., Bisht, N.S., Kumar R.(2008). Trees of National Zoological Park.

Pandey, R.K., Vashisth, N.S., Vashisth, S., Bhawal, A., Kumar, M. and Tripathi, S. (2020). Enrichment efforts for captive animals. National Zoological Park.

Tiwary, N. K., Sharma, B. B., & Urfi, A. J., (2014). Two new nesting colonies of Painted Stork (*Mycteria leucocephala*) from northern India. *Indian BIRDS* 9 (4): 85–88.

Urfi, A.J. (1993). Breeding patterns of Painted Stork (*Mycteria leucocephala* Pennant) at Delhi zoo, India. *Waterbird Society*. Vol. 16: 95-97.

Urfi, A. J. (1993). The birdlife of Okhla. *Sanctuary*, 13: 50-53.

Urfi,A.J. (1997).The significance of Delhi Zoo for wild waterbirds with special reference to the painted stork, *Mycteria leucocephala*. *Forktail*, 12;87-97.

Urfi,A.J. (2006). Biodiversity in an urban landscape. A case study of some Important Bird Areas on the River Yamuna in Delhi, India.

Urfi,A . J. and A. Kalam. (2006). Sexual Size Dimorphism and Mating Pattern in the Painted Stork (*Mycteria leucocephala*). *Waterbirds*2 9: 489-496.

Urfi,A.J. Meganathan, T. and Kalam (2007). Nesting ecology of the painted stork, *Mycteria leucocephala* at Sultanpur National Park, Harayana, India. *Forktail*, 23: p.150-153.

Urfi, A. J. (2011). *The Painted Stork: ecology and conservation*. Springer, New York, New York.

Warman, C.K. (1983). *Plants of National Zoological Park*.



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