



**BASELINE INFORMATION  
ON NATIVE FAUNA OF PUNE**

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## **FAUNA OF PUNE**

### **1. Introduction:**

The fauna of Pune shows species diversity and richness this is because of the fact that the city has diversified natural habitats such as forests, plantations, grassland, water bodies and wetlands and public garden established many decades ago. Over the years there has been a change in the native fauna of Pune because of urbanization and introduction of exotic species. Development of the city has resulted in the habitat loss and posed a threat on the faunal community. The current faunal diversity of urban Pune is as given below.

**Table 1 : Fauna richness in Pune**

GROUP	UNIT	Pune
Aquatic insects	Family	13
Snails	Species	15
Ants	Genus	12
Butterflies	Species	105
Fishes	Species	110
Amphibians	Species	14
Reptiles	Species	52
Birds	Species	332
Mammals	Species	65

### **2. Relevance to eco-housing**

Construction that provides habitat for human beings tends to destroy the habitat of the fauna of the region. A truly eco-friendly housing has to try to find a balance between sustaining both the faunal habitats and the human habitats. One method commonly adopted is to conserve separate areas as reserve areas for fauna and develop other areas for human habitation. Another method could be to merge the two areas by developing small pockets of conducive faunal habitats within the urban areas. To do this one needs to have an understanding of the native faunal diversity of Pune.

Following is information based on a report 'MILLENNIUM BIODIVERSITY DIRECTORY OF PUNE CITY' published by the Ecological Society of Pune in its monthly Journals in 2000. The report was compiled based on research of various expert naturalists in Pune. This information is also available on the website at – [www.ranwa.org](http://www.ranwa.org).

### **3. Fauna**

#### **3.1 Aquatic insects and molluscs**

The aquatic insects and molluscs were studied from Mula, Mutha, and Pavana rivers as well as Pashan lake, Bhugaon lake, and Taljai. Molluscs of 15 species belonging to 10 genera and aquatic insects belonging to 13 families from nine orders were recorded from various localities. The dominant group of aquatic insects were those that prefer polluted water, marshy area and water-body with vegetation cover respectively. Some other species were found to be quite common in relatively unpolluted water-bodies and parts of rivers. In the molluscs, *viviparidae*, *lymnaeidae* and *thiaroidae* were found dominant. Among *thiaroidae*, *Thiara scabra* and *Paludonus inflatus*, and *Gyrulus labiatus* from *planorbidae* were very rare. Aquatic insects and molluscs are highly sensitive to water quality. Certain groups of aquatic insects and molluscs prefer unpolluted water while the other prefer the polluted water. Heavily polluted water-bodies include Mutha river near Warje, Mula-Mutha river near Kawadi, Pavana river near Chinchwad, Pashan lake and Taljai. Less polluted water-bodies include Pavana river near Punavale, Bhugaon lake, Khadakwasla dam. The study indicates that certain groups of aquatic macro-invertebrates are highly specific for their microhabitats, as substrate type influences the distribution of most of the forms of aquatic insects and molluscs. The distribution of various forms of aquatic macro-invertebrates is highly diverse at various localities because of increasing pollution, human interference and habitat loss. The presence of *chironomid* larvae in most of the localities indicates that the rivers and water-bodies are polluted. Habitat loss is also affecting presence of many forms. Few years ago, in Kothrud region, where in the ditches some forms of aquatic macro-invertebrates were prevailing, due to urbanization, their habitats are lost. Many roles performed by macro-invertebrates in aquatic ecosystem underscores the importance of their conservation. Macro-invertebrates have served as valuable indicators of degradation of aquatic ecosystem, and as increasing demands are placed on our water resources, their value in assessments of these impacts is necessary (Wallace and Webster, 1996).

*Experts: Rupesh Raut, Shruti Desai & Rohini Bapat.*

### **3.2 Ants**

Ants deserve a special place in the study of ecology, including behaviour; given their species richness, social habits and high densities contributing much of the animal biomass on earth. The habitats used for sampling included forests, scrub and grasslands in the wilderness zone while tree plantations, agriculture and human habitations in the zone with pronounced human influence. Ant sampling yielded 12 genera belonging to four sub-families. The Table indicates that tree plantations are most diverse, while the rest harbour about half the generic richness, with habitations equaling the agriculture and grasslands. Thus, residential area alongside tree plantations is richest in ant fauna, as evident from the fact that eleven out of total thirteen genera were collected in Kothrud, where tree clad housing colonies are fringed by erstwhile scrub, grassland and agricultural area, including remnant groves of fruit trees like Mango. Thus, mosaic of habitats here harbours nearly twice the diversity as compared to even areas with low human impact such as Bhamburda and Pachgaon hill forests or banks of Pashan lake. Few genera are confined to few localities or habitat types, such as *Pheidole* and *Cryptopone* recorded only from hill forests and thus more vulnerable. *Myrmecaria*, the biting, small, red ants are most commonly seen everywhere, even foraging in houses and gardens. *Tapinoma* and *Catalaucas* are also found right up to the kitchen. *Leptogenys* ants are seen foraging in gardens and plantations.

**Table 2: Habitat-wise Genus Richness sampled at Pune**

<b>Habitat type</b>	<b>Pune</b>
Forest/Scrub	5
Tree Plantation	8
Grassland	4
Agriculture	4
Human Habitation	4
TOTAL	12

*Experts: Tejaswini Pachpor & Yogita Ghodke*

### **3.3 Butterfly**

Pune district may harbour about 170 species, of which 103 are so far reported from Pune urban area within 20 km radius remaining are mostly forest dwellers. The habitat specialists include predominantly forest dwellers like the Bushbrown, few species of Yellows and Flats. The habitat generalists include Common Rose, Lime Butterfly, species of Grass Blues etc. found in variety of habitat types. Butterflies in all habitats have distinct flight periods. Almost all butterflies have very short seasonal peaks, and they are either absent or rare in other seasons. However, their interesting patterns probably reflect phenophases of their host plants. Some species occur throughout the year with a short population peak in a specific season, and some species occur only for a few months. Certain hillocks in Pune are grazed by migratory herds of sheep and resident livestock while some are annually burned in uncontrolled and artificial fires. Intense grazing seriously alters composition of ground flora in grasslands. Cattle uproot grasses while feeding on them, and therefore decrease their densities promote unpalatable herbs. Nearly half the species are recorded in the township, including various kinds of plantations of trees and shrubs like home gardens, public gardens, avenues etc. However, all of them may not survive if the natural vegetation like forest and grasslands surrounding the city vanish. Some of the species seen around human habitation have their food plants. Together, a fifth of the species are recorded primarily from such wilderness, rarely encountered in the city. These are thus most vulnerable to any further destruction of wilderness areas. This can be minimised by promoting these food plants, whether herbs or climbers, rather than planting exotic trees. Controlling hill fires is also a requisite for protection of forest dwellers. *See detailed list in Annexure 1*

**Table 3: Habitat type wise species richness of butterflies**

Habitat	No. of total species	No. of Unique Species
Forest (F)	68	11
Scrub (S)	76	2
Grassland (G)	38	0
Plantations (P)	57	2
Agriculture (A)	69	0
Wild (F, S, G)	80	20
Impacted (P, A)	70	0

*Experts: Krushnamegh Kunte*

### 3.4 Fish

Pune has water bodies such as Mula and Mutha River and three lakes - Katraj lake, Pashan lake, and Lakaki lake where a total of 110 fish species were found. The two major rivers of Pune City, Mula and Mutha, are highly polluted owing to organic and inorganic waste. Mula River flows through an industrial zone and hence inorganic salts and heavy metals from the industrial wastes contaminate the water. This has probably resulted in absence of all fish species except *Oreochromis mossambica* near Khadki. Organic pollution has triggered spread of water hyacinth plants covering water surface in many places. While Katraj lake is polluted mainly by domestic sewage, industrial effluents pollute Pashan lake. While this has affected most fish negatively, populations of few species such as *Heteropneustus fossilis* that can withstand organic pollution due to its breathing ability are even increasing. The introduction of commercially important fish such as *Cyprinus carpio communis*, *Oreochromis mossambica* have probably driven away fishes such as *Labeo fimbriatus*. Population decline of *Aplocheilus liniatus* feeding on larvae may be attributed to resource competition with introduced exotic larvivorous fishes of the family *Poecillidae*. Despite of new geographical records, the fish population is on decline of over third of the recorded species, another sixth having become locally extinct. Impending fish erosion cannot be minimised without halting siltation and promote optimal, rather than maximal harvests; and exploring checks on growth of exotic species. *See detailed list in Annexure 2*

Experts: S.S. Kharat & Neelesh Dahanukar.

Large building complexes that plan to have a water body in the form of ponds or streams can attempt to preserve some of these native fish species, instead of introducing exotic fish species. Some fish species that can be specifically recommended for aquatic bodies are:

	Family	Species
1.	Notopteridae	<i>N. notopterus</i> (Pallas)
2.	Cyprinidae	<i>P. sophore</i> (Hamilton – Buchanan)
3.	Cyprinidae	<i>P. ticto ticto</i> (Hamilton – Buchanan)
4.	Cyprinidae	<i>Danio aequipinnatus</i> (McClelland)
5.	Cyprinidae	<i>D. devario</i> (Hamilton – Buchanan)
6.	Cyprinidae	<i>D. malabaricus</i> (Jerdon)
7.	Balitoridae	<i>N. denisoni denisoni</i> (Day)
8.	Aplocheilidae	<i>Aplocheilus lineatus</i> (Valenciennes)
9.	Aplocheilidae	<i>A. panchax</i> (Hamilton – Buchanan)

Expert: Mukul Mahabaleshwarkar

### **3.5 Amphibians**

Amphibians are probably the best indicators of environmental health of all vertebrates being extremely sensitive to temperature and humidity (Daniels, 1991). Their easily permeable skin makes them susceptible to environmental changes, including pollution. They are also sedentary, unlike birds that have strong dispersal ability. Thus, any change in amphibian population alarms conservationists the most. A record of 13 amphibian species from Pune City. Nine of these today occur only outside the city while four of them are recorded only beyond 20 km from city centre. Five species could not be presently retraced in localities or elsewhere and may be locally extinct. These include *Rana hexadactyla*, *Bufo stomaticus*, *B. parietalis*, *B. microtypanum* and *Philatus bombayensis*. Much of the amphibian decline can be attributed to the habitat loss due to rampant urbanisation, accompanied by quarrying and slums developed on the hill slopes. Over two third of the past habitat area of amphibians is now encroached. Recent Industrial estate in Pirangut has reduced the *Tomopterna* and *Rana malabarica* populations that were aplenty earlier, the latter being nearly wiped out due to loss of paddy fields, a major breeding ground. Resultant loss of scrub, grasslands, paddy fields compaction and modification of the soil has ceased the formation of rainwater pools that are critical to amphibian sustenance. The important breeding grounds along the riverbed within the city should remain untouched by any human activities. Fortunately, few low impact areas like scrub and grasslands within military campus such as NDA still offer some peace to amphibians despite the ever-increasing human pressures. Protection of the habitats especially breeding sites free from human interference is necessary. *See detailed list in Annexure 3*

*Experts: A. D. Padhye & Mukul Mahabaleshwarkar*

### **3.6 Reptiles**

A total of 52 reptilian species have been reported from the Pune area, about two third of which are snakes. There has been increase in the number of species. The high diversity at Pune can be primarily attributed to its mantle of rivers and hill chains. Mula-Mutha riverbed is an excellent foraging ground for snakes due to abundance of prey species such as rodents and frogs. However, much of this fertile breeding ground is lost due to channel walls and ongoing road along the riverbed, demolishing also crab holes that shelter snakes. Similarly, encroachment of grassland and barren lands i.e. so called wasteland along city fringes by urbanisation has affected species such as Saw scaled viper. Habitat loss includes deforestation that especially affects tree dwelling species such as Bamboo pit viper, Cat and Vine snakes. However, habitat of grassland dwellers like Racer snakes is lost due to monoculture plantations around Pune, especially on hillocks. Saw scaled vipers are susceptible to rock excavation along hills, while soil extraction from riverbed and banks affects shield tail and worm snakes. Keelback snakes seem susceptible to chemical water pollution. Fertiliser and pesticidal effluents from agriculture affect the breeding of most species therein while domestic chemical sprays threaten house geckos. Killing out of superstitions affects Chameleon the most. Turtle and Monitor lizard are hunted for consumption as food and for medicinal purpose. If proper measures are not taken then there will be possibility of reptile population declining. Possible corrective measures include encouraging restoration of not just hill forests but also grasslands and rocky areas from fringe villages as well as the restoring the riverbed ecology, besides public awareness to minimise the fear-borne killing. *See detailed list in Annexure 4*



**Table 4 - Reptile species richness across habitat types**

<b>Habitat Type</b>	<b>No. of Total Species</b>	<b>No. of Unique Species</b>
Forest	30	7
Scrub	20	1
Grassland	20	-
Plantation	24	-
Agriculture	22	-
Housing	8	1
Low impact zone (Forest, Scrub, Grassland)	41	11
Impacted zone (Plantation, Agriculture, Habitation)	28	2

*Experts: Sanjay Thakur*

### **3.7 Avifauna**

Pune has 332 species of birds. There are six major habitat types that include Forest (F), Scrub (S), Grassland (G), Tree plantation (P) including garden, orchards and avenues, Houses (H), Agriculture (A) and Waterbodies (W). The first three habitat types (F, S, G) comprise the wilderness zones with low human impacts while the next three (P, H, A) comprise the impacted zone on land. About a third of the species are water birds, primarily winter migratory. Blackwinged stilt are most abundant in polluted water where hardly any other species survive; few species such as sparrow, crow and common myna are preferential of human habitations. Less than a tenth of the total species inhabit human habitations while over 90% of the total species inhabit the wilderness zone. This emphasizes why hill forests, grasslands and water bodies are essential to maintain over a third of the urban avifauna. Four habitat types viz. Hill forest and scrub, tree plantations and water bodies together support most of the urban avifauna. Well-wooded compounds with large, tall trees are popular roosting sites for communal birds like Crows, Mynas, Herons and Egrets, Parakeets and Kites. House Crows, House Sparrows, Common Mynas, Roseringed Parakeets and Cattle Egrets go out of the city in the morning and return by evening. Their daily commuting routes more or less coincide with the river courses and the hill ranges. Commoner species such as House Sparrows and Crows are showing declining trend particularly in the last five years. The proportion of Jungle Crow to House Crow has increased. The Redwhiskered Bulbul, once considered to be uncommon within the city has now started replacing the Redvented Bulbul as around Bibwewadi and Sinhadgad road this due to loss of treecover on the city outskirts. Little Brown Dove also seems to be declining. The removal of age-old Banyan and other fig trees from Pune-Paud road, Pune-Panshet road, Pune-Satara-Bangalore Highway and University road is probably preventing the Common Green Pigeon from visiting the area. The waders along rivers, streams and lakes have declined significantly. However, there may not be much change in the population of Egrets and common Ducks. The Little Cormorant, considered to be an uncommon bird in the past, has now become numerous especially along the rivers Mula-Mutha. The Blackwinged Stilt has also become numerous, especially around those spots, where sewage water enters the river. Pied Kingfisher has also declined in number, particularly along the much polluted stretch of the Mula-Mutha, where turbid water prevents it from fishing. Non-insectivorous species of grassland and cultivations have not declined compared to the insectivorous species. Species such as Magpie-Robin, Iora, Sunbirds, Tailorbird, Redvented Bulbul, which are indirectly associated with urban habitats have not been affected. Owls as a whole except the Spotted Owlet are showing a declining trend. *See detailed list in Annexure 5*

*Experts: S. Ingalhallikar, R. Purandare, S. Nalavade & S. Dhole.*

**Table 5 - Species Diversity and Exclusivity Distribution across habitat types**

Species	Total	Unique
Agriculture (A)	100	1
Forest (F)	125	40
Scrub (S)	140	10
Grassland (G)	55	2
Habitations (H)	30	2
Plantations (P)	80	-
Waterbodies (W)	105	80
Wilderness (FGSWu)	300	180
Impacted zone (AHPWp)	105	10

Wu- un/less-impacted Waterbodies Wp- polluted waterbodies

Some of the avifauna species that are well adapted to human habitation can be attracted by developing conducive urban niches. There are two types of these birds as follows:

a) Birds nesting inside/ on / over human habitations (buildings/ houses etc.)

- i. House Sparrow
- ii. Blue Rock Pigeon
- iii. Roseringed Parakeet
- iv. Common Myna
- v. Jungle Myna
- vi. Dusky Crag Martin
- vii. House Swift
- viii. Barn Swallow
- ix. Cliff Swallow
- x. Brahminy Myna
- xi. Spotted Owlet
- xii. Barn Owl
- xiii. Indian Robin
- xiv. Magpie Robin

b) Birds nesting/ resting in shrubs / bushes / trees in backyards

- i. Tailor bird
- ii. Ashy Wren Warbler
- iii. Redvented Bulbul
- iv. Redwhiskered Bulbul
- v. Munia species
- vi. Coppersmith Barbet
- vii. Little brown Dove
- viii. Koel (in crow's nest)
- ix. Common House Crow
- x. Jungle Crow

- xi. Crow Pheasant
- xii. Large Grey Babbler
- xiii. Iora
- xiv. White eye
- xv. Flowerpeckers (2 species)
- xvi. Grey Tit
- xvii. Sunbirds (2 species)

Developing urban niches that can attract these birds can prevent a decline in their population and help to conserve the biodiversity of Pune.

### **3.8      Mammals**

Pune urban area hosts 65 species of mammals, ranking highest amongst India metropolis. Despite the extinction of few species and general population decline or retreat, rodents, particularly rats and mice appear flourishing. Squirrels can be spotted aplenty during the day, unlike most other species. Fruit bats have benefited most due to urbanisation, where home gardens bear many fruit trees. Besides carnivores, herbivores inhabiting hills but foraging on crops in the plains are main sufferers hill deforestation. Until two decades ago, thickets along the Katraj and Pashan lake were the favourite haunt of Jungle Cat that has disappeared today, as housing colonies have enveloped the lake. The wild boar has shifted to a less impacted Shivganga basin across the Katraj hills. Besides habitat loss urbanisation has also resulted habitat degradation or disturbance. The dense network of overhead electric wires poles and transformers in the city has become hazardous for some mammals. Flying foxes are the most vulnerable. Wild boar is the most heavily persecuted animal, having been shot, poisoned and even bombed decreasing its number to 8-10 individuals two decades ago. *See detailed list in Annexure 6*

*Expert: S. Nalavade.*

**Table 6 - Mammal Species Richness of Pune habitats**

Habitat Type	No. of Total Species	% of Unique Species
Forest	38	30
Scrub	20	10
Grassland	10	6
Plantation	12	-
Agriculture	22	-
Habitation	15	6
Low impact zone (Forest, Scrub, Grassland)	42	30
Impacted zone (Plantation, Agriculture, Habitation)	36	6

Some of these mammals as listed below, are usually associated with human habitations and should be encouraged by creating conducive environments.

- i. Striped Squirrels (2 species)
- ii. Grey Musk Shrew
- iii. Insectivorous Bats (many species) in ledges and crevices
- iv. Fruit Bats (3 species)- in trees
- v. Common Mongoose

#### 4. Need for creating ‘urban niches’

Since man has been clearing land to build cities, towns, and farms, a great deal of native flora and fauna has been altered or destroyed. Many of the native species of fauna that once thrived in certain areas have had to find other places to live or they eventually disappeared. Not all species have been affected in a negative way. Species of wildlife that are highly adaptable, have benefited from the habitat alteration that have taken place in developed areas. Some species are not so adaptable to man's habitat alteration, and have suffered severe declines in their numbers. There are many species of wildlife, especially birds that can thrive in urban and suburban areas, but need a little help.

Many residential areas have a great deal of potential for restoring or enhancing wildlife habitat. Creating small pockets of urban niches – environments conducive for fauna can help to conserve the biodiversity of the area. These would be cultivated habitats that provide certain adaptable fauna with conducive environments. Creating and maintaining such urban niches would not only help the native fauna of the areas but also provide children with an opportunity to see butterflies, birds and other fauna in their backyard, than having to travel outside the urban limits to see them.

##### 4.1 Creating ‘urban niches’ for flora and fauna in residential complexes:

With the aim of conserving or recreating a pocket of natural habitat on the site, the first step has to be done before any site activity is initiated. A baseline ecological inventory of the site should be undertaken to identify the following:

**a. Different environments:** It is often useful to record existing habitat diversity and associated flora and fauna. Record those areas that receive sunshine and shade during the day. Record the various environmental gradients such as temperature, moisture, wind etc. Also, the areas that are wet most of the time and those that are dry. This provides valuable information about which types of trees and shrubs would be best to plant in each area, and about the kinds of animals that they are likely to be able to attract.

**b. Existing vegetation:** Record the trees, shrubs, flowers, grasses and other plants naturally occurring on the site

**c. Existing wildlife:** Record fauna species seen and the time of observation. Record information such as whether certain areas are more populated than others and the type of plant animal association seen.

Develop a comprehensive plan to conserve as much as feasible. *Refer to measures given in biodiversity conservation for measures to be taken to conserve the biodiversity.*

##### 4.2 Planning for developing conducive environment:

The next step is to plan for developing such urban niche. Faunal species prefer areas undisturbed by humans, thus these pockets of natural habitats should be planned in secluded corners of the site. The spots should be developed such that it is not easily accessible and can grow on its own. Another important factor to be considered is that urban niches can not be developed in isolation, they need to be connected in some nature to surrounding natural habitat areas. Thus during the site planning process, consideration should be given to demarcate areas near existing natural areas.

A good niche should provide food, water, cover, and nesting area. Hence developing a urban niche that will provide the animals with all the basic facilities will make sure that they do not move away in search of any.

**a. Plants:**

Plants provide food for insects, birds, mammals etc. the more diverse the vegetation, the more diverse the animal population will be. Select plants that bear fruit at different times of the year so that food is available throughout the season. Native plant species are more preferred over the exotic species. In addition to the wildlife benefits, native plants are well adapted to the local climate, soil and water conditions and hence they require very little maintenance. Planting native trees and shrubs will also help restore some of the habitat that was destroyed when the area was developed. Restoring the natural habitat, will attract some of the native species of wildlife that have had to look elsewhere for their food, water, and shelter. The trees and shrubs provide shelter for the animals for resting, escaping into when alarmed, protection from severe weather and nesting sites. Creating small thickets of 3-5 trees and 3-6 shrubs provide a better habitat. Different animals favor different plants. Bees prefer flowers that produce a peculiar fruity smell of the nectar. Butterflies like bright coloured flowers mostly red and yellow. They also prefer puddles because of the dissolved nutrients. The nutrients gained from the puddles also help in producing pheromone; the chemical, which is a sexual attractant, released by the males to attract the females. Moths feed at night and are therefore attracted to white or pale coloured flowers that have a strong, sweet smell. Birds also prefer red and other bright coloured flowers. The plants should provide them with food, cover and nesting area. The birds favor trees and shrubs with multistem and forming thick canopy. Fruit trees such as *Ficus racemosa* (Umbar), *Terminalia catapa* (Wild almond) etc attract birds as they provide food. Insects such as wasps, flies bees and even mammal such as bat prefer bell shaped flowers, while brush and tube shaped flowers are preferred by bees, moths, butterflies and birds for sucking nectar. Although many of the exotic, ornamental shrubs that are frequently used for landscaping will provide some benefit to native species of wildlife, they are not highly recommended. Many of the ornamentals do not produce food for wildlife, nor do they serve as host for the invertebrates that many birds feed on. Sometimes artificial source of food can also be provided in the garden to attract certain species. Artificial feeder such as grain tub attract many birds.

**b. Water:**

Water is one of the main requirements for survival. If water is not available in the complex where they feed and nest, the creatures will go where it can be found. Water bodies such as pools, ponds, water puddles, water pots, birdbath and fountains are thus an important component of the garden. These water bodies will also help in maximizing diversity. The aquatic habitat will support an entire ecosystem of aquatic plants and animals thus any creek, springs or wetlands on the land should be preserved. Butterflies use mud puddles, and birds prefer birdbaths or shallow ponds. Dripping water is very attractive to birds.

Vernal pools are formed by the small depressions that collect the rainwater or the runoff. These are the natural breeding pools and hence are very important. They often dry up in the summer, but support amphibians such as frog, along with many invertebrates such as insects and snails.

**c. Cover:**

Cover is a term often used for any form of shelter from enemies and the elements. Just as different species favor different foods, cover preferences vary: tall trees, shorter trees, tall and short shrub areas, dead trees (snags) and so on. Cover is especially crucial near foraging areas; most food-bearing vegetation serves as its own cover, but addition of sheltering trees, shrubs and grasses close to other popular feeding places such as ponds, birdbaths, and artificial feeders should be done. Hedgerows planted with a combination of shrubs and trees can provide cover, nesting site and a corridor for safe passage from one habitat to another.

Traditionally in older buildings such as Pune's wadas, holes were purposely maintained in the walls to provide nesting site for birds. Although birds such as pigeons can become a nuisance, certain niches can be formed that can attract birds such as Barn owl, House sparrow etc to form nesting sites. With assistance of ornithologists niches can be designed, that can attract only certain species of birds and hamper the entry of others.

#### **d. Reproductive Areas:**

Most animals require a very specific kind of cover in which to raise their family. This type of cover is referred to as "reproductive areas." Some species nest on the ground, others need thick bushes to nest on and still others require mature trees. Some species require water body as their breeding ground. Regardless of the specific type, nesting areas are usually constructed in safe area, relatively inaccessible places which in most cases means mature vegetation. If there is little or no such growth on the garden then there is a need to provide artificial reproductive cover such as birdhouses and nesting boxes. These artificial nesting structures are specifically designed for the species of bird you want to attract. The size of the hole is critical to prevent the eggs and young from being destroyed by larger birds. Birdhouses can sometimes be as a habitat supplement. Hence a habitat should be created which is stable and at a secure place in which wildlife can live and reproduce.

### **4.3 Measures to be taken for developing natural habitats:**

- Do not use any pesticides and herbicides, as they will kill most of the butterflies and insects species.
- Protect the urban niche from human predators.
- Selection of native plant species to exotic ones as they are more preferred by the animals.
- Selecting plants that form a dense canopy, as it will satisfy the needs for nesting and cover.
- Have a variety of plant species in the garden so that a diverse faunal group will be attracted.
- Birdbaths should be no more than 3" deep, with gently sloping sides, and a rough surface to provide good footing. Change the water every few days to keep it fresh.
- Provide water sites; let plants around the water body to grow as they provide a good aquatic habitat.
- Provide nesting materials and sites; leave small twigs and grass growing nearby undisturbed as they are used as construction material of making nest. Add birdhouses hanging in the garden and even balcony as a landscape feature.
- Try and have a layering effect in the garden with taller trees towards the back and smaller shrubs in front of them this will create an 'edge' effect.
- Allow grass and weeds to grow in the garden as they provide the fauna with food, cover and nesting site.



- Leave rock piles and log piles undisturbed as they form smaller pockets of habitat attracting certain fauna.
- Maintain quiet spots or areas with less human interference in the garden.
- In lines with the old English gardens with natural landscaping, such urban niches should be planned that allow seasonal weeds to grow too. These weeds will attract the seasonal fauna of insects, bees and butterflies.
- Plant trees that flower and fruit at different times such that food is available for the fauna year round.
- Plant trees with brightly coloured flowers such as orange, magenta etc so as to attract birds and butterflies.

## ANNEXURE 1

### Distribution and abundance of butterflies in Pune urban area

HABITATS: F-forest, S-Scrub, G-Grassland, P-Plantations, A-Agriculture

ABD (Abundance): A-Abundant, C-common, O-Occasional, R-rare, S-Stray

REMARKS: LC- Law College, PU- Pune University

The common names are adopted from Evans (1932) and Winter Blythe (1957). For scientific nomenclature, consult Gaonkar (1996).

Common Name	ABD	Habitats	Remarks
Family Papilionidae			
Common Rose	C	FSGPA	
Crimson Rose	O	FSPGA	
Tailed Jay	C	P	
Common Mime	S		source 40 km
Lime	A	FSGPA	
Common Mormon	C	FP	
Blue Mormon	O	FP	increasing
Family Pieridae			
Common Emigrant	A	FSPA	
Mottled Emigrant	A	SGPA	
Small Grass Yellow	C	FSGPA	
Spotless Grass Yellow	A	FSGPA	Seasonal forms
Common Grass Yellow	A	FSGPA	
Three-Spot Grass Yellow	?	F	rare, Sinhagad
Common Jezebel	C	FP	
Psyche	C	FSPA	
Common Gull	A	FSGPA	
Pioneer Or Caper White	A	SGPA	
Plain Puffin	O	P	fresh arrival
Striped Albatross	R	SGA	sporadic
Small Salmon Arab	S	SA	
Small Orange Tip	C	SGA	
Plain Orange Tip	R	SGA	
Crimson Tip	R	SGA	only PU & LC
Large Salmon Arab	R	SGA	LC hill

White Orange Tip	O	FSPA	
Yellow Orange Tip	S	FS	
Common Wanderer	C	FSPA	
Family Nymphalidae			
Common Evening Brown	A	FSGPA	
Common Treebrown	R	FS	
Common Bushbrown	O	F	
Common Threering	C	FSGA	
Common Fivering	C	FS	
Common Nawab	R	FPA	winter
Black Rajah	R	FSPA	winter
Tawny Coster	C	SGPA	
Common Leopard	C	FSA	
Common Sailer	C	FS	source at Sinhgad
Common Baron	C	FPA	winter
Baronet Or Red Baron	R	FS	frequents Malwadi
Joker	O	SGA	localized
Angled Castor	R	SA	
Common Castor	A	FSPA	
Yellow Pansy	C	FSGPA	
Blue Pansy	C	SGPA	
Lemon Pansy	A	FSGPA	
Peacock Pansy	C	FSPA	Waterbodies
Grey Pansy	C	FSPA	Waterbodies
Chocolate Pansy	C	F	
Painted Lady	O	SGA	highly seasonal
Great Eggfly	O	FSPA	
Danaid Eggfly	O	FSPA	
South Indian Blue Oakleaf	R	F	
Glassy Tiger	O	FSPA	
Blue Tiger	C	FSPA	
Plain Tiger	A	SGPA	
Striped Or Common Tiger	O	FSPA	
Common Indian Crow	A	FSGPA	
Family Lycaenidae			
Plum Judy	O	F	highly seasonal
Apefly	S		
Common Pierrot	C	FSPA	

Angled Pierrot	O	F	highly seasonal
Rounded/Rusty/Striped Pierrot	O	SPA	
Zebra Blue	C	FSPA	
Bright Babul Blue	O	FSA	
Dull Babul Blue	O	FSA	
African Babul Blue	C	SA	
Common Hedge Blue	O	F	highly seasonal
Pale Grass Blue	C	SGPA	
Dark Grass Blue	C	SGPA	
Lesser Grass Blue	C	SGPA	
Tiny Grass Blue	C	FSGPA	
Lime Blue	O	PA	
Small Cupid	S?	SGA	
Plains Cupid	C	SGPA	
Grass Jewel	C	SGA	highly seasonal
Gram Blue	A	FSGPA	
Forget-Me-Not	O	F	
Pea Blue	C	FSGPA	
Dark Cerulean	O	FA	
Common Cerulean	A	FPA	
Common Line Blue	O	FS	
Red Pierrot	C	SPA	localized
Common Silverline	R	FPA	
Shot Silverline	S?	S	
Scarce Shot Silverline	S?	S	
Peacock Royal	O	FA	
Indian Red Flash	O	FS	
Slate Flash	O	FS	
Indian Sunbeam	O	FSPA	
Family Hesperidae			
Common Banded Awl	A	FSPA	
Brown Awl	O	F	highly seasonal
Common Spotted Flat	R	F	
Malabar Spotted Flat	R	F	
Common Small Flat	R	SG	
Spotted Small Flat	R	SG	
Indian Grizzled/Indian Skipper	O	SGPA	
Grass Demon	C	FP	

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Indian Palm Bob	O	PA	
Pale Palm Dart	O	FS	
Dark Palm Dart	O	FS	
Rice Swift	C	FSPA	
Bevan's Swift	C	FSGPA	

*Experts: Krushnamegh Kunte*

## ANNEXURE 2

**Distribution pattern of fresh-water fishes of Pune city.**

* Records doubtful. Localities are indicated only for species found at one or two sites ABD (abundance): a-abundant, c-common, o-occasional, r- rare CHG (change): d-decreasing, f-first record, in-increasing, it-introduced, n-presently unrecorded, x-extinct DF (Driving Forces):h-harvest, i.e.-introduced sp. effect, p-pollution				
FISH SPECIES	ABD	CHG	DF	LOCALITY
<b>Family: Notopteridae</b>				
<i>Notopterus chitala</i> (Hamilton-Buchanan)*		n		
<i>N. notopterus</i> (Pallas)	a			
<b>Family: Anguillidae</b>				
<i>Anguilla bengalensis bengalensis</i> (Grey)		x	h	
<b>Family: Cyprinidae</b>				
Subfamily: Cyprininae				
<i>Catla catla</i> (Hamilton-Buchanan)	c			
<i>Cirrhinus cirrhosus</i> (Bloch)	o	f		Aundh
<i>C. fulungee</i> (Sykes)	a			
<i>C. mrigala mrigala</i> (Hamilton-Buchanan)	c			Yerwada
<i>C. reba</i> (Hamilton-Buchanan)	c			
<i>Cyprinus carpio coomunis</i> Linnaeus	o	it		
<i>Gonoproktopterus kolus</i> (Sykes)	a			
<i>G. thomassi</i> (Day)		n		
<i>Labeo ariza</i> (Hamilton-Buchanan)	r	d	h	Yerwada
<i>L. boggut</i> (Sykes)	r	d	h	Yerwada
<i>L. calbasu</i> (Hamilton-Buchanan)	a			
<i>L. fimbriatus</i> (Bloch.)		x	h, ie	
<i>L. kawrus</i> (Sykes)		x	h, ie	
<i>L. porcellus</i> (Heckel)	c			
<i>L. potail</i> (Sykes)		x	h	
<i>L. rohita</i> (Hamilton-Buchanan)	a			
<i>L. sindensis</i> (Day)		x	h	
<i>Neolissochilus wynaadensis</i> (Day)*		n		
<i>Osteobrama cotio cunma</i> (Day)*		n		
<i>O. cotio peninsularis</i> Silas	c			
<i>O. neilli</i> (Day)	c			Aundh
<i>O. vigorsii</i> (Sykes)	a			

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<i>Osteocheilus</i> ( <i>Osteochilichthys</i> ) <i>godavarinsis</i> (Rao)	c	f		Vishrantwadi
<i>O.</i> ( <i>Osteochilichthys</i> ) <i>nashii</i> (Day)	a			Warje, Aundh
<i>O.</i> ( <i>Osteochilichthys</i> ) <i>thomassi</i> (Day)*		n		
<i>Puntius amphibius</i> (Valenciennes)	a			Aundh, Yerwada
<i>P. arenatus</i> (Day)		n		
<i>P. chola</i> (Hamilton-Buchanan)	a			
<i>P. conchoniis</i> (Hamilton-Buchanan)	o			Warje, Aundh
<i>P. dorsalis</i> (Jerdon)		n		
<i>P. jerdoni</i> (Day)	c			Aundh
<i>P. melanostigma</i> (Day)		n		
<i>P. sarana sarana</i> (Hamilton-Buchanan)	r	d	h	Yerwada
<i>P. sarana subnasutus</i> (Valenciennes)	a			
<i>P. sophore</i> (Hamilton-Buchanan)	c			
<i>P. ticto</i> (Hamilton-Buchanan)	a			
<i>Rohetee ogilbii</i> (Sykes)	c			Aundh
<i>Schismatirhyncus</i> (Nukta) <i>nukta</i> (Sykes)		x	h	
<i>Tor khudree</i> (Sykes)		x	h	
<i>T. mussulah</i> (Sykes)		n		
Subfamily: Cultrinae				
<i>Chela cachius</i> (Hamilton-Buchanan)		n		
<i>C. laubuca</i> (Hamilton)		n		
<i>Salmostoma acinaces</i> (Valenciennes)		n		
<i>S. boopis</i> (Day)	c			
<i>S. clupoides</i> (Bloch)		n		
<i>S. novacula</i> (Valenciennes)	c			
<i>S. phulo</i> (Hamilton)		n		
Subfamily: Rasborinae				
<i>Amblypharyngodon mola</i> (Hamilton-Buchanan)	c			Aundh
<i>Barilius barna</i> (Hamilton-Buchanan)		x	h	
<i>B. bendelisis</i> (Hamilton-Buchanan)	c			
<i>B. gatensis</i> (Valenciennes)		x	h	
<i>Danio aequipinnatus</i> (Mc-Clelland)	a			
<i>D. devario</i> (Hamilton- Buchnan)*		n		
<i>D. malabaricus</i> (Jerdon)	c			Aundh
<i>Rasbora daniconious</i> (Hamilton-Buchanan)	a			
<i>R. labiosa</i> (Mukerji)	o	f		
Subfamily: Garrinae				
<i>Crossocheilus latius latius</i> (Hamilton- Buchanan)		x	p	

<i>Gara gotyla gotyla</i> (Gray)	c			Aundh
<i>G. mullya</i> (Sykes)	a			
<b>Family: Parapsilorhynchidae</b>				
<i>Parapsilorhynchus tentaculatus</i> (Annandale)		x	p	
<b>Family: Balitoridae</b> Subfamily: Nemacheilinae				
<i>Nemacheilus anguilla</i> (Annandale)	c			Warje
<i>N. denisoni dayi</i> (Hora)		n		
<i>N. denisoni denisoni</i> (Day)	a			
<i>N. evezardi</i> (Day)	a			
<i>N. moreh</i> (Sykes)	a			
<i>N. rueppelli</i> (Sykes)	c			Aundh, Yerwada
<i>N. savona</i> (Hamilton-Buchanan)		n		
<i>N. striatus</i> (Day) *		n		
<i>N. sps.</i> (resembling <i>N. cincticouda</i> (Blith)) *		n		
<i>N. sps.</i> (resembling <i>N. multifasciatus</i> Day)*		n		
<i>N. sps.</i> (resembling <i>N. savona</i> Hamilton)*		n		
<b>Family: Cobitidae</b> Subfamily: Cobitinae				
<i>Lepidocephalus guntea</i> (Hamilton-Buchanan)	c			
<i>L. thermalis</i> (Valenciennes)		n		
<b>Family: Bagridae</b>				
<i>Aorichthys seenghala</i> (Sykes)	c			
<i>Mystus bleekeri</i> (Day)	c			
<i>M. cavasius</i> (Hamilton-Buchanan)	a			
<i>M. gullo</i> (Hamilton-Buchanan)		x		
<i>M. malabaricus</i> (Jerdon)	c			Aundh, Yerwada
<i>Rita kuturnee</i> (Sykes)	o			Aundh
<i>R. pavimentata</i> (Valenciennes)		x	h	
<i>R. rita</i> (Hamilton- Buchanan)*		n		
<b>Family: Siluridae</b>				
<i>Ompok bimaculatus</i> (Bloch)	a			
<i>O. pabo</i> (Hamilton)		x	h, p	
<i>Wallago attu</i> (Schneider)	r	d	h	
<b>Family: Schibeidae</b> Subfamily: Schibeinae				
<i>Proeutropiichthys taakree taakree</i> (Sykes)	r	d	h, p	Yerwada
<i>Silonia childreni</i> (Sykes)		x	h	



<b>Family: Sisoridae</b>				
<i>Bagarius bagarius</i> (Hamilton-Buchanan)		x	h	
<i>B. yarrelli</i> (Sykes)		n		
<i>Glyptothorax conirostre poonensis</i> (Hora)		x		
<i>G. lonah</i> (Sykes)		x	h	
<i>G. madraspatanum</i> (Day)	o			Yerwada
<i>Nangra itchkeea</i> (Sykes)		n		
<b>Family: Heteropneustidae</b>				
<i>Heteropneustes fossilis</i> (Bloch)	c	it, in	p	Yerwada
<b>Family: Belonidae</b>				
<i>Xeneotodon cancila</i> (Hamilton-Buchanan)	c			Yerwada
<b>Family: Aplocheilidae</b>				
<i>Aplocheilus lineatus</i> (Valenciennes)	o	d		Vittalwadi, K'wasla
<i>A. panchax</i> (Hamilton - Buchanan)*		n	ie	
<b>Family: Poeciliidae</b>				
<i>Gambusia affinis</i> (Baird & Girard)	a	it		
<i>Poecilia</i> (Labistes) <i>reticulata</i> (Peters)	a	it		
<i>Xiphophorus hellerii</i> (Heckel)	c	it		Warje, Vitthalwadi
<b>Family: Ambassidae</b>				
<i>Chanda nama</i> (Hamilton-Buchanan)	c			Warje
<i>Pseudambassis ranga</i> (Hamilton-Buchanan)	c			
<b>Family: Mugilidae</b>				
<i>Rhinomugil corsula</i> (Hamilton-Buchanan)	c	it, in	p	Yerwada
<b>Family: Cichlidae</b>				
<i>Oreochromis mossambica</i> (Peters)	a	it, in	p	
<b>Family: Gobiidae</b>				
Subfamily: Gobiinae				
<i>Glossogobius giuris</i> (Hamilton-Buchanan)	c			
<b>Family : Belontiidae</b>				
<i>Macropodus cupanus</i> (Valenciennes)		n		
<b>Family: Channidae</b>				
<i>Channa marulius</i> (Hamilton-Buchanan)	c			
<i>C. orientalis</i> (Bloch & Schneider)		n		
<i>C. punctatus</i> (Bloch)	a			
<i>C. striatus</i> (Bloch) *		n		
C. sps.		n		
<b>Family: Mastacembelidae</b>				
<i>Mastacembelus armatus</i> (Lacepede)	c			

*Experts: S.S. Kharat & Neelesh Dahanukar.*

**ANNEXURE 3:****Ecological preferences and changes of amphibian species of Pune.**

AB (Abundance): Vc- very common, C- common, O- occasional, R- rare;

PC (Population changes): D- decline, En- endangered;

REMARKS : Blw- Balewadi, Kth- Kothrud, Mst- Mastani lake, Psh- Pashan, Sgd- Sinhgad, Unv- University

SPECIES	COMMON NAME	HABITATS PREFERRED	MICROHABITAT	AB	PC	CAUSES	REMARKS
<b>Family Ranidae</b>							
<i>Rana cyanophlyctis</i>	Skipper Frog	St, R, D, P, L, Pwb	Su, Bw	Vc	D	Ur, Pl, HI, Ind	all
<i>Rana tigerina</i>	Indian Bull Frog	Gr, C, Pg, Hg, St, R, P, L, D, Pwb	Su, Wb, Bw	C	D	Hh, Pl, Ur, Ind, HI	all but city
<i>Rana malabarica</i>	Fungoid Frog	Gr, C, A, Hs	Sl, Cp, Gl, Pf	O	En	Ur, HI	Sgd
<i>Rana beddomi</i>	Beddom's leaping Frog	Hs, St	Gl, Bw	R	En	HI, Ur	Sgd
<i>Rana lymnocharis</i>	Cricket Frog	S, Gr, C, A, St, Hs	Sl, Rt, Gl, Pf	O	D	Ur, Ind, HI	most but city
<i>Rana sahyadrensis</i>	Tiny Cricket Frog	S, Gr, C, A, Pg, Hg, St, Hs	Sl, Rt, Gl, Pf	Vc	C		all
<i>Tomopterna rolandii</i>	Southern Burrowing Frog	S, Gr, C, A, Mb	Sl, Sd, Ug	C	D	Ur, HI	Kth, Psh, Mst
<i>Tomopterna breveceps</i>	Indian Burrowing Frog	S, Gr, C, A, Mb	Sl, Sd, Ug	C	D	Ur, HI	beyond 10 km
<i>Tomopterna rufescence</i>	Rufescent burrowing frog	S, Gr, C, A, Mb	Sl, Sd, Ug	R	D	Ur, HI	beyond 20 km
<b>Family Rhacophoridae</b>							
<i>Philautus bombayensis</i>	Bombay Bush - Frog	Fr, S, A, T,	Cp, Ob, Lf, Bk	C	En	HI, Df, Ur	Sgd
<i>Polypedatus maculatus</i>	Common Tree Frog	Fr, A, T,	Cp, Ob, Lf, Bk	O	En	HI, Df, Ur	Unv, Sgd
<b>Family Bufonidae</b>							

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<i>Bufo melanostictus</i>	Common Indian Toad	Fr, S, Gr, R, Pg, Hg, B,	Sl, Sd, Gl, Rt,	Vc	C		all
<b>Family Microhylidae</b>							
<i>Microhyla ornata</i>	Ornate frog	S, Gr, A,Pg, Tm	Sl, Sd, Ur, Ug	Vc	D	HI, Ur, PI, Ind	most but city
<i>Euperdon globulosus.</i>							Psh,Blw

*Experts: A. D. Padhye & Mukul Mahabaleshwarkar*

## ANNEXURE 4

**Distribution of Reptiles in Pune Urban Area**

Localities : An- Aundh, Bm- Bhamburda, Cc- Chandani Chowk, Fc- Fergusson College, Kj- Katraj, Kw- Khadwasla, Kt- Kothrud, Mw- Malwadi, Pc- Pachgaon, Pd- Paud, Ps- Pashan, Sg- Sinhgad, Uv- University, Wj- Warje, Yw- Yerwada, Vs- Vadgaon-sheri

Habitats : F- Forest, S- Scrub, G- Grassland, P- Plantation, A- Agriculture, H- Habitation, W- Water, R-Rocky

Ab (Abundance) : A- Abundant, C- Common, O- Occasional, R- Rare

Remarks : Species recorded without our own observations are accredited to reporters:- AC-A. Captain, AK- A. Khaire, RM- R. Marathe, SN- S. Nalawade, HG- H. Ghate; besides literature as per the case.

Common name	Scientific name	Localities	Habitats	Ab	Remarks
Indian flapshell turtle	<i>Lissemys punctata</i>	KjPsKwUv	W	C	Introduced as water purifier.
Common leopard gecko	<i>Eublepharis macularius</i>	Uv			Underwood 1945
Rock gecko	<i>Hemidactylus maculatus</i>	SgKj	R	O	Forts
Brook's house gecko	<i>Hemidactylus brookii</i>	All	FSGPHA	C	
Northern house gecko	<i>Hemidactylus flaviviridis</i>	All	PH	A	
Bark gecko	<i>H. leschenaultii</i>	All	FSPH	O	
Termite hill gecko	<i>Hemidactylus triedrus</i>	SgPcKjKw PdPs	SGA	R	
Deccan ground gecko	<i>Geckoella dekkansensis</i>	Sg	F	R	
Indian garden lizard	<i>Calotes versicolor</i>	All	SGPA	A	
Roux forest lizard	<i>Calotes rouxii</i>	Sg	F	R	

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Fan-throated lizard	<i>Sitana ponticeriana</i>	SgKjPcBm CcPsKw	SG	O	
Chamaeleon	<i>Chamaeleon zeylanicus</i>	SgKj	FSP	R	Abundant at Vs
Lined supple skink	<i>Lygosoma lineata</i>	Uv	S	R	
Spotted supple skink	<i>Lygosoma punctatus</i>	Yw		R	Chopra, 1964
Gunther's supple skink	<i>Lygosoma guentheri</i>	Model colony		R	Chopra, 1964
Three lined grass skink	<i>Mabuya trivittata</i>			?	Chopra, 1964
Keeled grass skink	<i>Mabuya carinata</i>	All	FSGPA	C	
Pune mole skink	<i>Eumeces poonaensis</i>	Kj		?	Sharma, 1964
Snake eyed lacerta	<i>Ophisops jerdoni</i>	SgKjPcBm WjKw	SG	O	
Common Indian monitor lizard	<i>Varanus benghalensis</i>	KjSgPcBm CcPdPsKw	FSGPA	R	
Brahminy worm snake	<i>Ramphotyphlops braminus</i>	All	FSGPHA	C	
Beaked worm snake	<i>Rhinotyphlops acutus</i>	All	SGPA	O	
Common sand boa	<i>Eryx conica</i>	KjSg	FSGPA	O	
John's earth boa	<i>Eryx johnii</i>	Vs	SGPA	O	AK
Bombay shieldtail	<i>Uropeltis macrolepis</i>	PsKSgKwPd	SPA	O	
Phipson's shieldtail	<i>Uropeltis phipsonii</i>	UvPsSgAu	SGPA	O	
Common vine snake	<i>Ahaetulla nasutus</i>	KjKwSg	FSPA	O	

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Brown vine snake	<i>Ahaetulla pulverulenta</i>	KtKj	S	R	AK
Buff-striped keelback	<i>Amphiesma stolata</i>	All	FSGPHA	C	
Banded racer	<i>Argyrogena fasciolatus</i>	KtPsBmPg MwKj	FSGPHA	O	
Common Indian cat snake	<i>Boiga trigonatus</i>	KtSgPgCc MwPd	SPHA	O	
Slender racer	<i>Coluber gracilis</i>	PsFcKj	G	R	
Indian smooth snake	<i>Coronella brachyura</i>	Kt		R	AK
Common Indian trinket snake	<i>Elaphe helena helena</i>	All	FSGPHA	O	
Common wolf snake	<i>Lycodon aulicus</i>	All	FSPGHA	C	
Yellow-spotted wolf snake	<i>Lycodon flavomaculatus</i>	Lately only at Talegaon		Ex?	Smith
Barred wolf snake	<i>Lycodon striatus</i>	KjSgKwPs	FSA	R	AK
Travancore wolf snake	<i>Lycodon travancoricus</i>	Confirmed from Torna			GhatpandeMistaken?
Green keelback	<i>Macropisthodon plumbicolor</i>	All	FSGPHA	C	
Banded kukri snake	<i>Oligodon arnensis</i>	All	SGPHA	O	
Streaked kukri snake	<i>Oligodon taeniolatus</i>	Kt	G	R	Ghatpande
Pakistani ribbon snake	<i>Psammophis leithii</i>	SgKw	F	R	AK
Indian rat snake	<i>Ptyas mucosus</i>	All	All	C	

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Cantor's black-headed snake	<i>Sibynophis sagittaria</i>	UvKjSgAn	FSPA	R	<u>S. subpun-ctatus</u>
Checkered keelback water snake	<i>Xenochrophis piscator</i>	All	All	C	
Common Indian krait	<i>Bungarus caeruleus</i>	All except city core	All	O	
Common slender coral snake	<i>Calliophis melanurus</i>	KjKtAn Hadapsar	SGPA	R	AK, RM
Black slender coral snake	<i>C. melanurus nigrescens</i>	Sg	F	R	<u>C. nigrescens khanda-lensis</u>
Spectacled cobra	<i>Naja naja</i>	All but city	All	O	
Russell's viper	<i>Daboia russelii</i>	All but city	all	O	
Sawscaled viper	<i>Echis carinatus</i>	All but city	All, no F	O	
Bamboo pit viper	<i>Trimeresurus gramineus</i>	KjSgKw	FS	R	

*Experts: Sanjay Thakur*



**ANNEXURE 5**  
**Birds Of Pune Urban Area**

<p>CODES:                      Seasonality:- R- Resident, L* - Local Migratory, R/L - Resident but some population locally moving, M- Winter Migratory, BM - Breeding Migrant, PM - Passage Migrant.                      Abundance:- ab- Abundant, c- Common, o- Occasional, u- Uncommon, r-Rare, s-Stray; Changes:- d- decrease, I-increase                      * L - Moving short distances within the distribution range in search of food, water, breeding site etc.</p>		
Habitat Code	Habitat type	Typical localities
F	Forest	Sinhagad, Katraj.
S	Scrub	Bhamburda, Chandani Chowk, Pachgao.
G	Grassland	Malwadi,Pune-Solapur,Pune-Nagpur Rd.
P	Plantation, gardens, avenues	University, Prabhat Road etc.
H	Houses	City core
A	Agricultural	Malwadi, Paud, Pashan,Manjari etc.
C	Cliffs	Sinhagad
R	Rocky Scarps	Sinhagad
Wi	Water inside	Pashanlake,Kawdi,Mula-Mutha etc.
Wb	Water bank	
Wa	Water aerial	
Wv	Waterside Vegetation	
Wp	Polluted Waterbody	

Common Name	Seasonality	Habitats preferred	Abundance	Change
Little Grebe	R	Wi	c	
Cormorant	R/L	Wi	o	d
Indian Shag	R/L	Wi	o	
Little Cormorant	R/L	Wip	c	i
Darter	R/L	Wi	u?	
Grey Heron	L	Wb	o	i
Purple Heron	L	Wb	o	i

*Native fauna of Pune*

Little Green Heron	R/L	Wb	u	
Pond Heron	R/L	Wbp	c	
Cattle Egret	R/L	GWb	c	
Large Egret	R/L	Wb	o	
Smaller Egret	R/L	Wb	c	
Little Egret	R/L	Wbp	c	
Reef Heron	L	Wi,Wb	u	
Night Heron	R	Wbp	o	i
Little Bittern	M	Wb	r	d
Chestnut Bittern	R	Wb	o	
Yellow Bittern	R	Wb	u	
Painted stork	L	Wb	o	
Openbill Stork	R/L	Wb	o	
Whitenecked Stork	R	Wb	c	
White Stork	M	Wb,Wv	u	
Black Stork	M	Wb	u	
White Ibis	L	Wb	o	
Black Ibis	R	Wb	o	
Glossy Ibis	R/L/M	Wb	o	
Spoonbill	L	Wb	o	
Flamingo	M	Wbi	o	
Lesser Whistling Teal	R/L	Wbi	o	
Large Whistling Teal	M	Wi,Wb	u	
Ruddy Shelduck	M	Wi	o	
Common Shelduck	M	Wi	u	
Pintail	M	AWi	c	
Common Teal	M	Wi	c	
Spotbill Duck	R	Wi	c	
Mallard	M	Wi	u	
Gadwall	M	Wi	u	
Wigeon	M	GWi	o	
Garganey	M	Wi	c	
Shoveller	M	Wi	c	
Redcrested Pochard	M	Wi	u	
Common Pochard	M	Wi	o	
White-eyed Pochard	M	Wi	o	
Tufted Duck	M	Wi	o	
Cotton Teal	R	Wi	c	

*Native fauna of Pune*

Comb Duck	R/L	Wi	o	
Blackwinged Kite	R	AG	c	
Honey Buzzard	R/L	F	o	
Pariah Kite	R	AFGHPSWa	c	
Brahminy Kite	R	Wa	u	
Shikra	R	AFGPS	c	
Sparrow Hawk	M	F	o	
Longlegged Buzzard	M	AF	u	
White Eyed Buzzard	R	AFS	o	d
Crested Hawk Eagle	R	F	o	d
Bonelli's Eagle	R/L	AFS	o	d
Booted Hawk Eagle	M	F	o	d
Tawny Eagle	R/L	AHS	o	
Lesser Spotted Eagle	L	AF	u	d
Black Eagle	R/L	F	o	
Longbilled Vulture	R	ACHR	o	d
Whitebacked Vulture	R	F	c	d
Egyptian Vulture	R	FP	o	d
Pale Harrier	M	AGS	o	d
Montagu's Harrier	M	AGWa	o	d
Marsh Harrier	M	Wa	c	
Short Toed Eagle	L	AF	c	
Crested Serpent Eagle	R	F	c	
Osprey	M	W	u	
Laggar Falcon	R/L	AFS	o	d
Shaheen Falcon	R	AHR	o	d
Hobby	M	FS	u	
Redheaded Merlin	R	AS	o	
Lesser Kestrel	M	ACGS	u	
Kestrel	R/M	ACGS	c	
Painted Partridge	R	GS	c	
Grey Partridge	R	AFS	c	
Grey Quail	M	AG	c	
Rain Quail	R/L	GS	c	
Bluebreasted Quail	R	GS	o	
Jungle Bush Quail	R	FS	c	
Rock Bush Quail	R	S	c	
Red Spurfowl	R	S	o	

*Native fauna of Pune*

Painted Spurrowl	R	FS	r	
Grey Junglefowl	R	FS	u	
Common Peafowl	R	AFS	o	
Yellowlegged Button Quail	R	GS	u	
Common Bustard Quail	R	AFGS	u	
Demoiselle Cranes	M	AWb	o	
Ruddy Crake	R	Wv	o	
Brown Crake	R	Wv	o	
Whitebreasted Waterhen	R	Wvp	c	
Indian Moorhen	R	Wv	c	
Purple Moorhen	R	Wv	c	
Coot	R/M	Wi	c	
Pheasant Tailed Jacana	R	Wv	c	
Bronzewinged Jacana	R	Wvp	o	
Redwattled Lapwing	R	AGSWb	c	
Yellow-wattled Lapwing	R	AG	o	d
Eastern Golden Plover	M	GWbv	o	
Little Ringed Plover	R/L	Wb	o	
Kentish Plover	M	Wb	u	
Curlew	M	Wb	u	
Blacktailed Godwit	M	Wb	o	
Bartailed Godwit	M	Wb	u	
Redshank	M	Wb	c	
Marsh Sandpiper	M	Wb	o	
Greenshank	M	Wb	c	
Green Sandpiper	M	Wb	c	
Spotted Sandpiper	M	Wb	c	
Common Sandpiper	M	Wb	c	
Pintail Snipe	M	GWb	o	
Fantail Snipe	M	Wb	c	
Jack Snipe	M	Wb	o	
Sanderling	M	Wb	u	
Little Stint	M	Wb	c	
Temminck's Stint	M	Wb	o	
Dunlin	M	Wb	o	
Ruff and Reeve	M	Wb	o	
Painted Snipe	L	Wb	u	
Blackwinged Stilt	M	Wbp	c	

*Native fauna of Pune*

Stone Curlew	R	PS	o	
Great Stone Plover	L	Wb	o	
Indian Courser	R	AGS	o	
Small Indian Pratincole	L	Wb	o	
Brownheaded Gull	M	Wa	o	
Blackheaded Gull	M	Wa	o	
Whiskered Tern	L	Wa	c	
Gullbilled Tern	L	Wa	c	
Indian River Tern	L	Wa	c	
Little Tern	M	Wa	o	d
Indian Sandgrouse	R	AGS	o	
Painted Sandgrouse	R	SWb	u	
Yellowlegged Green Pigeon	R	FP	o	d
Blue Rock Pigeon	R	AHP	c	
Nilgiri Wood Pigeon	R/L	F	o	
Rufous Turtle Dove	RL	F	o	
Ring Dove	R/L	AHPS	c	
Red Turtle Dove	R/L	AHS	o	
Spotted Dove	R	FS	c	
Little Brown Dove	R	AHPS	c	d
Alexandrine Parakeet	R	AFP	u	
Roseringed Parakeet	R	AFP	c	
Blossomheaded Parakeet	R	FS	c	
Indian Lorikeet	R	F	o	
Pied Crested Cuckoo	BM	FS	o	
Common Hawk Cuckoo	R/L	AFPS	c	
Indian Cuckoo	M	F	o	
The Cuckoo	M	F	o	
Indian Baybanded Cuckoo	M	F	u	
Indian Plaintive Cuckoo	BM	FPS	c	
Drongo-Cuckoo	BM	F	u	
Koel	R	AFHPS	c	
Sirkeer Cuckoo	R	FS	o	
Crow-Pheasant	R	AFPS	c	
Barn Owl	R	AHPS	c	
Peninsular Scops Owl	?	FP	u	
Collared Scops Owl	R	F	o	d
Great Horned Owl	R	FS	c	

*Native fauna of Pune*

Brown Fish Owl	R	F(Wa)	u	
Barred Jungle Owlet	R	FS	o	
Spotted Owlet	R	AHPS	c	
Mottled Wood Owl	R	AFP	o	d
Brown Wood Owl	R	F	o	
Indian Jungle Nightjar	R	F	o	
Common Indian Nightjar	R/L	AGHS	c	
Alpine Swift	R/L	R	o	
House Swift	R	HC	c	
Palm Swift	R	AFGPS	o	
Crested Tree Swift	R	F	o	
Lesser Pied Kingfisher	R/L	Wau	c	
Small Blue Kingfisher	R	Wa	c	
Whitebreasted Kingfisher	R	AFPWa	c	
Bluetailed Bee-eater	PM	FP	u	
Small Green Bee-eater	R/L	AGHPS	c	
Indian Roller	L	AFPS	c	
Hoopoe	R/L	AFPS	c	d
Common Grey Hornbill	R	AFPS	c	d
Small Green Barbet	R	F	c	
Coppersmith	R	FPS	c	
Wryneck	M	AS	o	d
Goldenbacked Woodpecker	R	FPS	o	
Yellowfronted Pied Woodpecker	R	FPS	c	d
Pigmy Woodpecker	R	FPS	r	
Indian Pitta	PM	FS	u	
Redwinged Bush Lark	R	GS	c	
Ashycrowned Finch-Lark	R	AGS	c	
Rufoustailed Finch-Lark	R	AGS	c	
Short-toed Lark	M	G	u	
Malabar Crested Lark	R	AGS	c	
Sykes's Crested Lark	R	AGS	o	
Small Indian Skylark	R/L	AGS	o	
Collared Sand Martin	M	Wa	u	
Plain Sand Martin	M	AGS	o	
Crag Martin	M	R	c	
Dusky Crag Martin	R	AGHPSWa	c	
Swallow	M	APWa	c	

*Native fauna of Pune*

Wiretailed Swallow	R	ASWa	c	
Indian Cliff Swallow	L	GS	c	
Redrumped Swallow	R	AGHPS	c	
House Martin	M	AGPS	u	
Grey Shrike	L	APS	o	d
Baybacked Shrike	R/L	APS	o	
Pale Brown Shrike	M	AS	u	
Rufousbacked Shrike	R	AFPS	c	
Brown Shrike	M	FSWv	u	d
Golden Oriole	R	FPS	c	d
Blackheaded Oriole	R	FP	o	
Black Drongo	R	AFGHPS	c	
Grey Drongo	M	FS	o	
Whitebellied Drongo	R/L	F	o	
Ashy Swallow-Shrike	R/L	FGS	u	
Greyheaded Myna	R/L	FS	u	
Brahminy Myna	R	AGHPS	c	
Rosy Pastor	M	AGS	c	
Starling	M	APWa	r	
Common Myna	R	AGHPS	ab	
Bank Myna	R	AHPWb	o	
Jungle Myna	R	APS	c	i
Indian Tree Pie	R	FS	c	
House Crow	R	AHPWa	ab	d
Jungle Crow	R	AFHPS	ab	i
Common Wood Shrike	R	AFPS	c	
Large Cuckoo Shrike	R	AFS	o?	
Blackheaded Cuckoo Shrike	R	FS	o	
Small Minivet	R	FPS	c	
Whitebellied Minivet	R	FS	u	d
Common Iora	R	AFHPS	c	
Goldenfronted Chloropsis	R	AFPS	o	
Redwhiskered Bulbul	R	AFPS	c	i
Redvented Bulbul	R	AFHPS	ab	
Whitebrowed Bulbul	R?	F	r	
Yellowbrowed Bulbul	R?	F	o	
Black Bulbul	R/L	F	u?	
Spotted Babbler	R	FS	o	

*Native fauna of Pune*

Slatyheaded Scimitar Babbler	R	FS	o	
Rufousbellied Babbler	R	FGS	o	
Yelloweyed Babbler	R	FS	c	
Common Babbler	R	GS	u	
Large Grey Babbler	R	APS	c	
Jungle Babbler	R	AFPS	c	
Quaker Babbler	R	FS	o	
Brown Flycatcher	L	AFPS	u	
Redbreasted Flycatcher	M	FPS	c	
Whitebrowed Blue Flycatcher	R	FPS	u	i?
Whitebellied Blue Flycatcher	L	F	o	
Tickell's Blue Flycatcher	R	FPS	o	i?
Verditer Flycatcher	L	F	o	
Greyheaded Flycatcher	M	F	c	
Whitespotted Fantail Flycatcher	R	FPS	o	
Paradise Flycatcher	L	FP	o	
Blacknaped Blue Flycatcher	R	FP	c	
Streaked Fantail Warbler	R	AG	c	l?
Franklin's Wren Warbler	R	FPS	c	
Rufousfronted Wren Warbler	R	S	o	
Indian Wren Warbler	R	FS	o	d
Ashy Wren Warbler	R	AGHPS	c	
Jungle Wren Warbler	R	GS	c	
Tailor Bird	R	AHPS	c	
Bristled Grass Warbler	R	GR	o	
Great Reed Warbler	R/M	SWv	o	
Blyth's Reed Warbler	M	AS	c	
Booted Tree Warbler	M	S	o	
Orphean Warbler	M	S	u	
Lesser Whitethroat	M	S	o	d
Chiffchaff or Brown Leaf Warbler	M	GPS	c	
Bluethroat	M	APWv	u?	d
Magpie Robin	R	AFHPS	c	
Shama	R	F	u	
Black Redstart	M	AS	c	
Collared Bush Chat	M	AS	o	
Pied Bush Chat	R	APS	c	
Indian Robin	R	APS	c	



*Native fauna of Pune*

Blueheaded Rock Thrush	M	F	u?	
Blue Rock Thrush	M	FS	c	
Malabar Whistling Thrush	L	F	o	
Whitethroated Ground Thrush	R	F	o	
Blackbird	R	FP	c	
Grey Tit	R	PS	c	
Yellow cheeked Tit	R	FP	o	
Tree Pipit	M	AGS	c	
Indian or Paddyfield Pipit	R	AGS	c	
Brown Rock Pipit	R	GSwb	c	
Yellow Wagtail	M	Wb	o	
Yellowheaded Wagtail	M	Wb	o	
Grey Wagtail	M	Wbp	c	
White Wagtail	M	APWb	c	
Large Pied Wagtail	R	Wb	c	
Thickbilled Flowerpecker	R	FPS	o	l?
Tickell's Flowerpecker	R	FPS	c	d?
Purplerumped Sunbird	R	FHPS	c	
Small Sunbird	R	F	u	
Purple Sunbird	R	FPS	c	
Yellowbacked Sunbird	R?	F	u	
White-eye	R	FPS	c	
House Sparrow	R	AFGHPS	ab	
Yellowthroated Sparrow	R	AFS	c	d
Weaver Bird	R	AGS	c	
Red Munia	R	GWv	c	
Whitethroated Munia	R	PS	c	
Spotted Munia	R	AFPS	c	
Blackheaded Munia	R	Awv	o	d
Common Rosefinch	M	S	c	
Blackheaded Bunting	M	A	u	
Greynecked Bunting	L	S	o	d
Striolated Bunting	R/L	S	o	
Crested Bunting	R	FGS	c	l
Wood Sandpiper	M	FP	U	
Mahratta Woodpecker	R	FP	O	
Scarlet Minivet	R	P	C	
Domestic Fowl	R	PG	O	

Eastern Steppe Eagle	M	P	C	
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Source: -

1. Report -Avifuna around Pune : Experts: S. Ingalhallikar, R. Purandare, S. Nalavade & S. Dhole.
2. Report – Birds of University of Pune Campus – Jayshree Awatade

## ANNEXURE 6

**Distribution Status Of Mammals In Pune Urban Area**

CODE: A- Abundant, ABD- Abundance, C- Common, CHG- Change, CS- Cause, D- Decline, F- Forest, G- Grassland, H- Housing, HH- Harvest, HL- Habitat loss, I- Increase, K- Katraj, O- Occasional, P- Plantation, R- Rare, S- Scrub, Shgd- Sinhgad, W- Waterbodies						
SCIENTIFIC NAME	COMMON NAME	HABITAT	ABD	CHG	CS	REMARK
<b>Order Insectivora</b>						
<i>Suncus etruscus</i>	Indian pigmy shrew	HFS	O			
<i>Suncus murinus</i>	Grey musk shrew	H	A			
<b>Order Scandentia</b>						
<i>Anathana ellioti</i>	Common/Madras tree shrew	F	O			K, Shgd
<b>Order -Chiroptera</b>						
<i>Rousettus leschenauti</i>	Fulvous fruit bat	HFS	C	I		Suburbs
<i>Pteropus giganteus</i>	Indian flying fox	HFS	C			Sangam bridge
<i>Cyanopterus spinx</i>	Short nose fruit bat	HFS	C	I		Suburbs
<i>Taphozous logimaus</i>	Longwinged Tombbats					
<i>Megaderma lyra</i>	Great false vampire bat	HF				Suburbs
<i>Rhinolophus rouxii</i>	Rufous horse shoe bat					
<i>Hipposideros speoris</i>	Schneider leaf nosed bat	HF	R			
<i>Myotis horsfieldii</i>	Horsefields bat	H	R			Peshwa Bat
<i>Pipistrellus ceylonicus</i>	Kelaarts pipistrelle	HPAF	C			
<i>Pipistrellus coromandra</i>	Indian pipistrelle	HPASF	C			
<i>Pipistrellus tenuis</i>	Indian pigmy pipistrelle	HPASF	C			
<i>Hesperoptenus tickelli</i>	Tickells bat		R			
<i>Scotophilus heathii</i>	Great yellow house -bat	HPASF	C			
<i>Scotophilus kunlii</i>	Lesser yellow house bat	HPASF	C			
<i>Kerivoula picta</i>	Painted bat		R			
<i>Tadarida aegyptiaca</i>	Egyptian free tailed bat		R			
<b>Order Primates</b>						
<i>Macaca radiata</i>	Bonnet monkey	HPASF	C			
<i>Presbytis entellus</i>	Hanuman Langur	HPASF	C			Summer
<b>Order Carnivora</b>						
<i>Canis aureus</i>	Jackal	A(W)	O	D		
<i>Canis lupus pallipes</i>	Wolf	SG	R		HL	Summer emigrant
<i>Vulpes benghalensis</i>	Indian fox	HAFG(W)		D	HL	eastern

*Native fauna of Pune*

						Fringes
<i>Lutra perspicillata</i>	Smooth-coated otter	F(W)	R	D		Parvati canal
<i>Viverriculla indica</i>	Small Indian civet	HASF				Dhayari
<i>Paradoxurus hermaphroditus</i>	Common palm civet	HPASF	C	D		
<i>Herpestes edwardsi</i>	Common mongoose	FSGPA	C	D		Suburbs
<i>Herpestes smithi</i>	Ruddy mongoose	F	O			
<i>Hyaena hyaena</i>	Striped Hyaena	FS	O		HL	Fringes
<i>Felis silvestris</i>	Desert cat	A	?			
<i>Felis chaus</i>	Jungle cat	SG	O	D	HL	K, Pashan
<i>Felis bengalensis</i>	Leopard cat					not city
<i>Panthera pardus</i>	Leopard or Panther	F	O			Winter, K, Shgd
<i>Panthera tigris</i>	Tiger	F	O	Ex		NDA, 1930
<b>Order Artiodactyla</b>						
<i>Sus scrofa cristatus</i>	Wild boar	SA	O	D	HH,HL	Mula canal
<i>Tragulus memmina</i>	mouse deer	F	R			NDA
<i>Muntiacus muntjak</i>	Muntjac or barking deer	F	O			K, Shgd
<i>Axis axis axis</i>	Cheetal or Spotted deer	F	C	I		NDA, Introduced
<i>Tetracerus quadricornis</i>	Four horned antelope	S	O			
<i>Bos gaurus</i>	Gaur	F	S	?		K
<i>Antelope cervicapra</i>	Black buck/Indian antelope	G	O	Ex	HH	Agakhan Palace
<i>Gazella gazella benneti</i>	Chinkara or Indian gazelle	FS	O	D	HH	
<b>Order Pholidota</b>						
<i>Manis crassicaudata</i>	Indian pangolin	FS	R			
<b>Order Rodenta</b>						
<i>Funambulus palmarum</i>	Three striped palm squirrel	FPA	A			
<i>Funambulus pennanti</i>	Five striped palm squirrel	PH	A			
<i>Funambulus tristriatus</i>	Jungle striped squirrel	F	R			Shgd
<i>Tatera indica</i>	Indian gerbil	A				
<i>Vandeleuria oleracea</i>	Long tailed tree mouse	F	S?			Erandawana, Bhat
<i>Golunda ellioti</i>	Indian Bushrat	S	C			
<i>Millardia kondana</i>	Kondana field-rat	F	R			Mishra, 1976
<i>Millardia meltada</i>	Soft-furred field-rat	A				

*Native fauna of Pune*

<i>Rattus blanfordi</i>	Blandfords rat	F	F			
<i>Rattus rattus</i>	Common house rat	H	A			Grainary
<i>Mus booduga</i>	Little Indian field-mouse	A				Fringes
<i>Mus musculus</i>	Common house-rat	H	C			Wadas, Grainary
<i>Mus platythrix</i>	Indian brown spine- mouse	A				Fringes
<i>Bandicota bengalensis</i>	Indian mole-rat	A				
<i>Bandicota indica</i>	Bandicoot rat	H	A	I		Drainage
<i>Hystrix indica indica</i>	Indian crested porcupine	FS	O	D	HH	
<b>Order Logomorpha</b>						
<i>Lepus nigricollis</i>	Indian blacknaped hare	FSAG		D	HL	NDA

*Expert: S. Nalavade.*

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