Annual Methodological Archive Research Review
http://amresearchreview.com/index.php/Journal/about
Volume 4, Issue 4 (2026)

Online ISSN 3007-3197
Print ISSN 3007-3189

http://amresearchreview.com/index.php/Journal/about

Avian Diversity of Family Columbidae (Doves and Pigeons) of Sindh, Pakistan

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ABSTRACT

A study to find out the bird diversity of Family Columbidae in Sindh province was carried out over the period of eight months from January to August, 2025. Different habitats of variable locations such as Badin, Jamshoro, Karachi. Larkana, Mirpurkhas, Naushehroferoz and Tando Muhammad Khan were explored. All the study locations were marked using GPS for regular surveys, birds of Family Columbidae were captured for morphometry and physical characteristics. Surveys were carried out in different habitat types: scrubland, cropland, urban and suburban areas. From different study sites of Sindh, five species: *Columba livia*, *Streptopelia decaocto*, *Treron phoenicoptera*, *Streptopeliarisorii* (Barbary Dove) and *Streptopelia senegalensis* (Laughing Dove) were recorded. *Columba livia* was found most abundant, while least occurrence of *Treron phoenicoptera* was recorded from the study area. The environmental factors found in the study area included habitat change, environmental degradation, nest damage and hunting, though plenty of food and water was recorded available near all the birds resting and nesting sites. Preference of habitat varied from species to species of Family Columbidae, though most of species remain vulnerable to man encroachment and anthropogenic activities throughout the study area. Hunting was recorded as most dangerous factor for pigeons and doves. There is no prevalence of

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any efforts for the conservation of Family Columbidae throughout the Sindh province.

Keywords: Doves, Pigeons, avian diversity, habitat, Conservation, Sindh.

Introduction:

Family Columbidae consists of Pigeons and doves under the order *Columbiformes*, which includes about 42 genera and 310 species Bock, Walter J. (1994). These birds primarily feed on seeds, fruits, and plants and have worldwide distribution with exception of the driest areas of the Sahara Desert, Antarctica and its surrounding islands, and the high Arctic. The species of family columbidae have adapted to most of the habitats such as arboreal, , or semi-terrestrial, while some species are recorded to inhabit savannas, grasslands, deserts, temperate woodlands and forests, mangrove forests, and even the barren sands and gravels of atolls.

Assessing diversity of avian fauna of an area over time and space is one of the important issues so as to confirm distribution of different species in different areas of a region. Diversity of avian fauna is of great importance as they act as indicators of status of ecosystem health by being sensitive to environmental changes (Taper et al. 1995; Olechnowski 2009).

The bird diversity and population status is affected by changes in vegetation structure either by the natural processes or due to anthropogenic activities which encroach into wild habitats (Maurer 1981; Wiens 1989; Rahayuninagsih et al. 2007). Poaching is also main factor that causes avian diversity to deteriorate. Compound disturbance caused simultaneously be natural disastrous conditions and human encroachment may have negative impacton ecological resilience and recovery of bird diversity (Buna & Wessman 2011; Harvey et al. 2014). Environmental changes such as changes in vegetation composition may also impact the quality and quantity of habitat for birds in terms of food and shelterparticularly and such conditions can further affect the diversity and distribution of birds (Western & Grimsdell 1979). Research shows that vegetation composition has demonstrated that avian diversity increases with an enhanced level of vegetation (Wiens 1969).

This study aims to investigate the diversity of family Columbidae and environmental factors that cause disturbances in their habitats in neglected area in terms of wildlife

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conservation. This study may prioritize the conservation of bird species after getting their current diversity confirmed. In the long run, the diversity of doves and pigeons may prominently be helpful to contemporary and future ecologists for improving their environmental conditions.

Material and Method

Study Area

Surveys were carried out in different study zones of Sindh province (25.8943° N, 68.5247° E) encompassing geographical area of 140,914 km²(table 1).Types of habitats of each study zone included scrubland, cropland, urban and suburban areas were explored for the discovery of species of family Columbidae for the period of eight months: January to August (2024).Along with different vegetation and plantation and a wide range of climatic conditions, topography is also different of different divisions of Sindh (Figure 1), thus diverse structure of habitats is available in vast area of Sindh for avifauna.

Table 1: ***Details of study zones explored for diversity of family Columbidae***

Study areas of Sindh province	**Area (km²)**	**Coordinates**	**No. of Survey counts**
Badin	6,726	24°-5` to 25°-25` N, 68 21' to 69 20'E	15
Jamshoro	11,517	25.4304° N, 68.2809° E	22
Karachi	3,780	24.8607° N, 67.0011° E	12
Larkana	7,423	27.5570° N, 68.2028° E	18
Mirpur Khas	3,319	25°33′ 02″ N 069°00′ 11″ E	10
Naushehroferoz	2,945	26°50'0N 68°7'0E	10
Tando Muhammad Khan	1,734	26.8058° N, 68.0478° E	09

For the field surveys, Transects were divided into three habitat types according to preference of doves and pigeons i.e. human-inhabited areas, open scrub areas, vegetation cover areas available in all study locations (Table 1).

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Bird Survey

Bird diversity was measured through the belt transect method (Cunningham et al. 2006). The observer tallied the numbers of bird species seen on transect walk. The survey was administered directed during morning or evening by Cunningham et al. 2006 and Simons et al. 2006, so morning survey was held from 06:00 to 10:00hr or evening survey was performed between 17:00 and 20:00 hr; at the maximum bird activity times that were finally observed.

Diversity of Doves and Pigeons

To assess the diversity of doves and pigeons and differences in their diversity at different divisions of Sindh avian assemblages at each site was thoroughly observed and recorded at once. The recorded species of birds were then studied identified using morphology and study of taxonomic literature of relevant family of birds.

Equipment

High quality DSLR camera was used for capturing birds images on each survey, whereas calipers, rulers, tapes and scales were used for direct measurements of morphometric parameters including: body weight, body length, beak measurement, primary and secondary feathers measurements, head structure, wing span, tail feathers length, tarsus length, bill length, and head length. electronic balances were used for measuring weight.

Results and Discussion

Altogether five Columbidae species were discovered from the study area. All birds were studied morphologically and their systematics was determined as follows: *Columba livia*, *Streptopelia decaocto*, *Treron phoenicoptera*, *Streptopelia risoria* (Barbary Dove), *Streptopelia senegalensis*(Laughing Dove). The detail about each species is detailed below:

***Columba livia* (Gmelin, 1789)**

This species was found as most abundant pigeon in all the habitats with massive population density and large number of nesting and roosting sites in left buildings and even in man-occupied buildings of academic institutions, restaurants and hospitals etc. A large number of roosting sites of this species were found near food and water locations of study areas (Table 1).

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Feral pigeons (*Columba livia*), which are most populous commensal animal, habitat abundant in distinct environments within agricultural zones or adjacent to the human environment [2, 3]. They are animals best known for being hunted, farmed or kept as pets for their amusement or use. Another use of pigeons is for the harvesting of guano (droppings) to be used as a fertilizer. They keep the environment clean by cleaning up our waste and feeding on food that is wasted as trash by humans. Pigeons do not compete with native animals for food and shelter and so do not harm other valuable species.

Table: 2: *Morphometrics ofColumba livia*

Parameters	Min/Max(g/cm)	Average value	Standard deviation (S.D)
Weight of body	264-278	271.46	3.99
Length of body	32-34.5	33.58	0.71
Length of beak	1.6-1.9	1.72	0.09
Length of head	2.7-3.1	2.89	0.13
Length of neck	2.6-3.3	2.88	0.17
Length of wingspan	30-32	30.71	0.53
Length of tail feather	10.5-11.8	11.15	0.37
Length of shank	4-4.5	4.33	0.15
Length of neck ring	8.7-9	8.90	0.10
Number of tail feather	9-12	10.90	1.08
Number of wing plumage	19-21	20.62	0.70

***Streptopelia* decaocto** (Frivaldszky, **1838)**

The *Streptopelia decaocto* (Frivaldszky, 1838), known by many English names (collared dove, Eurasian collared-dove or Indian ring-dove) was observed for the first time in an extensive area of Sindh province in variety of habitats (scrubland, cropland and human impacted environment including urban and suburban areas). As observed, *S. decaocto* is a common game bird as it was sifted, global distribution of

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occurrence into cropland and scrub/shrublands mostly during field observations Even if its density was low in suburban and urban habitats, it conflicts with recent studies [4] which show that the species is also observed in urban and suburban area. The most commonly spotted *S. decaocto* types do not move in open swathes of land.

S. decaocto is a stout-bodied, medium-sized simmer and long-tailed dove species measuring 32·1 cm (12·6 in) on average from tip of the bill to tail tip. This species has been found to weigh between 125–240 g and have a wingspan of 47 cm to 55 cm.[5] The adult Eurasian collared dove had grey/ pinkish-grey upon its feather color? Above and dark grey below with white tips. The breast was pinkish, with a narrow black hind neck half-collar (the rear part of the neck) lined with white; more features were added based on fossil evidence and other extinct S. species. Its primaries and coverts were dark brown with a gray band across. The under-tail coverts were gray, patterned black and white with a broad terminal white edge. The other features of this bird were dark red legs, thin black beak, thin edge of reddish-brown or deep red iris but when seen from little distance pupiol size that was larger and in black color made eye clearing seem blacker. *S. decaocto* also was described as having small region of exposed skin around its eyes, white rather than yellow in some specimens. Juveniles were distinguished by a poorly developed collar and brown iris, suggesting some morphologic divergence from the adult. They also had grey a band across the coverts and dark brown or pinkish brown primary wing feathers. Under tail coverts are also dull greyish with black and white patterns well seen in them, as well as a white terminal edge seen in under tail coverts.

Eurasian collared dove has a wide distribution, and it is assumed that their presence disturbs the normal ecology niche of other bird species because they lead to inter specific competition with other bird species such as mourning dove and turtledove [3]. The diet of Eurasian collared-dove consists of larger seeds than the Eurasian wryneck and this bird considered being a crop pest in Pakistan [3-4]. *S. decaocto* is very easily established and spread rapidly [3] similarly was found in this study, recording abundant occurrence of this weed in Sindh province. It has been noted that *S. decaocto* are crop pests as they almost solely dependent on seeds and cereal grains in addition to various fruits, plants, and small invertebrates; hirundines

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also capitalizes on elevated bird feeders or plants (berries) on bushes; therefore their population presence causes severe damage to crop [4]. This indicates a broad and yet facultative distribution of *S. decaocto* in Sindh province.

Table: 3: *Morphometricsof Streptopelia decaocto*

Parameters	Min/Max (g/cm)	Average value	Standard deviation (S.D)
Weight of body	142-152	148.36	2.69
Length of body	26.1-27.9	27.06	0.58
Length of beak	1.5-1.8	1.61	0.10
Length of head	2.5-3	2.73	0.17
Length of neck	2.6-3.2	2.83	0.20
Length of wingspan	18.5-21	20.25	0.81
Length of tail feather	11.2-12.5	11.66	0.40
Length of shank	2-2.7	2.48	0.15
Length of neck ring	6.9-7.2	7.02	0.11
Number of tail feather	10-12	11.57	0.69
Number of wing plumage	18—21	19.05	0.97

***Treron phoenicoptera* (Latham, 1790)**

Despite its rich biodiversity, many species remain unknown to the world in Sindh province of Pakistan. Yellow-footed green pigeon (*Treron phoenicoptera)* After all, the extremely limited distribution of the yellow-footed green pigeon (the species in question here), is blamed on habitat fragmentation. It is rarely spotted in different regions of Pakistan so very little is known about this species.

During monthly surveys, *Treron pheonicpterus* that belongs to order Columbiformes (Latham,1790) was collected. This order consists of only one family Columbidae (William Elford Leach, 1820), representing 40 genera of which genus Treron(Louis Jean Pierre Vieillot, 1816) embraces 29 species including *Treron pheonicpterus*. Present study shows that the *T. phoenicopterus*) is a medium sized green pigeon. The body was yellowish olive-green which were duller overhead and the

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Print ISSN 3007-3189

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crown was blue grey. Iris: Pink-red on the outer circle; Pale blue The shoulders had a lilac patch; the blackish wings, a yellow bar. Abdomen dull green, greyer flanks to Sulphur-yellow lower belly and conspicuous bright yellow leg feathers. They have a typical anisodactyl foot structure with one long-backward toe and three front toes. The bird had pale yellow-orange breast and throat, and pale underparts. It had yellow-mustard neck, leg was yellow, bill was cream- white and upper mandible was crooked. The female is less brightly colored than the male, and even has a smaller mauve patch on her shoulder. Accurate morphometrics of *Treron pheonicopterus* They were social and attractive birds, seen in pairs or small groups of five to 10 birds but sometimes in large bachelor flocks. The yellow-footed green pigeon feeds primarily on fruit; it prefers living in areas on the periphery of a city, specifically villages that engage in fruit cultivation with emphasis on Ficus trees (Stiles 1985; Corlett 1998).

Table: 4: ***Morphometrics of Treron phoenicpterus***

Parameters	**Min/Max (g/cm)**	**Average value**	**Standard deviation (S.D)**
Weight of body	201-210	204.6	3.36
Length of body	28-30	29.04	0.82
Length of beak	1.7-2	1.82	0.10
Length of head	2.5-3	2.6	0.29
Length of neck	2.4-3	2.74	0.24
Length of wingspan	18-21	19.4	1.22
Length of tail feather	9.9-11	10.32	0.44
Length of shank	3-3.5	3.26	0.18
Number of tail feather	11-12	11.2	0.44
Number of wing plumage	19-20	19.4	0.54

***Streptopelia risoria* Linnaeus, 1758)**

The color of body, head, neck, wing and tail was pure white so light grey color have been seen in ring of neck at male. Color of bill pale flesh. Eye color: the iris is bright

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red and pupil is black, white area of skin near eye was observed throughout its entire life, while studying their young one's age to adult it was observed that their eye color has been changed to good absorption of light. Two types of eye species including simple and bull-eye, were recorded in all specimens except for one bull-eyed bird. They had *ansiodactyle* feet with shocking pink soles and light pink claws. It was perceived as familiar to the human population. This fauna was recorded as existing close to the urban human population.

Table: 5: *Morphometrics of Streptopelia risoria*

Parameters	Min/Max (g/cm)	Average value	Standard deviation (S.D)
Weight of body	141-152	147	3.30
Length of body	23..5-27.9	26.11	1.4
Length of beak	1.3-1.7	1.54	0.13
Length of head	2.5-3	2.66	0.16
Length of neck	2.4-3.5	2.9	0.29
Length of wingspan	18-21.5	19.7	1.03
Length of tail feather	10.1-11.3	10.89	0.31
Length of shank	2-2.3	2.12	0.12
Number of tail feather	8-12	11	1.08
Number of wing plumage	17-21	19.77	0.87

***Streptopelia senegalensis* (Laughing Dove)**

All these birds were pinkish brown colored, *heterodactylous* members with long tails and lean bodies. Head, nape and side of face; neck and throat generally pale pink venations. The upper abdomen progressively proving pale; the lower, fulvous white. Vent and rufous under tail coverts, chin white and neck sides with black patches chequered with dark rufous feathers. The edges of the wings were ashier colored. Primaries and their coverts dusky brown, first three quills edged with fulvous white;

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secondaries darker than primaries slightly edged and tipped pale grey. The tail is graduated and the outer feathers bear white tips. Black colored beak, Dark brown with white iris in eye, lake red legs. The heavier body weight of *streptopelia senagalensis* in shrub, dry sites and cultivated areas dominated by dense trees and scrubs. The species population tended to inhabit less vegetated areas.

Table: 6: ***Morphometrics of Streptopelia senegalensis***

Parameters	**Min/Max (g/cm)**	**Average value**	**Standard deviation (S.D)**
Weight of body	75-84	79.73	2.65
Length of body	22.6-27.5	25.18	1.46
Length of beak	1.2-1.6	1.42	0.11
Length of head	3.1-3.5	3.39	0.28
Length of neck	2.5-3.6	2.92	0.28
Length of wingspan	16.7-18.5	17.55	0.55
Length of tail feather	10.3-11.2	10.89	0.28
Length of shank	1.9-2.4	2.06	0.15
Number of tail feather	8-12	10.6	1.18
Number of wing plumage	17-21	19.2	1.08

Every pigeon and dove species that was recorded ate nuts and fruits. Their diet mainly consists of seeds, i.e corn, mustard, millets also grains such as barely paddy-grains, wheat and peas. They will also eat fruits, (hedges), small invertebrates, insects (termites and beetles) and different plants. All these types of pigeons and doves can additionally consume it which is provided by human beings. *C. livia* for example are fed bread and rice, *S. decaocto* & *S. risoria* consomebolas of cooked rice; *S. senegalensis* particularly cereals.

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Table: 7: *Type of food of recorded species of Pigeon and Doves*

Scientific name	Common name	Type of food
Columba livia	Rock pigeon	Seeds,grains, bread, cakes etc.
Treronpheonicopterus	yellow-footed green pigeon	Mainly Fruits, also eat seeds
Streptopelia decaocto	Eurasian collered dove	Mainly Seeds, grains and variety of plants, small invertebrates, insects, cooked rice
Streptopelia risorii	Barbary dove	Seeds, grains and cooked rice
Streptopelia senegalensis	laughing dove	Grains and small ground insect



Fig.1Morphometrics of Columba livia



Fig.2.Morphometrics of Streptopelia decaocto

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Fig 3 Morphometrics of Treron phoenicpterus



Fig.4.Streptopeliarisoria



Fig.5 Streptopelia senegalensis(Laughing Dove)

Conclusion

All documented pigeon and doves species except Streptopelia risoria found making relatively weak nests by means of sticks and other debries within low bushes, on branches of thick trees, on ledges, on the cottage ground in ancient buildings in eaves of houses/cervices nearby man settlements or food supply. Both the male and female of both parents participate equally in building nests. General, pigeons and doves laid 2 eggs an interval of 1 day between them both parent took part in incubating & feeding the young but in frugivores species a single egg was laid. Egg color was noted white or buff. Both parents incubate the eggs. Once the chicks

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hatched, parents began feeding their babies "pigeon milk" for three to four days.

Members of Family Columbidae (Order: Columbiformes): Conservation status. Human activities, due to some species of Family Columbidae like Columba livia and streptopelia decaocto have expanded its habitat and increase their population in urban and sub urban areas so basically their population remains unaffected in these areas but even hunting is affecting its population as it status as an introduced species was decreasing their population. Several other species of Family Columbidae (Order: Columbiformes) including Treronpheonicopterus | Streptopelia risoria and Streptopelia senegalensis were on the edge of extinction due to several factors such as loss of habitat, human encroachment and hunting.

These birds are important for seed dispersal, and pollination processes, maintaining food chain etc. By protecting the living conditions and habitat of pigeons and doves, we can save the number of birds.

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