Depredatory and Insectivorous Birds in Agricultural Ecosystem of Punjab

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PUNJAB AGRICULTURAL UNIVERSITY, LUDHIANA-141004

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Preface

Intensive agricultural and changed land use practices, results in increase of population of more opportunistic animals including birds. The avifauna of India includes around 1314 species, including 4.8% endemic to India. Punjab has rich bird fauna comprising of more than 300 species of birds. A total of 189 species of birds belonged to 17 orders 56 families and 117 genera were recorded from different agricultural habitats of Punjab. Birds are both beneficial and harmful to agriculture; on one hand they are known to cause considerable economic damage to a variety of crop; on the other hand insectivorous and rodentivorous bird are beneficial to agriculture. A total of 63 species of birds identified damaging several crops and 46 species of beneficial birds have been identified in different agricultural ecosystems of India. The range of crop damage caused by depredatory birds in selected crop fields were reported to be 17.41-31.7% in mustard, 11.75% in maize and up to 27.50% in paddy crop fields.

This bulletin entitled “Depredatory and insectivorous birds in agricultural eco-system of Punjab” features both depredatory and insectivorous birds' species that have an important role in agricultural ecosystem. In addition to reading about their identifying features, status and habitat readers will also be able to learn about their behavior and economic status in agriculture.

We hope this information will open a broader vista in readers, and be just the starting point for enriching their life with birds. The idea behind this is to spread awareness among the common masses including farmers about the depredatory and insectivorous birds which are present in our agricultural ecosystem and management practices used for depredatory birds.

We are grateful to Indian Council of Agricultural Research (ICAR), New Delhi for providing financial assistance; we are also thankful to the Worthy Vice-chancellor, PAU and The Director of Research, PAU for providing the necessary facilities required for completion of this bulletin; we owe a special debt of gratitude to Dr Shammi Kapoor (Dean, College of Basic Sciences and Humanities) and Dr Neena Singla, Principal Zoologist (Rodents) and Head, Department of Zoology, for their support and encouragement for helping us bring the useful information at one place.

The constructive suggestions from the conscious readers are always cordially invited for further improvement of the book.

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From the desk of Director Research

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In agricultural habitats, 244 species of birds belonging to 136 genera under 18 orders and 53 families have been reported in India. Punjab is mainly an agrarian state having high cropping intensity and rich avian diversity. Most of the birds play helpful roles in agriculture, but some species are problematic. A few species of birds are reported to cause damage in agricultural landscape in Punjab, while some are insectivorous and play significant role in suppression of insect pest in crops. I am happy to see that scientists at PAU, Ludhiana have generated extensive information on depredatory and insectivorous birds in agricultural landscape of Punjab.

I appreciate the efforts of the scientists involved in the All India Network Project on Vertebrate Pest Management (Agricultural Ornithology), PAU in bringing out this information on "Depredatory and insectivorous birds in agricultural eco-system of Punjab" in the form of a technical bulletin. I am sure the information contained in the publication will be of immense help to farmers, agricultural scientists, horticulture scientists, extension workers, students, and researchers to understand about the role of birds and their management strategies.

Dr Navtej Singh Bains

From the desk of ADG

Dr Sunil Chandra Dubey
Assistant Director General (Plant Protection and Biosafety)
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Birds constitute an important component of agricultural ecosystems. Agriculture provides a concentrated and highly predictable source of food to birds. Some species come in conflict with farmer's interests by inflicting economic damage to crops, fruits, and stored grains. To understand the role of depredatory and insectivorous birds in agriculture and to widen the understanding about them, there is a need for precise and compact information in the form of scientific publications.

I am happy that the Punjab Agricultural University, Ludhiana center of All India Network Project on Vertebrate Pest Management is publishing a bulletin entitled "Depredatory and insectivorous birds in agricultural eco-system of Punjab". It emphasizes the uniqueness of each bird species, their identifying features, habitat, feeding habits, breeding, damaging status in agriculture and their management. The effort made by the authors reflects a sincere, meticulous and objective-based attempt.

This bulletin is written in a well-defined manner based on the combination of data derived from published scientific knowledge, first-hand professional experience and scientific research carried out under All India Network Project on Vertebrate Pest Management. It will certainly provide a framework for learning about the depredatory birds and their management and role of insectivorous birds in agriculture ecosystem to farmers, the general public, students, extension workers, and researchers in a defined way.

Dr Sunil Chandra Dubey

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Avian Diversity in Punjab

Punjab state, with an area of 50,362 km^2, is situated in the north western part of the country. It extends from latitude 29°33' to 32°32' North and longitude 73°55' to 76°50' East with an average elevation of 300 m above mean sea level. The state has been classified into five agro-climatic zones, i.e., sub-mountain undulating zone, undulating plain zone, central plain zone, western plain zone and western zone on the basis of homogeneity, rainfall pattern, distribution, soil texture, cropping patterns etc. The climate of Punjab is characterized by extreme hot and extreme cold conditions. Annual temperatures in Punjab range from 1°C to 46°C (min/max), but can reach 49°C in summer and 0°C in winter. It has three defined seasons; summer, monsoon and winter. Summer season tends to be very hot and very dry and it ranges from April through June with average highs in May and June hovering around 40 °C. A slight decrease in average temperature and an increase in humidity is witnessed in the monsoon season which runs from July through September with an annual precipitation average ranges between 960 mm in the sub-mountain region and 460 mm in the plains. Average temperature tends to decrease during the months of October and November. The winter months (December to February) are relatively mild with warm days and chilly nights and March is a transitional month from winter to summer.

Avian diversity have been monitored and recorded during the field surveys conducted in All India Network Project on Vertebrate Pest Management and a total of 189 species of birds belonged to 17 orders 56 families and 117 genera were recorded. Of these, 111 were recorded as resident species, 47 resident migrant, 30 migrant and 01 species in the vagrant category. In different habitat viz., agricultural habitat, residential area (urban/rural), aquatic habitat (ponds/canal/river/wetland) and uncultivated area(forest/barren land)bird diversity was 125, 63, 67 and 19, respectively, with some occupying more than one habitat. In term of conservation status, of the recorded 189 avian species, 10 species were in critically endangered category. Critically endangered category further comprised of 1 endangered, 1 vulnerable and 8 near threatened species.

The birds have a significant role in agricultural landscape, as they are both beneficial and harmful. Insectivorous avian species play important role in decreasing insect populations in crops, thereby proving useful to farmers, on the other hand, damage caused by depredatory birds is a matter of concern. The intensity of bird damage vary in relation to crop stage, location of field, population status of species, habitat features of surrounding area and community structure. Even the same species may be beneficial or problematic in different situations. Only a few of about 300 species of birds in Punjab cause problems in crop fields and granaries. The Rose–ringed Parakeet is responsible for major damage in horticultural and agricultural crops and hence a big threat to farmer's interests.

Table 1: Cultivated Area under major crops of Punjab*

	PADDY	WHEAT	MAIZE	MUSTARD
Area (000ha)	**3103**	**3520**	**109**	**30.5**
Production (000 tonnes)	**19137**	**18262**	**396**	**46.5**
Yield (Kg/ha)	**6167**	**5188**	**3625**	**1524**

*According to Handbook of Agriculture 2021, Punjab Agriculture University, Ludhiana.

Harmful Birds: Rose-ringed Parakeet is the major bird pest causing serious damage to almost all cereal crops. It is particularly harmful to sunflower. House crows damage sprouting maize, sunflower and maturing maize. Doves and pigeons damage pulses, weaver birds damage stored grains at shellers and godowns. These birds also damage rice nurseries and maturing bajra and sorghum. Bird damage in various agricultural crops are crop specific and stage specific. Ranges of crop damage caused by birds in selected fields of wheat (sowing), maize (sowing), maize (ripening), paddy (sowing) and paddy (ripening) were 3.0-9.0%; 4.5-8.6% ; 5-9.5%; 5-11.5% and 4-7.0% respectively. Similarly, ranges of damage by birds to sunflower (sowing), sunflower (ripening), safflower (ripening), mustard (sowing) and mustard (ripening)(oilseed crops) were 5-10%; 9-18%; 8.5-20%, 9-11% and 4-19% respectively.

Table 2: Depredatory potential of birds in different agricultural crops

CROPS → BIRDS SPECIES ↓	PADDY	WHEAT	MAIZE	MUSTARD	SUNFLOWER	PULSES
Rose-ringed Parakeet	√	√	√	√	√	√
House Crow	√	√	√	√	√	√
Rock Pigeon	–	–	–	√	√	√
Indian Peafowl	√	√	√	√	–	√
Common Myna	–	–	–	–	–	√
Ring Dove	–	√	√	√	–	√
Baya Weaver	–	–	–	√	√	√
Purple Moorhen	√	√	–	–	–	–
Red-vented Bulbul	–	–	–	–	–	√

(√- presence; - absence)

Table 3: Depredatory potential of birds in different horticultural crops

CROPS → BIRDS SPECIES ↓	GRAPES	GUAVA	BER	PEAR	PEACH	CUCURBITS sps.	TOMATO	PEA
Rose-ringed Parakeet	–	√	√	√	√	√	√	√
Alexandrine Parakeet	–	√	√	–	–	–	–	–
House Crow	–	√	√	√	√	√	√	√
Indian Peafowl	–	–	–	–	–	√	√	√
Common Myna	–	√	–	–	–	–	–	–
Ring Dove	–	–	–	–	–	–	–	√
Purple Moorhen	–	–	–	–	–	√	–	–
Red-vented Bulbul	√	√	–	√	√	–	√	–
Black Myna	√	–	–	–	–	–	–	–

(√- presence; - absence)

Table 4: Birds damage in different developmental stages of crops

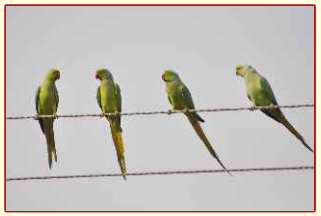
CROPS	Sowing/ Transplanting	Germination Stage	Vegetative Stage	Maturing Stage
Paddy	√	–	–	√
Wheat	√	√	–	√
Maize	√	√	–	√
Mustard	√	√	–	√
Sunflower	√	–	–	√
Pulses	√	√	–	√
Horticulture Crops	–	–	–	√

(√- presence; - absence)

Depredatory Birds of Agricultural Ecosystem:

1. Rose-ringed Parakeet *Psittacula krameri*

(Order: Psittaciformes; Family: Psittacidae)



Rose-ringed Parakeet is also commonly known as *Tota*. It is one of the most destructive depredatory bird species in cultivated areas of Punjab.

Size: Its body size is approximately 42 cm.

Identifying features: It has bright red bill and long tail and having all green colored body. Males have chin stripe and collar whereas female lacks it.

Distribution: It is resident bird, very adaptable and it associates with human habitation and cultivation.

Habitat: Its habitat also included grain storage facilities, markets, deciduous trees, secondary growth, gardens and vicinity of habitation.

Breeding: Its breeding season ranges from February-April and form nests in holes of tree trunks or can excavated its nesting holes. Fledglings become independent and leave nest holes before monsoon season.

Feeding habits: The foraging behavior of parakeet is gregarious in nature, feeds and roosts in large flocks.

Damaging status: It is observed to cause damages to cereals, pulses, oilseeds, fruits and vegetables in standing crops, orchards and gardens.

Indian Wildlife Protection Act Status: Schedule IV

Status in Punjab: There has been observed shift in its preferred trees for nesting from traditional to agro forestry trees in recent years. Large flocks are often observed at grain store facilities. Orchard owners use variety of methods both traditional and mechanical like cracker fire gun / acetylene gas powered guns to scare them from fruiting trees. Netting has been found to be the most successful and efficient method to reduce parakeet damage.

2. Alexandrine Parakeet *Psittacula eupatria*

(Order: Psittaciformes; Family: Psittaculidae)

Alexandrine Parakeet is one of the largest parakeets also commonly known as *Raa Tota.* It is observed in good numbers in districts like Gurdaspur, Pathankot and Hoshiarpur; and also inhabits major wetlands like Harike and Nangal.

Size: Its body size is approximately 53 cm.

Identifying features: It is having red bill and maroon colored shoulder patch. Males have black chin stripe joining pink and turquoise hind collar. Females and juveniles don't have black chin stripe and hind collar.

Distribution: It is resident bird of Punjab. It is found in areas having good forest cover and uneven terrains.

Habitat: Its habitat is like Rose-ringed Parakeet which includes grain storage facilities, deciduous trees, secondary growth, gardens and vicinity of habitation.

Breeding: Its breeding season coincides with that of Rose-ringed Parakeet; ranges from February-April. More than one brood has been noted in a breeding season.

Feeding habits: Foraging habits of alexandrine parakeet include feeding on fruits in orchards and on grains particularly at grain godowns.

Damaging status: It is observed to cause damages to cereals, pulses and oilseeds at post harvest facilities. Damage levels are high at solitary fruiting trees and in small acreage orchards.

Indian Wildlife Protection Act Status: Schedule IV

Status in Punjab: Localized damage has been noted at preferred sites like orchards and grain stores near tree plantations.

3. House Crow *Corvus splendens*

(Order: Passeriformes; Family: Corvidae)

House Crow commonly known as *Kan* in vernacular language is an opportunist birds and can feed on variety of food available.

Size: Its body size is approximately 43 cm.

Identifying features: It has mostly black plumage; forehead crown and throat are glossy black contrasting with dusky gray nape, neck, upper breasts and upper back.

Distribution: It is resident bird, very adaptable and it associates with human habitation and cultivation.

Habitat: Its habitat has wide range; commonly found in rural / urban areas, cultivation and forest edges. It lives in close association with man and their habitat.

Breeding: Its breeding season ranges from April- August in this region. It makes nest in the form of a platform of twigs intermixed with iron wire, coir fibers, etc. and lays 4-5, pale blue green, speckled and streaked with brown eggs in one clutch and both parents perform the duties of raring the chicks.

Feeding habits: It is very bold, cunning and omnivorous feeder. Gregarious behavior noted during feeding and roosting times. Scavengers at rubbish dumps, seeks invertebrates and grain in cultivation near villages.

Damaging status: It causes damages to crops by pulling out freshly sown seeds of cereals, pulses, oilseeds and feeding on matured maize cobs and horticultural crops.

Indian Wildlife Protection Act Status: Schedule V

Status in Punjab: Because of wide-spread distribution it has been noted causing damage on maize and other cereals at sowing stages. Large numbers of House crows, Cattle Egrets and Common Myna are observed at waste/garbage dumps and at animal flaying centers in villages and small towns.

4. Rock Pigeon *Columba livia*

(Order: Columbiformes; Family: Columbidae)

The Rock Pigeon is also known as *Gola Kabutar.*

Size: It has body size of 33 cm.

Identifying features: Grayish with glistering metallic green, purple green on neck, blackish terminal band on grey tail, short, broad black bars across inner wing

Distribution: It is resident and having wide distribution.

Habitat: Its lives in flocks and colonies near human's habitation, villages, towns and cities. It lives in colonies all throughout the year.

Breeding: Its nest is a flimsy collection of a few sticks on ledge, on refers, ceilings of houses and it lays two white elliptical eggs.

Feeding habits: Feeds chiefly in cultivations, mainly on seeds, pulses, grains and also eats green shoots.

Damaging status: It pulls out newly sown seeds of cereal, pulse and vegetable crops.

Indian Wildlife Protection Act Status: Schedule IV

Status in Punjab: It is widely distributed in agricultural landscapes. Their population runs into hundreds in cities where people offer grains. Flocks observed foraging either in newly sown cereal /pulses fields or gleaning in fields after harvesting operations.

5. Indian Peafowl *Pavo cristatus*

(Order: Galliformes; Family: Phasianidae)

The Indian Peafowl also known as *Mor*. It is our national bird and well known for its beautiful plumage.

Size: It has a body size approximately 122 cm.

Identifying features: Male and females can be differentiated on the basis of appearances. Male has blue neck and breast and long, trailing bronze, green upper tail coverts ending in blue green while females are duller having lower neck metallic green instead of blue and lacks the long train.

Distribution: It is resident and having wide-spread distribution.

Habitat: It inhabits dense scrub, villages and cultivations. It can be commonly seen in cultivated areas and in light wooded habitats.

Breeding: Its breeding season ranges from January-October and built a nest having shallow scrape in ground in dense thicket lined with leaves and sticks. It lays 3 eggs of glossy pale cream color.

Feeding habits: Feeds chiefly in cultivations, mainly on grains, vegetables shoots, insects, lizards and snakes.

Damaging status: It causes damage to germinating crops.

Indian Wildlife Protection Act Status: Schedule I

Status in Punjab: Indian Peafowl is of considerable abundance in some districts like Patiala, Hoshiarpur, some locations like Mirzapur water body (Mohali), Harike wetland surroundings, Ropar wetland, foothills near Ballowal Saunkeri and forest belt along canal in district Fatehgarh Sahib.

6. Common Myna *Acridotheres tristis*

(Order: Passeriformes; Family: Passeridae)

It is also known as *Lalri/Gutar/Shark* in local language. It is a familiar bird in villages, towns and cities.

Size: Its body size is 25 cm.

Identifying features: It is having rich vinous-brown plumage, Black head, neck, upper breast, during flight, blackish tail, with broad, white tips to all but central feathers. Abdomen is whitish in color. Sexes are alike in Common Myna.

Distribution: It is resident and having wide distribution.

Habitat: It lives in pairs and flocks near human's habitation, villages, towns and cities.

Breeding: Its breeding season ranges from April-August. It is a cavity nester and builds nest in a hole of tree, wall, ceiling etc. Its nest is a collection of twigs, roots, paper and rubbish, sometime shed skins of snakes are also used. The eggs are glossy blue and ranges from 4-5 in single clutch.

Feeding habits: Common Myna is omnivorous and can feed on fruits, cereals, nectar, insects, kitchen scraps and refuse. It follows grazing cattle or the plough for insects and invertebrates or feeds in cultivation. It has observed in large number at waste/garbage disposal sites.

Damaging status: It is also reported to cause very negligible damage.

Indian Wildlife Protection Act Status: Schedule IV

Status in Punjab: It is having high abundance in areas adjoining habitations. Common Myna population along with Rock Pigeon has increased in recent years because of supplemental feeding sites in urban areas.

7. Ring Dove *Streptopelia decaocto*

(Order: Columbiformes; Family: Columbidae)

Ring Dove commonly known as *Ghuggi.*

Size: Ring Dove has a body size of 32 cm.

Identifying features: It is pale grey and Brown color distinguished by prominent narrow black half ring or collar on the hind neck. The breast is lilac, turns into ashy grey on abdomen and darker grey on remaining under parts. Its broad whitish tips to brown tail feathers, can be seen as a terminal band when fanned during landing. Its bill is brownish swollen at the base and the feet are dark pinkish red or magenta in color.

Distribution: It is resident and having wide distribution.

Habitat: It can be easily seen in human habitation especially cultivated land. Small parties are noted during non-breeding season and it associates with other doves.

Breeding: Its breeding season is throughout the year. Its builds it nest in a bush or small tree, rarely in human dwellings and is scanty twig platform like structure. It lays two white eggs.

Feeding habits: Large gatherings feed in cultivated areas, paddy stubbles, newly sown millet fields, matured mustard and sunflower.

Damaging status: It causes damage to crops during post harvest stage, on the threshing ground or in the godown.

Indian Wildlife Protection Act Status: Schedule IV

Status in Punjab: It is having good abundance and widely distributed like Rock Pigeon. Large flocks along with other dove species are often seen feeding/foraging in fields after crop harvesting operations. In godowns with open plinth storage, it causes damage along with other granivores.

8. Baya Weaver *Ploceus philippinus*

(Order: Passeriformes; Family: Passeridae)

It is also known as *Bijra* or *Baya* locally.

Size: Its body size is 15 cm.

Identifying features: Female and male in non breeding plumage are having dark-streaked fulvous brown above, plain whitish reddish yellow below. It has a stout conical bill short square-cut tail.

Distribution: It is resident species and usually lives in flocks and colonies.

Habitat: It roosts in large numbers bordering ponds, found in paddy and cereal cultivation, which provides nesting material and food.

Breeding: During breeding season which ranges from May to September, male has bright yellow breast, cream buff on under parts. It mainly flocks about open cultivations and agricultural fields. Its nest is a swinging retort-shaped structure with long vertical entrance tube, woven with strips of paddy leaf and rough edged grasses. It lays 2-4 eggs of pure white colorations.

Feeding habits: It feeds in large flocks, gleaning paddy fields and other grains in harvested fields. It is omnivorous, feeds on cereal grains, seeds of weeds and also eats insects.

Damaging status: It damages ripening crops.

Indian Wildlife Protection Act Status: Schedule IV

Status in Punjab: It has localized distribution as was noted during surveys. Colonies of baya weaver birds have been found near canals in wild grasses, near sugarcane fields and on Acacia/ Date palm trees. Damage has been found low to mild in field adjoining to their colonies. Being omnivorous and particularly insect eater in breeding season, it has dual role in agriculture.

9. Purple Moorhen *Porphyrio porphyrio*

(Order: Gruiformes; Family: Rallidae)

Purple Moorhen is also known as *Nili Jalkukari.*

Size: The size of the bird is 51 cm.

Identifying features: It is having dark, shiny indigo or purple feathers and red bills and frontal shields. Plumage color of their backs and wings are dark green, brown or black with a green sheen. Their tails are short, and they have bright white feathers on the undersides of their tails. Their legs are long, scaly, and orange-red.

Distribution: It is resident species and can be seen in small flocks.

Habitat: It lives in freshwater ponds and wetlands which containing plenty of vegetation.

Breeding: It makes its nest in a large pad of interwoven reed flags, etc., on a floating debris or amongst reeds slightly above water level in swamps. It lays 3–6 speckled eggs, pale yellowish stone to reddish buff, blotched and spotted with reddish brown.

Feeding habits: They eat the bulbs of aquatic plants, vegetable matter, small animal prey and browse on the shoots of marsh grasses and reeds.

Damaging status: Causes occasional and localized damage in paddy nurseries before transplantation and even after transplantation.

Indian Wildlife Protection Act Status: Schedule IV

Status in Punjab: It is one of the ubiquitous species noted around village ponds and large water bodies. Even though it is very less in abundance but localized damage have been recorded in paddy at its initial stages near ponds. Small parties of 15-20 birds have been noted causing damage to paddy nurseries and at transplantation stage.

10. Bank Myna *Acridotheres ginginianus*

(Order: Passeriformes; Family: Sturnidae)

Size: Its body is 23 cm.

Identification feature: Bank Myna has orange-red orbital patch and a prominent orange-yellow bill. It is bluish grey with blackish cap. The juveniles are duller and browner than adults.

Distribution: It is resident bird and is wide-spread in northern and central India.

Habitat: It is widely distributed in damp grasslands, cultivation areas near villages and is often associated with grazing animals.

Breeding: Breeding season starts from March and lasts till August. The nest is always built in earth walls, on the banks of rivers, embankments or the sides of open wells. The nest is lined with grass, feathers and sometimes snake sloughs. Mostly clutch size is of 4-5 pale sky blue or greenish-blue eggs. Two broods have been recorded in the same season. The eggs hatch after about 13 to 14 days. Nestlings open their eyes after about 5 days and fledge in about 21 days.

Feeding habits: It is omnivorous and feeds on grains, insects and fruits. Like Common Myna they also follow grazing animals picking up disturbed insects or even ticks on the animals.

Damage: It causes minor damage during harvesting and post harvesting season of wheat, paddy and maize crop. In grape vines, it causes damage to unripe/ ripe berries. It has been recorded solitary or in pairs or small parties cause damage to different fruit tree types.

IWPA status: Schedule IV

Status in Punjab: Population abundance is good and more or less evenly distributed in small towns in rural areas and at peripheral areas of urban settlements. There has been observed large number of nesting sites of this species in storm holes of flyovers and cavities in bridges throughout Punjab.

11. Red-vented Bulbul *Pycnonotus cafer*

(Order: Passeriformes; Family: Pycnonotidae)

It is also known as *Bulbul or Guldum* locally.

Size: Its body size is approximately 20 cm.

Identifying features: It has black head with dark sooty brown plumage. Pale edges of feathers on back and breast give scaly appearance. The presence of white rump and red vent are distinctive feature. Dark tail tipped white. Sexes are alike.

Distribution: It is a resident species.

Habitat: It lives in pairs or in small loose flocks according to season usually keeping itself to middle level of trees and bushes. Light scrub, secondary growth, gardens and roadside avenues are the preferred sites.

Breeding: It breeds in the months of February-May and make nest in cup shape made up of rootlets, in a bush or tree, plastered outside with cobwebs. It lays 2-3 eggs of pinkish white, botched with purplish brown color. It has often been noted aggressively defending nests and nestlings from even large birds like Crows.

Feeding habits: Insects, fruits, grains of sorghum, pearl millet, flower nectar and kitchen wastes.

Damaging status: Solitary bird or pair has been noted to cause damage to ripening fruits especially in kitchen gardens. Damage level may be moderate to high on individual or solitary fruit plant.

Indian Wildlife Protection Act Status: Schedule IV

Status in Punjab: It has been commonly observed but in low abundance throughout the Punjab.

12. Little Brown Dove *Streptopelia senegalensis*

(Order: Columbiformes; Family: Columbidae)

It is also known as *Totru* locally.

Size: Its body size is approximately 27 cm.

Identifying features: Small, slim dove earthy brown and grey above Pinkish brown and white below with a miniature chessboard in rufous and black on either side of neck. It has black head with dark sooty brown plumage. Pale edges of feathers on back and breast give scaly appearance. The presence of white rump and red vent are distinctive feature. Dark tail tipped white. Sexes are alike.

Distribution: It is a resident species.

Habitat: It lives in pairs or loose flocks in dry scrub or semi-desert areas.

Breeding: It breeds in practically throughout year. Nest are flimsy twig platform in a Euphorbia clump, frequently also on rafters, etc. in inhabited dwellings..

Feeding habits: Seeds and grains gleaned on the ground.

Damaging status: Birds cause damage to crops during post harvest stage or on the threshing ground.

Indian Wildlife Protection Act Status: Schedule IV

Status in Punjab: It has been commonly observed but in low abundance throughout the Punjab.

Management of Depredatory birds

Birds, in general, are both useful and harmful to agriculture. Even the same species may be beneficial or problematic in different situations. Only a few of about 300 species of birds of Punjab cause problems in crop fields and granaries.

Harmful Birds: Parakeet is the major bird pest causing serious damage to almost all cereal crops. It is particularly harmful to sunflower. House crows damage sprouting maize, sunflower and maturing maize. Doves and pigeons damage pulses. Weaver birds damage stored grains at shellers and godowns. These birds also damage rice nurseries and maturing bajra and sorghum.

Table 5: Stage specific depredatory bird management methods

CROPS	Sowing/ Transplanting	Germination Stage	Maturing Stage
Paddy	RR/PN/B/JR	RR/PN/B/JR	RR
Wheat	RR/B	RR/B	–
Maize	RR/B/S	RR/B/S	RR/WL/S/SC/LC
Mustard	RR/PN/JR	RR/PN/JR	RR/B
Sunflower	RR/S	RR/S	RR/B/PN
Pulses	RR/PN	RR/PN	RR/B
Horticulture Crops	–	–	RR/B/PN

Methods: RR-Reflective ribbon; PN- Poly net; B- Bioacoustics; JR- Jute Rope; S- Scare crow; WL- Wrapping of leaf; SC- Screen crop; LC-Lure crop

Management Techniques

(Part of the Package of Practices for crops of Punjab Rabi 2020-21, Punjab Agricultural University, Ludhiana)

❒ **Mechanical Control:**

- Use crackers to scare the birds at different intervals.
- Fixing of scare crows i.e. a discarded earthen pot painted to stimulate human like head supported with wooden sticks and clothed in human dress to give a humanlike appearance is one of the most effective traditional techniques to keep the birds away. Position, direction and the dress of the scare crow should be changed at least at 10 days interval. The height of the scare crow should be 1 meter above from the crop height.
- Use automatic bird scarers by shifting their position periodically.

❒ **Cultural Practices:**

- The traditional practices of planting 2-3 border rows of preferred and less remunerative crops like millet and dhaincha for reducing the bird pressure to the cash crops like sunflower and maize etc. Moreover, planting of these crops also act as physical barriers/ wind breakers and help in preventing lodging of crops during stormy/rainy days.
- As far as possible sowing of maize and sunflower crop should be avoided at sites most frequently visited by birds or where there are more resting sites like trees,electric wires, buildings etc.
- Crops sown in large area reduced the pressure of bird damage.

❒ **Alarming Calls:**

Playing of CD of distress or flock calls of parakeets and crows at high volume for ½ hr twice each in the morning between 7.00 to 9.00 a.m. and in the evening at 5.00 to 7.00 p.m., with a pause of 1 hour, scare the birds or halt their activities for full day in the freshly sown, emerging or maturing crop fields and in orchards. Use of distress or flock calls remain effective for 15-20 days. Better results can be obtained by using this technique in sequence or in combination with other methods as an integrated pest management. For covering larger area use of amplifier and additional speakers as per requirement can be used.

Different methods of management

- **Reflective Ribbon:** Ribbon was installed with the help of poles/ sticks, around the crops and at 30-45 cm above the crop canopy.
- **Poly bags:** Black Poly bags were installed with the help of sticks @ 40 polybags /acre, preferable at equal distance.
- **Wrapping of cobs:** Wrapping of cobs with the leaves of same plant were done for the outer 2 meter lines of maize plants.
- **Polynet:** It is installed around the periphery of field with the help of poles/ sticks.
- **Jute rope:** Fixing of Jute rope with the help of sticks/pegs, around the germinating/sprouting crop, at 1-2 meter interval, 30 cm above the ground in checkered patron of 1x1m.

Economics of Management methods

Damage estimation values are location specific and are not to be generalized for the entire area under crop.

Reflective Ribbon (@ 550 m / acre) costing an amount of Rs. 1720/- per acre (including labor). Bird damage estimation revealed 98-100% protection from depredatory birds.

Economic benefit to farmers:

Maize: The average yield of maize in Ludhiana during 2018-19 was 3925 kg/acre. The damage by depredatory birds to maize crop was 11.75%. The amount of maize damaged was 461.18 kg /acre with an economic value of Rs 8,115/acre (@Rs 1760/quintal MSP, 2019-20). By installing the reflective ribbon, farmer can save Rs 6,395/acre.

Paddy: The average yield of paddy in Ludhiana during 2018-19 was 2690 kg/acre. The damage by depredatory birds to crop was 10.50%. The amount of paddy damaged is 282.45 kg /acre with an economic value of Rs 5,126/acre (@Rs 1815/quintal MSP, 2019-20). By installing the reflective ribbon, farmer can save Rs 3,406/acre.

Poly bags (@ 40 polybags /acre) costing an amount of Rs. 530/- per acre (including labor) can be installed at germinating and maturity stage of maize crop.

Economic benefit to farmers - Maize crop: By installing the Poly bags, farmer will be able to save Rs 7,585/acre.

Wrapping of cobs (Labor cost @ Rs. 700/ acre; in 2 meter outer strip of plants) can be carried out in maize crop. By this method 97-98 % protection from bird pest species can be achieved.

Economic benefit to farmers - Maize crop: By using the wrapping the cobs method, farmer can save up to Rs 7,415/acre.

Polynet can be installed with one time installation cost approximately @ Rs 14,180 / acre) (including labor) around the periphery of field and supplemented by reflective ribbon @ Rs. 1720/- per acre. The installation of polynet is having one time cost for first year and afterward low cost maintenance for 3 years. There will be 100% protection from the birds.

Economic benefit to farmers:

Mustard : The average yield of mustard in Ludhiana during 2018-19 was 1948 kg/acre, the damage to mustard crop by depredatory birds was 17.41% then the amount of crop damaged was 339.14kg /acre with an economic value of Rs 15,000/acre (@Rs 4425/quintal MSP, 2019-20). By using the Polynet, farmer can get back the cost of polynet within one year and continue to protect the crop along with economic benefits after that, as polynet can be reused time and again.

Maize: Similarly like in mustard crop, by using the Polynet in maize crop, farmer can get back the cost of polynet within one year and protect the crop along with economic benefits after that, as it can be reused time and again.

Jute rope - Fixing of Jute rope around the sprouting mustard crop at 1-2 meter interval, 30 cm above the ground in checkered patron of 1x1m was used for protection of crop from Peafowl. Installation cost is Rs. 3500/acre including labor).

Economic benefit to farmers:

Mustard: By using the jute rope during germinating and reflective ribbon at maturing stage, farmer can save up to Rs 11,500/acre.

Insectivorous and Rodentivorous birds of agricultural ecosystem

1. Barn Owl *Tyto alba*

(Order:Strigiformes; Family:Tytonidae)

Barn Owl is also known as *Sunahiri Ulloo.*

Size: The size of Barn owl is 36 cm.

Identifying features: White face and black eyes. White to golden Buffy under parts finely spotted with black. Golden grey upper parts which are finely spotted with both black and white. Wings and tail appear uniform in flight.

Distribution: It is resident and widespread species.

Habitat: It is found to be associated with human habitations, nests in deserted buildings especially within cities and villages, also in caves and wells.

Breeding: The breeding season is undefined, throughout the year. It lays 4 to 7, white smooth roundish. Collection of straws, twigs, rags into tree hollow, holes in walls

Feeding habits: It feeds on rats and mice.

Status in Agriculture: It is very beneficial as it feeds on rats and mice.

Indian Wildlife Protection Act Status: Schedule IV

Status in Punjab: It has wide distribution. It has been mostly noted in areas having deserted buildings, ancient forts, dense vegetation and forest areas.

2. Black Drongo *Dicrurus macrocercus*

(Order: Passeriformes; Family: Dicruridae)

Black Drongo is also known as *Kalkalichi/Kotwal/Chepu.*

Size: The size of Black Drongo is 32 cm.

Identifying features: Slim and agile glossy blue bird. Long deeply forked tail usually shows white rectal spot, Moves singly on the open areas and about cultivation. Sexes are alike.

Distribution: It is resident and widespread species.

Habitat: Open areas, orchards, cultivation around villages, towns and cities. Single or in pairs. Gather in loose flocks in winter. Associated with grazing cattle. Perches singly on telegraph wires, bare treetop, earth bank or other vantage point in open areas. It catches insects in mid air or from the ground.

Breeding: The breeding season ranges from April to August. It lays 3 to 5 eggs having whitish coloration with brownish red spots; nest is flimsy, bottomed cup of fine twigs and fibers cemented with cobwebs.

Feeding habits: Insects, supplements with flower nectar, grains and small insects.

Status in Agriculture: It is very beneficial as it feeds on insects.

Indian Wildlife Protection Act Status: Schedule IV

Status in Punjab: It has wide distribution. It has been mostly noted in and around the cultivation around villages and suburbs of towns and cities, orchards and forest areas.

3. Black Ibis *Pseudibis papillosa*

(Order: Ciconiiformes; Family: Threskiornithidae)

Black Ibis is known as *Kala Buza* locally

Size: The size of Black Ibis is 68 cm.

Identifying features: Large black bird, Long curlew like down curved bill, White patch near shoulder, Brick red legs. Naked black head with triangular patch of crimson warts on the crown. Sexes are alike.

Distribution: It is resident species.

Habitat: Paddy fields, surrounding stubble and fallow land, marshes, found in neighborhood of rivers and canals.

Breeding: The breeding season ranges from March-October. Nest is large, cup-shaped made up of twigs, lined with straw and feathers, high up in tree, away from water. Clutch size is 2 to 4 having bright pale green eggs, either unmarked or with spots and streaks of brown.

Feeding habits: Insects, grains, small reptiles. Usually feeding around dry margins and in the surrounding stubble and fallow land.

Status in Agriculture: It is beneficial for agriculture as it feeds mostly on insects.

Indian Wildlife Protection Act Status: Schedule IV

Status in Punjab: It has been occasionally observed but in low abundance throughout the Punjab.

4. Black Kite *Milvus migrans*

(Order: Falconiformes; Family: Accipitridae)

Black Kite also known as *Ill/Chil*or Pariah kite

Size: The size of Black Kite is 61 cm.

Identifying features: Commonest raptor large brown hawk, forked tail, Sexes alike, Singly or gregariously scavenging in towns and villages, White patch on underside of wings.

Distribution: It is resident species.

Habitat: Confirmed commensal of man and usually found in neighborhood of human habitations.

Breeding: The breeding season spread practically all year. Nest is untidy platform of twigs, iron wire, tow, rags, rubbish, up in a large tree or on roof or building. It lays 2 to 4 eggs having dirty pinkish and white color, lightly spotted and blotched with reddish brown.

Feeding habits: Offal, garbage, earthworms, winged termites, lizards, mice, young birds.

Status in Agriculture: It is beneficial for agriculture.

Indian Wildlife Protection Act Status: Schedule IV

Status in Punjab: It has wide distribution and in good abundance. It has been mostly noted in and around the vicinity of human habitations.

5. Cattle Egret *Bubulcus ibis*

(Order: Ciconiiformes; Family: Ardidae)

Cattle Egret is also called as *Badami Bagla*

Size: The size of Cattle Egret is 53 cm.

Identifying features: In non-breeding, distinguished from little egret by color of bill and from other egrets by size while in breeding, the conspicuous Buffy-orange plumes on head, neck and back. Mostly follow grazing cattle. Sexes are alike.

Distribution: It is resident species.

Habitat: Found mostly in agricultural habitat, grasslands, marshes, lakes and forest clearings.

Breeding: The breeding season ranges from June to August. Nest is an untidy twig platform like a crow's nest, mostly form nests in large numbers in colonies known as heronries. It lays 3 to 5 eggs having pale skim-milk blue color.

Feeding habits: Gregarious, feed on agricultural pests, insects, frogs, reptiles and follows tractors. Scavengers at garbage dumps and slaughter houses.

Status in Agriculture: It is beneficial for agriculture.

Indian Wildlife Protection Act Status: Schedule IV

Status in Punjab: It has wide distribution and in high abundance. It has been mostly seen in agricultural habitat, grasslands, marshes, following grazing cattle and tractors performing field preparation activities.

6. Collared Scops-owl *Otus bakkamoena*

(Order: Strigiformes; Family: Strigidae)

Collared Scops-owl is also known as *KalarwalaUlloo* locally.

Size: The size of this bird is 24 cm.

Identifying features: Grey brown or rufous brown, little horned owl, pale half collar on upper back, sexes alike.

Distribution: It is resident species.

Habitat: Found in areas having cultivation, agricultural habitat, evergreen trees in or near towns and villages.

Breeding: The breeding season ranges from January to April. Nest is a natural hollow in a tree-trunk. It lays 3 to 5 eggs having white color with spherical shape.

Feeding habits: Beetles and other insects, mice and lizards.

Status in Agriculture: It is beneficial for agriculture.

Indian Wildlife Protection Act Status: Schedule IV

Status in Punjab: Population abundance is low and distributed in small towns in rural areas.

7. Common Hoopoe *Upupa epops*

(Order: Coraciiformes; Family: Upupidae)

Common Hoopoe is also known as *Chakkiraha/ Bebedukh* locally.

Size: The size of this bird is approximately 31cm.

Identifying features: Rufous orange or orange buff with striking black and white wings and tail. Black tipped fan like crest, usually held flat and long. Thin down curved bill. Broad rounded wings in flight. Sexes are alike.

Distribution: It is resident migrant species showing small migrations.

Habitat: Single or in pairs, usually seen on ground in light wooded areas. Perches and roosts in trees, search food on ground, running and walking actively, probing and pecking. Found in cultivation, villages and open light forests.

Breeding: Breeding season ranges from February to May. Nest is a Natural tree-hollow, or hole in a wall or ceiling of building, untidy lined with rags, rubbish, straw and lays 5 to 6 white eggs.

Feeding habits: Insects, grubs and pupae.

Status in Agriculture: It is beneficial for agriculture.

Indian Wildlife Protection Act Status: Schedule IV

Status in Punjab: Its population abundance is low and can be seen single or in pairs around open cultivations.

8. Green Bee-eater *Merops orientalis*

(Order: Coraciiformes; Family: Meropidae)

Green Bee-eater also known as *Makhi khora.*

Size: The size of Green Bee-eater is 16-18 cm with 5-7 cm elongated central tail-feathers.

Identifying features: It is a grass-green bird, having a golden-brown crown, a black eye-stripe above bluish throat and cheeks, which are separated from the breast by a thin black line. The dark bill is thin, sharp and slightly curved. It has two prominent elongated feathers that extend from the green tail.

Distribution: It is resident species but local summer migration was also present and it mostly lives in flocks.

Habitat: It is found in open countryside, often close to habitation and cultivation, and in wooded areas It is usually seen in pairs or small groups on wires and fence posts.

Breeding: The breeding months are from February to May. The birds usually nest in colonies, excavating horizontal tunnels, in the sides of earth banks, mounds, dry nullahs and burrow pits. It lays 4 to 7 eggs of pure white color and roundish ovals.

Feeding habits: It feeds on bees and other insects.

Damaging status: It has dual role i.e. beneficial as it is insectivorous and harmful as some time it causes damage to honey bee colonies by eating bees.

Indian Wildlife Protection Act Status: Schedule IV

Status in Punjab: It has wide distribution but seasonal in abundance. It has been mostly noted in areas having canals with wild vegetation and near wetlands. Large groups have been observed near apiaries; honey growers often use scaring methods to save bees from predation.

9. Spotted Owlet *Athene brama*

(Order: Strigiformes; Family:Strigidae)

Spotted Owlet is also known as *Chugal*.

Size: The size of this bird is approximately 21cm.

Identifying features: Grayish brown plumage, spotted white. Yellowish eyes, brown whitish buff nuchal collar, no ear tuffs. Sexes are alike.

Distribution: It is resident species.

Habitat: Pairs or small parties, roosts during day in leafy branches, tree cavities or a cavity in a wall, ruins and groves of old trees.

Breeding: Breeding season ranges from November to April. Nest is an untidy pad of tow or fibers in tree holes, hollows in crumbling walls, ceilings and roofs and lays 3 to 4 white roundish oval eggs.

Feeding habits: Beetles, moths, locusts, other insects. Also prey on lizards and mice.

Status in Agriculture: It is beneficial for agriculture.

Indian Wildlife Protection Act Status: Schedule IV

Status in Punjab: It has wide distribution and good abundance throughout the Punjab.

10. Indian Roller *Coracias benghalensis*

(Order: Coraciiformes; Family: Coraciidae)

Indian Roller is also known as *Nil Kanth/Garar*

Size: The size of this bird is approximately 31cm.

Identifying features: Pale greenish brown above, Rufous brown breast. Deep blue tail has light blue sub terminal band. In-flight the dark and pale blue portion of the wings shows up as brilliant bands. Solitary or in pairs. Perches on overhead wire etc. preferably in open cultivated areas. Sexes are alike.

Distribution: It is resident species.

Habitat: Spends most of the day on prominent perch such as telegraph wires and dead trees in open areas. Aggressively territorial throughout the year. Open areas, cultivation, orchards and open deciduous forests.

Breeding: Breeding season ranges from March to July. Nest is a collection of straw, rags, rubbish in tree hollow at moderate heights and lays 4 to 5 glossy white eggs.

Feeding habits: Insects, catches small lizards, frogs, small rodents and snakes.

Status in Agriculture: It is beneficial for agriculture.

Indian Wildlife Protection Act Status: Schedule IV

Status in Punjab: It has wide distribution and occasionally seen in open and cultivated areas mostly single and in pairs during breeding season.

11. Red-wattled Lapwing *Vanellus indicus*

(Order: Charadriiformes; Family: Charadriidae)

Red-wattled Lapwing is also known as *Tatihri*

Size: The size of Red-wattled Lapwing is approximately 33 cm.

Identifying features: Familiar plover, bronze-brown above, white below, with black breast, head and neck, more leggy, Crimson fleshy wattle in front of each eye. Broad band from behind eyes running down sides of neck to meet the white under parts. Sexes are alike.

Distribution: It is resident species.

Habitat: Open areas, ploughed fields, grazing land and margins of ponds.

Breeding: Breeding season ranges from March to August. Nest is on bare ground in open wasteland, with depression ringed around with few pebbles and harvested fields and lays 4 peg-top shaped, stone colored grayish brown eggs which are blotched with blackish color.

Feeding habits: Insects, grubs, mollusks etc.

Status in Agriculture: It is beneficial for agriculture.

Indian Wildlife Protection Act Status: Schedule IV

Status in Punjab: It has wide distribution and good abundance easily seen in open and cultivated areas in pairs during breeding season and in groups during non-breeding seasons.

Conservation of predatory birds

Predatory birds like owls, falcons, hawks, eagles, kites etc. eat large number of rats and mice. A single owl normally eats 4-5 rats a day. Insect eating birds like drongos, babblers, shrikes, lapwings, mynas and many other small birds eat away numerous insect pests. Even grainivor birds like sparrows and weaver birds feed a large number of insects to their young ones. A single pair of house sparrow feed insects to their young about 250 times a day. Therefore, the useful birds should not be killed. Rather they can be attracted to crop fields in several different ways and efforts can be made for conservation of beneficial bird species. Artificial nests are being utilized as a common conservation tool to augment the population of cavity nesting birds that are beneficial to our ecosystem. To combat the decline of and to conserve the beneficial bird species, experiments on use of artificial (wooden and earthen) nests were done under the All India Network Project on Vertebrate Pest Management (Agricultural Ornithology). Artificial nests were installed at selected locations in different habitat types in the field areas, urban and rural areas of different districts of Punjab *i. e.* Jalandhar, Ropar, Ludhiana, Shaheed Bhagat Singh Nagar, Fatehgarh Sahib, Barnala and Gurdaspur. Breeding success of cavity nestsing birds have been encouraging at farmer fields in different villages. These artificial nests were observed to be occupied by six bird species i.e. Common Myna *Acridotheres tristis*, Spotted Owlet *Athene brama*, Collared Scops Owl *Otus bakkamoena,* Magpie Robin *Copsychus saularis*, House Sparrow *Passer domesticus* and Blue Jay *Coracias benghalensis*. The successful breeding of beneficial bird species in artificial nests has the potential to augment the relative abundance of these beneficial bird species and their reproductive success in agro ecosystem of Punjab.

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Sr. No/Order/ Family	Common Name	Scientific Name	Status in Punjab	Residential Status	Food	IUCN status	Habitat
Anseriformes							
Anatidae							
1.	Northern Pintail	*Anas acuta* Linnaeus, 1758	UC	M	P, SI	LC	C
2.	Northern Shoveller	*Anas clypeata* Linnaeus , 1758	LC	M	P, SI	LC	C
3.	Common Teal	*Anas crecca* Linnaeus, 1758	UC	M	P	LC	C
4.	Eurasian Wigeon	*Anas penelope* Linnaeus, 1758	UC	M	P	LC	C
5.	Mallard	*Anas platyrhynchos* Linnaeus, 1758	LC	RM	I, SI, P	LC	C
6.	Spot Billed Duck	*Anas poecilorhyncha* Forster, 1781	VC	RM	SV,P	LC	C
7.	Garganey	*Anas querquedula* Linnaeus, 1758	UC	M	P	LC	C
8.	Gadwall	*Anas strepera* Linnaeus, 1758	UC	M	P	LC	C
9.	Bar Headed Goose	*Anser indicus* (Latham, 1790)	UC	RM	P	LC	C
10.	Common Pochard	*Aythya ferina* (Linnaeus, 1758)	UC	M	P, SV	LC	C
11.	Tufted Pochard	*Aythya fuligula* (Linnaeus,1758)	UC	M	SI, P	LC	C
12.	Ferruginous Pochard	*Aythya nyroca* (Guldenstadt, 1770)	UC	RM	P, SI	NT	C
13.	Lesser-whistling Duck	*Dendrocygna javanica* (Horsefield, 1821)	UC	R	SI, P	LC	C
14.	Red-crested Pochard	*Rhodonessa rufina* (Pallas, 1773)	UC	M	P, SI	LC	C
15.	Comb Duck	*Sarkidiornis melanotos* (Pennant1769)	UC	R	P, G	LC	C
16.	BrahminyShelduck	*Tadorna ferruginea* (Pallas, 1764)	C	RM	P, F	LC	C
17.	Common Shelduck	*Tadorna tadorna* (Linnaeus, 1758)	C	M	G, SV, P	LC	C

Sr. No/Order/ Family	Common Name	Scientific Name	Status in Punjab	Residential Status	Food	IUCN status	Habitat
Apodiformes							
Apodidae							
18.	House Swift	*Apus affinis* (J.E.Gray,1830)	C	RM	I	LC	AB
Charadriiformes							
Scolopacidae							
19.	Common Sandpiper	*Actitis hypoleucos* (Linnaeus, 1758)	VC	RM	I, SI	LC	C
20.	Dunlin	*Calidris alpine* (Linnaeus, 1758)	C	M	SI, I	LC	C
21.	Little Stint	*Calidris minuta (Leisler, 1812)*	C	M	SI	LC	C
22.	Broad-billed Sandpiper	*Limicola falcinellus (Pontoppidan, 1763)*	UC	M	SI	LC	C
23.	Wood Sandpiper	*Tringa glareola* Linnaeus, 1758	C	M	I, SI	LC	C
24.	Common Green Shank	*Tringa nebularia* (Gunner, 1767)	C	M	I, SI	LC	C
25.	Green Sandpiper	*Tringa ochropus* Linnaeus, 1758	C	M	I, SI	LC	AC
26.	Marsh Sandpiper	*Tringa stagnatilis* (Bechstein, 1803)	LC	M	I, SI	LC	C
27.	Common Red Shank	*Tringatotanus* (Linnaeus, 1758)	LC	RM	SI	LC	C
Burhinidae							
28.	Stone Curlew	*Burhinusoedicnemus* (Linnaeus, 1758)	C	R	I, SI	LC	A
29.	Great Stone-plover	*Esacusrecurvirostris* (Cuvier, 1829)	LC	R	I	LC	C
Charadriidae							
30.	River Lapwing	*Vanellusduvaucelii* (Lesson,1826)	LC	R	I, SI	NT	C
31.	Red-wattled Lapwing	*Vanellusindicus* (Boddaert,1783)	VC	R	I, SI	LC	AB

Sr. No/Order/ Family	Common Name	Scientific Name	Status in Punjab	Residential Status	Food	IUCN status	Habitat
Jacanidae							
32.	Pheasant Tailed Jacana	*Hydrophasianus chirurgus* (Scopoli, 1786)	LC	R	SI, I	LC	C
Laridae							
33.	Gull-billed Tern	*Gelochelidon nilotica* (Gmelin, 1789)	LC	RM	SI, I	LC	C
34.	Pallas's Gull	*Ichthyaetusi chthyaetus* Pallas, 1773	LC	M	P, SI, SV	LC	C
35.	Little Tern	*Sterna albifrons* Pallas, 1764	LC	R	SI, I	LC	C
36.	River Tern	*Sterna aurantia* J.E. Gray 1831	LC	R	SI, I, SV	NT	C
Recurvirostridae							
37.	Black-winged Stilt	*Himantopus himantopus* (Linnaeus, 1758)	VC	R	I	LC	AB
Ciconiiformes							
Ardeidae							
38.	Grey Heron	*Ardea cinerea* Linnaeus, 1758	LC	RM	SI, SV	LC	C
39.	Goliath Heron	*Ardea goliath* Cretzschmar, 1827	LC	V	SV	LC	C
40.	Purple Heron	*Ardeapurpurea* Linnaeus, 1766	LC	RM	SV	LC	C
41.	Indian Pond Heron	*Ardeolagrayii* (Skyes,1832)	VC	R	I,SI, SV	LC	AC
42.	Black Crowned Night Heron	*Nycticorax nycticorax* (Linnaeus, 1758)	C	R	I,SI	LC	AC
43.	Cattle Egret	*Bubulcus ibis* (Linnaeus,1758)	VC	RM	I, SI	LC	AC
44.	Great Egret	*Ardea alba* Linnaeus, 1758	LC	R	SI, SV	LC	C
45.	Little Egret	*Egretta garzetta* (Linnaeus, 1766)	C	R	I, SI	LC	C
46.	Median Egret	*Mesophoyx intermedia* (Wagler, 1827)	LC	RM	I, SI	LC	C

Sr. No/Order/ Family	Common Name	Scientific Name	Status in Punjab	Residential Status	Food	IUCN status	Habitat
Threskiornithidae							
47.	Glossy Ibis	*Plegadis falcinellus* Linnaeus, 1766	LC	RM	I, SI	LC	AC
48.	Oriental White Ibis	*Threskiornis melanocephalus* (Latham, 1790)	C	R	I, SI	NT	AC
49.	Black Ibis	*Pseudibis papillosa* (Temminck,1824)	C	R	I, G	LC	AC
Ciconiidae							
50.	Asian Open-bill Stork	*Anastomus oscitans* Boddaert 1783	LC	R	SV, I	LC	C
51.	European White Stork	*Ciconia ciconia* (Linnaeus, 1758)	LC	M	SV, I	LC	C
52.	White-necked Stork	*Ciconia episcopus* (Boddaert, 1783)	LC	R	SV, SI	LC	C
53.	Painted Stork	*Mycteria leucocephala* (Pennant, 1769)	LC	RM	SV, SI	NT	C
Columbiformes							
Columbidae							
54.	Blue Rock Pigeon	*Columba livia* Gmelin,1789	VC	R	G	LC	AB
55.	Spotted Dove	*Streptopelia chinensis* (Scopoli,1786)	C	R	G	LC	AB
56.	Eurasion Collared Dove	*Streptopelia decaocto* (Frivaldszky,1838)	VC	R	G	LC	AB
57.	Oriental Turtle-Dove	*Streptopelia orientalis* (Latham, 1790)	C	RM	G	LC	AB
58.	Little Brown Dove	*Streptopelia senegalensis* (Linnaeus,1766)	VC	R	G	LC	AB
59.	Red-collared Dove	*Streptopelia tranquebarica* (Hermann, 1804)	C	R	G	LC	AB
60.	Yellow-legged Green Pigeon	*Treron phoenicoptera* (Latham, 1790)	LC	R	F	LC	A

Sr. No/Order/ Family	Common Name	Scientific Name	Status in Punjab	Residential Status	Food	IUCN status	Habitat
Alcedinidae							
61.	Small Blue Kingfisher	*Alcedo atthius* (Linnaeus,1758)	LC	RM	I, SV	LC	C
62.	Lesser Pied Kingfisher	*Ceryle rudis (*Linnaeus, 1758*)*	C	R	I, SV	LC	C
63.	White-breasted Kingfisher	*Halcyon smyrnensis* (Linnaeus,1758)	VC	R	I, SV	LC	ABC
Bucerotidae							
64.	Indian Grey Hornbill	*Ocyceros birostris (Scopoli, 1786)*	C	R	F,I	LC	AB
Coraciidae							
65.	Indian Roller	*Coracias benghalensis* (Linnaeus,1758)	C	R	I	LC	A
66.	European Roller	*Coracias garrulous* Linnaeus, 1758	R	RM	I	NT	A
Meropidae							
67.	Green Bee-eater	*Merops orientalis* Latham,1801	VC	R	I	LC	A
68.	Blue-tailed Bee-eater	*Merops philippinus* Linnaeus, 1766	LC	RM	I	LC	A
Upupidae							
69.	Common Hoopoe	*Upupa epops* (Linnaeus,1758)	C	RM	I	LC	AB
Cuculiformes							
Cuculidae							
70.	Lesser Coucal	*Centropus bengalensis* (Gmelin, 1788)	LC	R	I,SI, SV	LC	A
71.	Greater Coucal	*Centropus sinensis* (Stephens, 1815)	C	RM	I,SI, SV	LC	A
72.	Pied Crested Cuckoo	*Clamator jacobinus* (Boddaert, 1783)	LC	RM	I	LC	AB
73.	Asian Koel	*Eudynamys scolopacea* (Linnaeus,1758)	C	R	I,F	LC	AB
74.	Brain Fever Bird	*Hierococcys varius* (Vahl,1797)	LC	R	I,F	LC	AB

Sr. No/Order/ Family	Common Name	Scientific Name	Status in Punjab	Residential Status	Food	IUCN status	Habitat
Falconiformes							
Accipitridae							
75.	Besra Sparrow Hawk	*Accipiter virgatus* (Temminck, 1822)	LC	R	SV, I	LC	D
76.	Shikra	*Accipiter badius* (Gmelin,1788)	C	R	I, SV	LC	AB
77.	Eastern Imperial Eagle	*Aquila heliacal* Savigny, 1809	LC	RM	SV	VU	AD
78.	Tawny Eagle	*Aquila rapax* (Temmnck, 1828)i	LC	R	SV	LC	ABD
79.	White-eyed Buzzard	*Butastur teesa* (Franklin, 1832)	LC	R	SV, I	LC	AD
80.	Pallied Harrier	*Circus macrourus* Gmelin, 1770	LC	M	SV	NT	ABD
81.	Black-shouldered Kite	*Elanus caeruleus* (Desfontaines,1789)	C	R	I,R	LC	AB
82.	Black Kite	*Milvus migrans* (Boddaert,1783)	VC	R	I,R	LC	AB
83.	Egyptian Vulture	*Neophron percnopterus* (Linnaeus,1758)	LC	RM	Carrion	EN	D
84.	Oriental-Honey-Buzzard	*Pernis ptilorhyncus*Temminck, 1821	LC	RM	I, SV	LC	AD
85.	Crested Serpent-Eagle	*Spilornis cheela* (Latham, 1790)	LC	R	SV	LC	AD
86.	Changeable Hawk Eagle	*Spizaetus cirrhatus* (Gmelin, 1788)	LC	R	SV	LC	AD
Falconidae							
87.	Common Kestrel	*Falco tinnunculus* Linnaeus,1758	LC	RM	I, SV	LC	AD
Pandionidae							
88.	Osprey	*Pandion haliaetus* Linnaeus,1758	LC	RM	SV	LC	AC
Galliformes							
Phasianidae							
89.	Black Francolin	*Francolinus francolinus* (Linnaeus,1766)	LC	R	G,I	LC	AB
90.	Grey Francolin	*Francolinus pondicerianus (Gmelin,1789)*	C	R	G,I	LC	AB
91.	Red Junglefowl	*Gallus gallus* (Linnaeus, 1758)	LC	R	G, I, P	LC	AD
92.	Indian Pea Fowl	*Pavo cristatus* Linnaeus,1758	C	R	G,P,I, SV	LC	AB

Sr. No/Order/ Family	Common Name	Scientific Name	Status in Punjab	Residential Status	Food	IUCN status	Habitat
Gruiformes							
Rallidae							
93.	White-breasted Waterhen	*Amaurornis phoenicurus* (Pennant,1769)	VC	R	I,SI,G,P	LC	ABC
94.	Common Coot	*Fulica atra* Linnaeus 1758	LC	RM	P, I, SI	LC	C
95.	Water-cock	*Gallicrex cinerea* (Gmelin, 1789)	LC	R	SI, I, P,G	LC	C
96.	Common Moorhen	*Gallinula chloropus* (Linnaeus,1758)	VC	RM	I,SI,G,P	LC	C
97.	Purple Moorhen	*Porphyrio porphyrio* (Linnaeus, 1758)	C	R	SI, P, I	LC	C
Passeriformes							
Acrocephalidae							
98.	Paddy Field Warbler	*Acrocephalus agricola (Jerdon, 1845)*	VC	RM	I	LC	A
Alaudidae							
99.	Eastern Sky lark	*Alauda gulgula Franklin, 1831*	C	R	I, G	LC	A
100.	Common Crested Lark	*Galerida cristata* (Linnaeus, 1758)	C	R	I,F	LC	A
Campephagidae							
101.	Scarlet Minivet	*Pericrocotus fammeus* (Forster, 1781)	LC	R	I	LC	AB
102.	Common Wood Shrike	*Tephrodornis pondicerianus* (Gmelin, 1789)	LC	R	I, SV	LC	A
Corvidae							
103.	Common Raven	*Corvus corax* Linnaeus 1758	*LC*	*R*	*O*	*LC*	ABD
104.	Jungle Crow	*Corvus macrorhynchos* Wagler,1827	LC	R	O	LC	AD
105.	House Crow	*Corvus splendens* Vieillot,1817	VC	R	O	LC	AB
106.	Indian Treepie	*Dendrocitta vagabunda* (Latham,1790)	VC	R	I,SV	LC	AB
107.	Yellow-bellied Blue Magpie	*Urocissa flavirostris* (Blyth, 1846)	LC	R	P, SV, F	LC	AB

Sr. No/Order/ Family	Common Name	Scientific Name	Status in Punjab	Residential Status	Food	IUCN status	Habitat
Dannidae							
108.	Great Grey Shrike	*Lanius excubitor* (Linnaeus,1758)	C	RM	I, SV	LC	A
Dicruridae							
109.	Black Drongo	*Dicrurus macrocercus* Viellot,1817	VC	R	I	LC	AB
Emberizidae							
110.	Red-headed Bunting	*Emberiza bruniceps* Brandt, 1841	LC	M	G	LC	A
Estrildidae							
111.	Red Munia	*Amandava amandava* (Linnaeus, 1758)	LC	R	G, F	LC	A
112.	White-throated Munia	*Lonchura malabarica* (Linnaeus,1758)	C	R	G, P	LC	AB
113.	Black-headed Munia	*Lonchura malacca* (Linnaeus, 1766)	C	R	I,G	LC	A
114.	Spotted Munia	*Lonchura punctulata* (Linnaeus,1758)	C	R	I,G	LC	AB
Fringillidae							
115.	Common Rose-finch	*Carpodacus erythrinus* (Pallas,1770)	LC	RM	F, P	LC	AB
Hirundinidae							
116.	Red-rumped Swallow	*Hirundo daurica* Linnaeus,1771	C	RM	I	LC	A
117.	Common Swallow	*Hirundo rustica* (Linnaeus,1758)	VC	R	I	LC	A
118.	Wire-tailed Swallow	*Hirundo smithii* Leach,1818	VC	R	I	LC	A
Laniidae							
119.	Rufous-backed Shrike	*Lanius schach* Linnaeus,1758	C	R	I	LC	A
120.	Baybacked Shrike	*Lanius vittatus* Valenciennes,1826	C	R	I, SV	LC	A
Monarchidae							
121.	Asian Paradise Flycatcher	*Terpsiphone paradisi* (Linnaeus, 1758)	LC	M	I	LC	AD

Sr. No/Order/ Family	Common Name	Scientific Name	Status in Punjab	Residential Status	Food	IUCN status	Habitat
Motacillidae							
122.	Oriental Tree Pipit	*Anthus hodgsoni* Richmond, 1907	C	RM	I,P	LC	A
123.	Paddy Field Pipit	*Anthus rufulus* Vieillot, 1818	VC	R	I,P	LC	A
124.	Brown Rock Pipit	*Anthus similis* Jerdon, 1840	C	RM	I,F	LC	A
125.	White Wagtail	*Motacilla alba* Linnaeus,1758	C	RM	I,SI	LC	AB
126.	Grey Wagtail	*Motacilla cinerea* Tunstall,1771	C	M	I,F	LC	AB
127.	Citrine Wagtail	*Motacilla citreola* Pallas, 1776	C	RM	I, SI	LC	A
128.	Yellow Wagtail	*Motacilla flava* Linnaeus, 1758	C	RM	I,SI	LC	AB
129.	Large Pied Wagtail	*Motacilla maderaspatensis* Gmelin,1789	C	R	I,SI	LC	AB
Muscicapidae							
130.	Oriental Magpie Robin	*Copsychus saularis* (Linnaeus,1758)	VC	R	I	LC	AB
131.	Verditer Flycatcher	*Eumyias thalassina* (Swainson,1838)	LC	R	I,F	LC	AD
132.	Indian Blue Robin	*Luscinia brunnea* (Hodgson, 1837)	LC	RM	I	LC	A
133.	Blue Throat	*Luscinia svecica* (Linnaeus, 1758)	LC	RM	I	LC	A
134.	Common Tailor Bird	*Orthotomu ssutorius* (Pennant,1769)	VC	R	I,P	LC	AB
135.	Black Redstart	*Phoenicurus ochruros* (Gmelin, 1774)	C	RM	I	LC	A
136.	Pied Bush Chat	*Saxicola caprata* (Linnaeus,1766)	C	R	I	LC	AB
137.	White Tailed Stonchat	*Saxicola leucura* (Blyth, 1847)	LC	R	I	LC	AB
138.	Common Stone Chat	*Saxicola torquata* (Linnaeus,1766)	C	RM	I	LC	A
139.	Indian Robin	*Saxicoloides fulicata* (Linnaeus,1758)	VC	R	I	LC	A
140.	Jungle Babbler	*Turdoides striatus* (Dumont,1823)	VC	R	I,F	LC	AB
Nectariniidae							
141.	Purple Sunbird	*Nectarinia asiatica* (Latham,1790)	VC	R	P	LC	AB

Sr. No/Order/ Family	Common Name	Scientific Name	Status in Punjab	Residential Status	Food	IUCN status	Habitat
Oriolidae							
142.	Eurasian Golden Oriole	*Oriolus oriolus* (Linnaeus, 1758)	LC	RM	I,F	LC	AB
Passeridae							
143.	House Sparrow	*Passer domesticus* (Linnaeus,1758)	*C*	*R*	G,I	LC	AB
144.	Yellow-throated Sparrow	*Petronia xanthocollis* (Burton,1838)	LC	R	G, P, F, I	LC	AB
Sylviinae							
145.	Large-billed Leaf Warbler	*Phylloscopus magnirostris* Blyth, 1843	C	M	I	LC	AB
146.	Greenish Leaf Warbler	*Phylloscopus trochiloides* (Sundevall, 1837)	C	M	I	LC	AB
147.	Common Chiffchaff	*Phylloscopus collybita* (Vieillot, 1817)	C	M	I	LC	A
148.	Ashy Prinia	*Prinia socialis* (Sykes, 1832)	VC	R	I	LC	A
149.	Jungle Prinia	*Prinia sylvatica* Jerdon, 1840	VC	R	I	LC	A
Ploceinae							
150.	Streaked Weaver Bird	*Ploceus manyar* (Horsfield, 1821)	C	R	I,G	LC	AB
151.	Baya Weaver Bird	*Ploceus philippinus* (Linnaeus,1766)	C	R	I,G	LC	A
Pycnonotidae							
152.	Himalyan Bulbul	*Pycnonotus leucogenys* (Gray, 1835)	LC	R	I, F	LC	D
153.	Red-vented Bulbul	*Pycnonotus cafer* (Linnaeus,1766)	VC	R	I,P,F	LC	AB
154.	White-eared Bulbul	*Pycnonotus leucotis* (Gould, 1836)	LC	R	F, G, I	LC	AB
Sturnidae							
155.	Rosy Sterling	*Sturnus roseus* (Linnaeus, 1758)	LC	M	I,F	LC	A
156.	Jungle Myna	*Acridotheres fuscus* (Wagler, 1827)	C	R	O	LC	A
157.	Brahminy Starling	*Sturnus pagodarum* (Gmelin,1789)	*C*	*R*	I,F	LC	AB
158.	Bank Myna	*Acridotheres ginginianus* (Latham,1790)	VC	R	I,F	LC	AB
159.	Common Myna	*Acridotheres tristis* (Linnaeus,1766)	VC	R	I,F	LC	AB
160.	Asian Pied Starling	*Sturnus contra* Linnaeus, 1758	VC	R	I,F	LC	AB
161.	Common Starling	*Sturnus vulgaris* Linnaeus, 1758	LC	M	I,F	LC	A

Sr. No/Order/ Family	Common Name	Scientific Name	Status in Punjab	Residential Status	Food	IUCN status	Habitat
Timaliidae							
162.	Rufous Bellied Babbler	*Dumetia hyperythra* (Franklin, 1831)	C	R	I, F	LC	A
163.	White-headed Babbler	*Turdoides affinis* (Jerdon, 1845)	C	R	I,F	LC	AB
164.	Common Babbler	*Turdoides caudata* (Dumont, 1823)	VC	R	I,F	LC	A
165.	Striated Babbler	*Turdoides earlei* (Blyth, 1844)	C	R	I,F	LC	AB
166.	Large Grey Babbler	*Turdoides malcolmi* (Sykes, 1832)	C	R	I,F	LC	A
Turdidae							
167.	Dark-throated Thrush	*Turdus ruficollis* Pallas, 1776	LC	M	I, G	LC	A
Turdinae							
168.	Indian Chat	*Cercomela fusca* (Blyth, 1851)	C	R	I	LC	AB
169.	Blue Whistling Thrush	*Myiophonus caeruleus* (Scopoli, 1786)	LC	R	I, SV, SI	LC	D
Zosteropidae							
170.	Oriental White Eye	*Zosterops palpebrosus* (Temminck,1824)	C	R	F,P	LC	AB
Pelecaniformes							
Anhingdae							
171.	Snake Bird	*Anhinga melanogaster* Pennant, 1769	C	RM	SI, SV	NT	C
Phalacrocoracidae							
172.	Great Cormorant	*Phalacrocorax carbo* Linnaeus, 1758	VC	RM	SI	LC	C
173.	Little Cormorant	*Phalacrocorax niger* Vieillot,1817	VC	RM	SI, SV	LC	C
Piciformes							
Picidae							
174.	Lesser Golden-backed Woodpecker	*Dinopium bengelensis* (Linnaeus,1758)	C	R	I	LC	AB
175.	Common Golden-backed Woodpecker	*Dinopium javanense* (Ljungh,1797)	C	R	I	LC	AB

Sr. No/Order/ Family	Common Name	Scientific Name	Status in Punjab	Residential Status	Food	IUCN status	Habitat
Capitonidae							
176.	Great Barbet	*Megalaima virens* (Boddaert,1783)	LC	R	F, I	LC	AD
177.	Coppersmith Barbet	*Megalaima haemacephala* (Statius Muller,1776)	C	R	F, I	LC	AB
178.	Brown-headed Barbet	*Megalaima zeylanica* (Gmelin, 1788)	C	R	I,F	LC	AB
Podicipediformes							
Podicipitidae							
179.	Great Creasted Grebe	*Podiceps cristatus* (Linnaeus, 1758)	LC	M	I, SI	LC	C
180.	Little Grebe	*Tachybaptus ruficollis* (Pallas, 1764)	C	R	I, SI, SV	LC	C
Psittaciformes							
Psittacidae							
181.	Alexandrine Parakeet	*Psittacula eupatria* (Linnaeus,1766)	C	R	F,P,G	LC	AB
182.	Plum-headed Parakeet	*Psittacula cyanocephala* (Linnaeus, 1766)	LC	R	F,P,G	LC	AB
183.	Slaty-headed Parakeet	*Psittacula himalayana* (Lesson,1832)	LC	R	G, F	LC	AB
184.	Rose-ringed Parakeet	*Psittacula krameri* (Scopoli,1769)	VC	R	F,P,G	LC	AB
Strigiformes							
Strigidae							
185.	Barn Owl	*Tyto alba* (Scopoli, 1769)	C	R	SV	LC	AD
186.	Spotted Owlet	*Athene brama* (Temminck,1821)	VC	R	I, SV	LC	AB
187.	Eurasian Eagle-Owl	*Bubo bubo* (Linnaeus, 1758)	LC	R	I, SV	LC	AB
188.	Collared Scops-Owl	*Otus bakkamoena* Pennant,1769	LC	R	I, SV	LC	AD
Suliformes							
Phalacrocoracidae							
189.	Indian Shag	*Phalacrocoraxfuscicollis* Stephens, 1826	C	RM	SV	LC	C

Status: VC- Very common; C – common; LC- Less Common; UC-Un-common; R- Rare; VR- Very rare; V- Vagrant;
Habitat : Type A - Agricultural Habitat; Type B -Residential area: Urban/Rural; Type C - Aquatic Habitat/ponds/canal/river/wetland; Type D-Uncultivated area/forest/barren land.
Residential Status: R -Resident, RM - Resident migrant; M- Migrant.
Food Habit: I - Insectivorous; G – Granivorous; F - Fruits/berries; P - Plants/aquatic vegetation/nectar; SI - Small invertebrates; SV – Smallvertebrates/fishes/mice/rat/small birds/eggs/reptiles); O - Omnivorous.
IUCN Status: EN – Endangered; VU – Vulnerable; NT - Near Threatened; LC - Least Concern.

Depredatory birds and their damage in crop fields

Rock Pigeon in post harvested wheat crop field

Rose Ringed Parakeet damaging pearl millet crop

Bird species in post harvested agricultural field

Group of Indian Peafowl in germinating wheat crop field

House Crow and Rock Pigeon damaging germinating maize crop

Bird damage in tomato crop

Management Methods

Use of reflected ribbon for management of bird pests in maize

Use of black polybags for management of bird pests in germinating maize crop

Use of reflected ribbon for management of bird pests in mustard

Wrapping method for protection of maize cobs from bird damage

Use of Jute rope in for management of pest birds in germinating mustard

Screen crop method for protection of maize cobs from bird damage

Management Methods

Use of polynet for protection from pest birds in fish pond

Bio-acoustic device *Kheti Rakshak* in maize crop field

Machan used for scaring birds from field

Predator eye Balloon in Guava plantation

Scare crow and netting in germinating maize crop field

Dummy Owl (Plastic model) for scaring pest birds

Conservation of beneficial birds

Different types of artificial nests for beneficial birds

Nest of House Sparrow in earthen artificial nest

Artificial nest occupied by Common Myna

Eggs of Common Myna in earthen artificial nest

Eggs of Common Myna in artificial nest

Young ones of Common Myna in artificial nest

Large sized artificial nest occupied by Spotted owlet