

Recently resighted population of Blue-breasted Quail (*Synoicus chinensis*) in and around East Kolkata Wetland is under threat due to development activities

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Abstract

Of the 271 species of birds recorded previously from the East Kolkata Wetlands (EKW), only 162 species have been sighted continually during the last decade and 109 species become locally extinct, majority of which are water birds. Surveys were conducted in and around EKW to assess the impact of developmental activities on the avian diversity, especially on the recently rediscovered Blue-breasted Quail population. We used Land Use Land Cover analyses to ascertain the recent changes that have happened to the areas around Baruipur wetlands where the quails have been recorded recently and found Build-up areas have increased since 2009 resulting in land use changes for human related activities by potentially threatening whole population of Blue-breasted Quail, which is the largest recorded breeding population of this species from India in recent time. Hence, the study is important for the conservation of the species

Keywords: Conservation, King Quail, Rediscovery, Threat, Wetlands

Introduction

World over development activities and clearing of natural vegetation for construction of roads have taken toll on many faunal species especially from many areas once remained as natural areas (Small and Hunter, 1988; Sisk *et al.*, 1994) and India is no exception. During 1950s, the areas adjoining the present Kolkata city remained as a huge natural salt water lake with mangrove vegetation. Presently known as the East Kolkata Wetlands (EKW) (22.41 – 22.66 N, 88.33 – 88.58 E), this Ramsar site, is part of the delta of River Ganga and located on the eastern fringes of Kolkata city spread over an area of 125 km². In 1945, the wetland covered approximately 81 km² but due to burgeoning human population and expansion of the city limits resulted in reclamation of Salt Lake area which was once the part of the East Kolkata Wetland. After these changes the East Kolkata Wetlands now reduced to only about 20 km² (Ghosh, 2005). The wetland complex once supported a variety of bird life including many water-dependent species and grassland birds as the tall grasslands associated with this ecosystem were ideal for these species. Over the years, due to shrinkage in land

area, many species have moved to adjacent areas in search of suitable habitat. Though, no proper documents exist to highlight about the faunal composition of the area in 1950s, definitely the area might have had all species now found in Sundarbans (Chattopadhyaya, 1990).

Also, there has been a rapid change in the biodiversity associated with the EKW due to changes in hydrological regimes and land use. A total of 271 species of birds were recorded from the wetlands, with the time and shrinking of habitat only 162 species have been invariably sighted during the last few decades (Mookherjee and Chatterjee, 1999). It is assessed that around 109 species of birds have become locally extinct and majority being the aquatic birds. For example, a study in 1960s had recorded 248 species of birds from Salt Lake (Ghosh, 1990). Whereas, Chowdhury (1984) had recorded only 123 species based on the surveys conducted during 1978-83. Prolonged developmental activities resulted in many larger species, such as Openbill Stork *Anastomus oscitans*, Spoonbill *Platalea leucorodia*, few duck species to avoid these waterbodies (Saha, 1984).

Till 1960s, the area had many species of birds including Spot-billed Pelican *Pelicanus philippensis*, Darter *Anhinga*

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rufa, Greylag Goose *Anser anser*, Bar-headed Goose *Anser indicus*, Mallard *Anas platyrhynchos*, Baer’s pochard *Aythya baeri*, Swamp Francoline *Francolinus gularis*, Rain Quail *Coturnix coturnix*, Blue-breasted Quail *Synoicus chinensis*, five species of crakes, Large-billed leaf warbler *Phylloscopus magnirostris*, Bristled Grass Warbler *Chaetornis striatus*, Finn’s Baya *Ploceus megarhynchus*, Black-breasted Weaver *Ploceus benghalensis* and Yellow-breasted Bunting *Emberiza aureola*. However, from late 1970s, to till date, majority of above-mentioned species have never been recorded. Present work highlights one such species i.e., Blue-breasted Quail that has never been reported from Kolkata vicinity after 1960 till 2019, recently it has been resighted (Bhattacharjee *et al.*, 2020). Moreover, it is a significant finding as this is the only healthy breeding population record from India of this shy and elusive species in recent times. Thus, this habitat is significantly potential and important for the species population to thrive. But in vain, the rampant development activities happening around the area where the species has been sighted at Baruipur, remains a big challenge for the species as they are inhabitants of tall grassland ecosystem. Finding them is a challenging job, they were unnoticed by birders for many decades and now faces new challenge.

Material and Methods

The surveys were conducted in and around EKW to ascertain the diversity of waterbirds and grassland-

dependent species as many tall grassland patches are still intact but under tremendous pressure from various development activities. Surveys were carried out to record the bird species (both resident and migratory) within the 25 km radius of Kolkata city in two phases once in 2013 (02 February to 7 March 2013) and again in 2019 (4 February to 15 March, 2019). In total, 6 and 3 visits have been made in 2013 and 2019, respectively, to various wetland complexes namely Nalbanberi (22.425 N, 88.586 E), Khariberi (22.652 N, 88.556 E), Malancha (22.508 N, 88.760 E) and Baruipur (22.364 N, 88.393 E) to document bird species to draw inference whether any species get affected because of development activities. After the sighting of Blue-breasted Quail in 2019 (Bhattacharjee *et al.*, 2020) we decided to study how the habitat around the present location from where the quails have been sighted changed over a decade i.e., 2009 to 2019. Birds were observed using Nikon 10x50 field binocular, and Nikon D7000 and D500 DSRL with Nikkor 200-500mm f/5.6 telephoto and 500m f/4 prime lens were used respectively for photographic documentation. We used Landsat 5 TM images (30m spatial resolution) and Landsat 8 OLI and TIRS images (30m spatial resolution) with minimum cloud cover for the month of February to see the changes that have happened to the ecosystem around Baruipur. The Landsat images were downloaded from USGS Earth Explorer (www.earthexplorer.usgs.gov) (Table 1). Different Land Use Land Cover (LULLC) parameters selected for image analyses are given in Table 2. All image

Table 1. Details of satellite data

Sensor	Month/Day/Year	Resolution	Path/Row
LANDSAT 5 TM CI LEVEL1	02/19/2009	30m	138/45
LANDSAT 8 OLI/TIRS C1 LEVEL 1	02/15/2019	30m	138/45

Table 2. Description of different LULC classes

LULC type	Description
Water body	Area with standing water like lakes, bheri, ponds, etc
Tree cover	Area with plantation, visible tree canopy, etc.
Built up	Area with human settlements like urban/rural areas, govt. and institutional buildings, commercial areas, industrials area, roads, etc.
Agricultural lands	Area use for the production of food and fiber (both standing and harvested crop lands)
Wetland associated vegetation	Area with marsh, bushes, shrubs and grasses seen to grow and water table is near / above the land for a significant part of the year.
Barren land	Area with exposed soil, landfills, infertile lands.

corrections and classifications were analyzed in QGIS (version 3.6) and ArcGIS 10.6 (www.esri.com).

Results and Discussion

During our surveys, we recorded 87 species of birds and out of which 29 (33%) were migratory. Sixty-one (70%) species were recorded in Nalban Bheri followed by Khariberi 37 (42%) area. Out of 29 migratory species recorded during our surveys, most of such species were sighted in and around Nalban Bheri. However, these places also support resident and migratory grassland species like Clamorous Reed Warbler *Acrocephalus stentoreus*, Blyth's Reed Warbler *Acrocephalus dumetorum*, Striated Grassbird *Megalurus palustris* and Baillon's Crake *Zapornia pusilla*. However, none of the species are of significant importance except the Blue-breasted Quail or King Quail *Synoicus chinensis* as it has been resighted after more than 50 years from Baruipur south-east of EKW. This sighting at Baruipur (Figure 1) in the outskirts of Kolkata in 2019 (Bhattacharjee *et al.*,

2020) is significant as the species has not been recorded in West Bengal after 1960s. However, their work did not address the threats and conservation aspects of resighted breeding population facing now due to various ongoing development works. On 15 July, 2019 a team of birders including the first author (AN) photographed the species at Baruipur from tall grasslands adjacent to paddy fields. Male (Figure 2A) has black and white marking over throat, chestnut belly and slaty blue flank, female (Figure 2B) has rufous forehead and supercilium along with barred breast and flank, which was confirmed after checking the specimen of the species from the collection of Zoological survey of India.

Six major LULC classes (Table 2) have been identified based on the satellite images and field observations for habitat analysis. The LULC maps for the years 2009 and 2019 with regard to the areas where the BBQ sighted were prepared using Maximum Likelihood Classification algorithm of supervised classification approach with the help of Semi-Automatic Classification Plugin (SCP) in QGIS 3.6. The overall error matrix accuracy details in

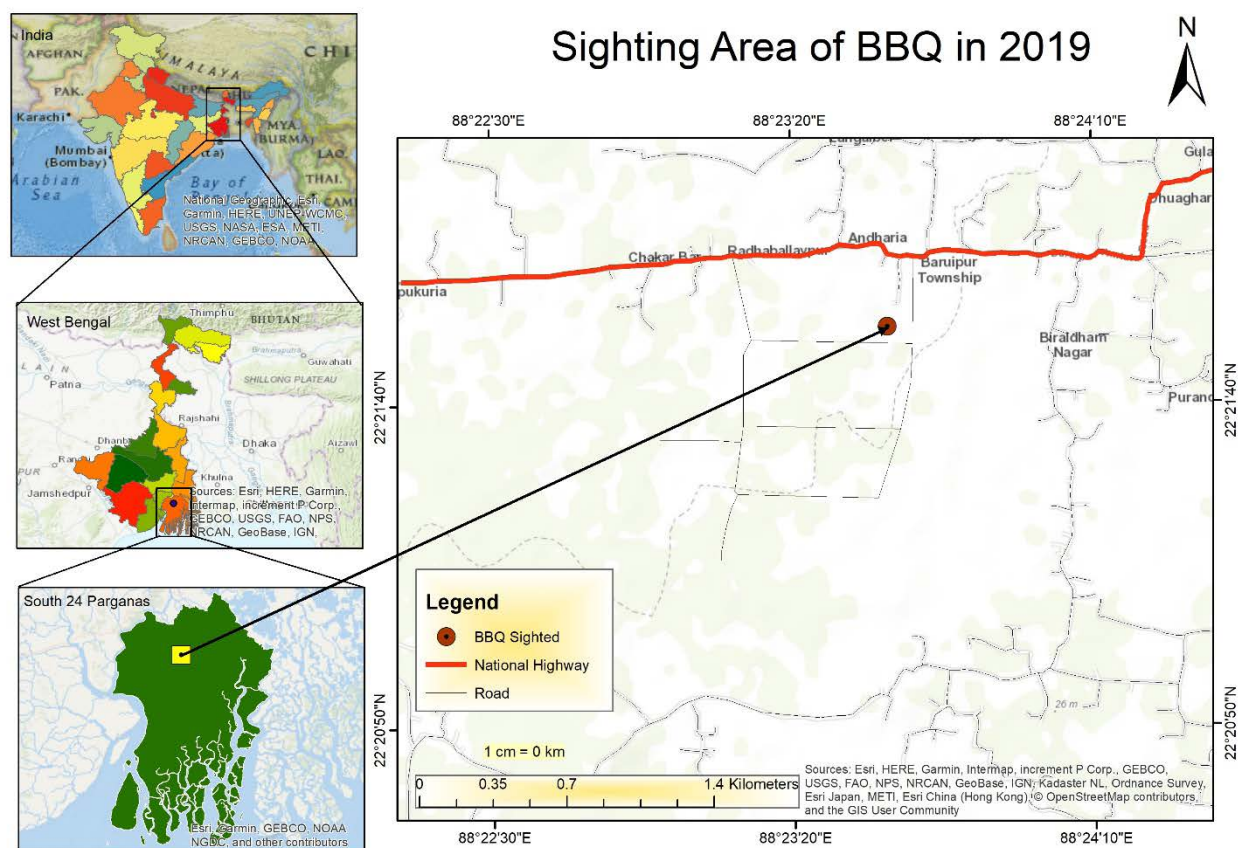


Figure 1. Showing the location where BBQ were recorded. (Maps are prepared using ArcGIS 10.6 www.esri.com).



Figure 2. (A) A male Blue-breasted Quails (BBQ) photographed at Baruipur (Photo: Amitava Majumder); (B) A female BBQ (Photo: Amitava Majumder); (C) A flock of BBQ (Photo: Anindya Naskar); (D) Same habitat wherein BBQ sighted in 2019 showing deteriorated condition and movement of heavy vehicles during filling up of wet grasslands (Photo: Anindya Naskar).

LCLU maps for both 2009 and 2019 are given in Tables 3 and 4. A total of 240 ground truth points was (40 for each class) used on the LULC map of 2009 and 2019. Normally accuracy above >85% is considered as high degree of accuracy (Anderson *et al.*, 1976) and in 2009 we achieved 90.42% followed by 89.58% in 2019 with respective kappa coefficient of 0.8850 and 0.8750, insight the classification performance (Landis and Koch, 1977). How the land use class transition happened in two years i.e., 2009 and 2019 is given in Table 5 also highlighting the fact that wetlands were filled up and then converted to construction purposes. The total area of land use changes that have happened over the two period i.e., 2009 and 2019 for each selected LULC parameters are given in Table 6 clearly depicting significant changes that have happened in terms of increase (60%) in built up areas (in 2019) against natural waterbodies in 2009. Similarly for the same period area of water bodies have declined around

32.09% (Table 6). The analysis shows that between 2009 and 2019 there were certain changes in land use pattern wherein the Built-up area increased by 60% (Table 6), Wetland associated vegetation area increased by 54.25%, and Barre land area increased by 29.17%. Over the decade, most of the increased Wetland-associated vegetation area along with the BBQ sighted area are under pressure due to the proposed Education hub by Kolkata Municipal Development Authority (KMDA Annual report, 2010-11), which leads to increased developmental activity within Wetland-associated vegetation area, resulting in a further decrease in suitable habitats of Blue-breasted Quail.

Globally the Blue-breasted Quail has broad distribution across its range countries, and according to BirdLife International (2019) the population is stable and no appreciable evidence of any decline or threats have been noticed. However, in India, the species has

Table 3. Error matrix for 2009 LULC map accuracy assessment

2009	Water body	Tree Cover	Built up	Agricultural land	Wetland-associated vegetation	Barren land	Total	User accuracy
Water body	32	4	1	3	0	0	40	80
Tree Cover	0	35	1	2	1	1	40	87.5
Built up	0	4	35	1	0	0	40	87.5
Agricultural land	0	0	0	40	0	0	40	100
Wetland associated vegetation	1	0	0	0	39	0	40	97.5
Barren land	0	1	2	1	0	36	40	97.3
Total	33	44	39	47	40	37	240	
Producer accuracy	96.97	79.55	89.74	85.11	97.5	97.3		
Kappa hat	0.7681	0.8469	0.8507	1	0.97	0.8818		

Overall accuracy = 90.42 % (>85%), Kappa coefficient = 0.8850

Table 4. Error matrix for 2019 LULC map accuracy assessment

2019 LULC Classes	Water body	Tree Cover	Built up	Agricultural land	Wetland- associated vegetation	Open Land	Total	User accuracy
Water body	33	1	3	3	0	0	40	82.5
Tree Cover	0	39	0	1	0	0	40	97.5
Built up	3	2	35	0	0	0	40	87.5
Agricultural land	3	0	1	35	1	0	40	87.5
Wetland associated vegetation	0	0	2	0	38	0	40	95
Barren land	0	1	4	0	0	35	40	87.5
Total	39	43	45	39	39	35	240	
Producer accuracy	84.62	90.7	77.78	89.74	97.44	100		
Kappa hat	0.791	0.9695	0.8462	0.8507	0.9403	0.8537		

Overall accuracy = 89.58% (>85%), Kappa coefficient = 0.8750

Table 5. Land use class transition matrix from 2009 to 2019

		2019 image (km ²)						
2009 Image (km ²)	LULC Types	Water body	Tree cover	Built up	Agricultural land	Wetland-associated vegetation	Open land	2019
	Water body	0.36	0.07	0.04	0.36	0.07	0.00	0.91
	Tree Cover	0.46	1.89	0.24	0.30	0.04	0.03	2.97
	Built up	0.14	0.34	0.64	0.36	0.35	0.08	1.92
	Agricultural land	0.26	0.77	0.13	3.77	0.13	0.04	5.11
	Wetland-associated vegetation	0.11	0.18	0.10	1.00	0.92	0.05	2.36
	Barren land	0.01	0.10	0.03	0.12	0.01	0.03	0.31
	2009	1.34	3.35	1.20	5.92	1.53	0.24	13.58

Table 6. Area statistics of BBQ location in 2009 and 2019

LULC classes	2009		2019		Overall Change 2009 to 2019	
	Area/km ²	%	Area/km ²	%	Area/km ²	%
Water body	1.34	9.87	0.91	6.70	-0.43	-32.09
Tree Cover	3.35	24.67	2.97	21.87	-0.38	-11.34
Built up	1.2	8.84	1.92	14.14	0.72	60.00
Agricultural land	5.92	43.59	5.11	37.63	-0.81	-13.68
Wetland- associated vegetation	1.53	11.27	2.36	17.38	0.83	54.25
Barren land	0.24	1.77	0.31	2.28	0.07	29.17
	13.58	100	13.58	100		

never been recorded in good numbers though reported to be a common breeding bird in Kerala, Malabar coast to Bombay (Baker 1928). Whereas, Ali and Ripley (1987) had refuted this statement by mentioning that the species was no longer common from Kerala to Bombay. They had mentioned that the species prefers swampy tall grasslands and road-side grasslands besides secondary scrubs and on the edges of the paddy fields. Only five specimens available in the collections of the Bombay Natural History Society, one each collected from Madhya Pradesh and Bihar and four from Assam (Abdulali, 1969). Out of four specimens present in ZSI, one was collected in October 1864 from Malda (Beavan, 1868) and the rest of the three are without labels finding the locality/origin of the specimens difficult. Wetlands around Salt Lake in east Kolkata areas were once considered as one of the most productive ecosystems of the world. These wetlands passed through many phases as silt brought in by great river systems raised the original seabed into mangrove wetlands and finally into its present state. Over the years, due to reclamation of many such wetlands for construction purposes and fishery activities bird life has changed drastically.

Surveys conducted by the Zoological Survey of India during 1964-69 (by late Dr. B. Biswas and others) had recorded Blue-breasted Quail from Salt Lake however, the later studies by Mookerjee and Chatterjee (1999) had never seen this species from anywhere in West Bengal in general and Kolkata in particular and considered the species as 'Locally Extinct'. We presume that the population of Blue-breasted Quail once existed in Salta Lake area of Kolkata has shifted presumably to other localities around EKW but unnoticed by the ornithologist

or bird watchers. The reason being that suitable tall grassland patches were either altered or reclaimed for development activities. Secondly, while shifting in search of suitable tall grasslands, these small birds were not noticed by birders as these localities were rarely visited by many birders. However, the locality from where the present population of quail discovered is under pressure since 2009 as new buildings and other settlements started mushrooming making it highly detrimental to Blue-breasted Quails and other grassland-dependent species including two Vulnerable and two Near Threatened species. Represented in Table 7, which is prepared as per the checklist of Praveen *et al.* (2021). New office and jail complexes are coming up in the place where the quails are recorded. In order to level the waterlogged area that is not fit for construction, sand and cement concrete mixings are being poured on daily basis to prevent any grass growth as the entire area is fertile (Figure 2D).

Constant movement of heavy machineries and their noise affect many bird species (Ryals *et al.*, 1999) especially signing birds like quails and we presume that this will have an effect on Blue-breasted Quails. The LULC images of 2009 and 2019 show changes (Figure 3) that have happened to the habitat at Baruipur due to development activities from where quails are discovered. Though the populations elsewhere are intact (BirdLife International, 2019), the Indian population is under tremendous threat as only a handful of records exist from the entire country. Therefore, a thorough revision is required to assess the present population status of this grassland dependent species in the whole of Indian subcontinent.

Land Use Land Cover Map Of BBQ Sighted Area

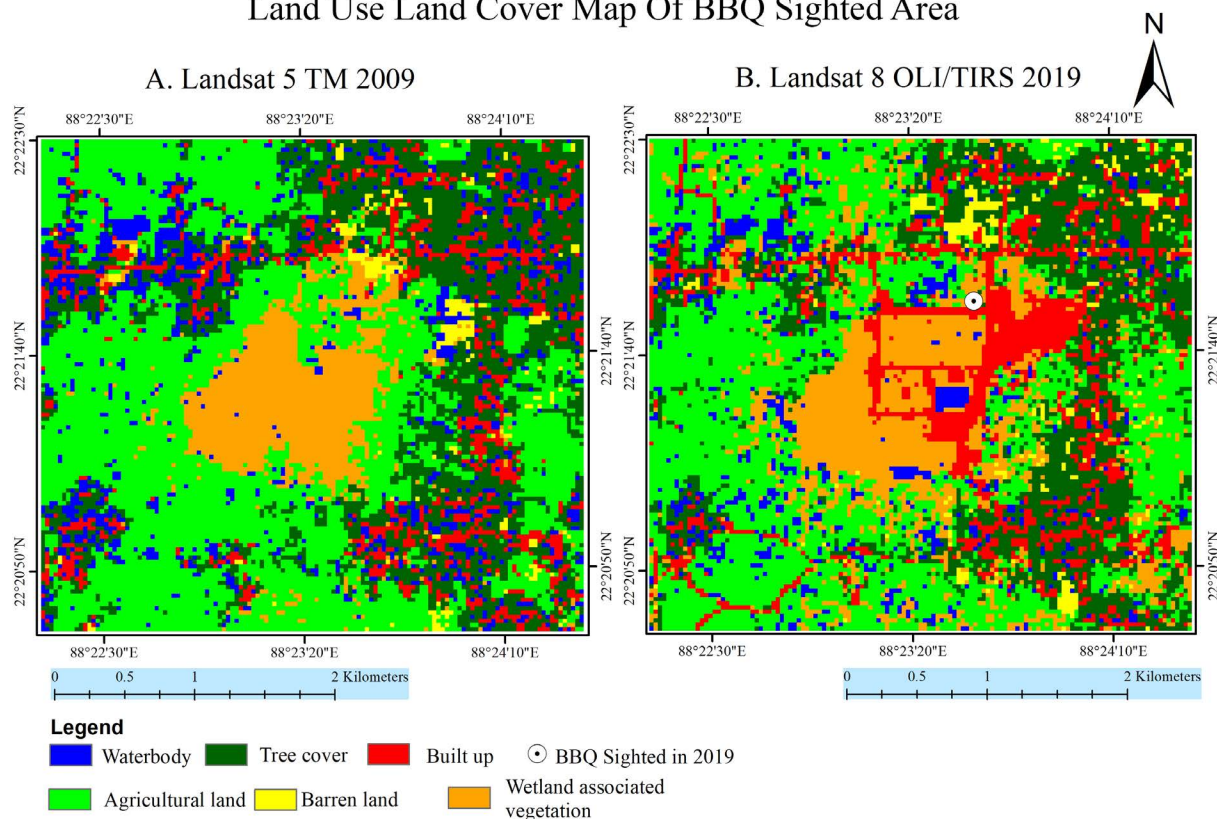


Figure 3. Showing LULC of the area where the BBQ were sighted.

Table 7. List of significant bird species recorded at Baruipur area in 2019

Sl.No.	Species	Family	Order	IUCN	IWPA Schedules
1	Blue-breasted Quail <i>Synoicus chinensis</i> (Linnaeus, 1766)	Phasianidae	Galliformes	Least Concern	Schedule-IV
2	Brown-cheeked Rail <i>Rallus indicus</i> Blyth, 1849	Rallidae	Gruiformes	Least Concern	Schedule-IV
3	Slaty-breasted Rail <i>Lewinia striata</i> (Linnaeus, 1766)	Rallidae	Gruiformes	Least Concern	Schedule-IV
4	Baillon's Crake <i>Zapornia pusilla</i> (Pallas, 1776)	Rallidae	Gruiformes	Least Concern	Schedule-IV
5	Watercock <i>Gallicrex cinerea</i> (J.F. Gmelin, 1789)	Rallidae	Gruiformes	Least Concern	Schedule-IV
6	Grey-necked Bunting <i>Emberiza buchanani</i> Blyth, 1845/	Emberizidae	Passeriformes	Least Concern	Schedule-IV
7	Clamorous Reed Warbler <i>Acrocephalus stentoreus</i> (Hemprich & Ehrenberg, 1833)	Acrocephalidae	Passeriformes	Least Concern	Schedule-IV

8	Black-browed Reed Warbler <i>Acrocephalus bistrigiceps</i> Swinhoe, 1860	Acrocephalidae	Passeriformes	Least Concern	Schedule-IV
9	Striated Grassbird <i>Megalurus palustris</i> Horsfield, 1821	Locustellidae	Passeriformes	Least Concern	Schedule-IV
10	Bristled Grassbird <i>Schoenicola striatus</i> (Jerdon, 1841)	Locustellidae	Passeriformes	Vulnerable	Schedule-IV
11	Rusty-rumped Warbler <i>Helopsaltes certhiola</i> (Pallas, 1811)	Locustellidae	Passeriformes	Least Concern	Schedule-IV
12	Black-breasted Weaver <i>Ploceus benghalensis</i> (Linnaeus, 1758)	Ploceidae	Passeriformes	Least Concern	Schedule-IV
13	Woolly-necked Stork <i>Ciconia episcopus</i> (Boddaert, 1783)	Ciconiidae	Ciconiiformes	Near Threatened	Schedule-IV
14	Black-headed Ibis <i>Threskiornis melanocephalus</i> (Latham, 1790)	Threskiornithidae	Pelecaniformes	Near Threatened	Schedule-IV
15	Eastern Marsh Harrier <i>Circus spilonotus</i> Kaup, 1847	Accipitridae	Accipitriformes	Least Concern	Schedule-I
16	Pied Harrier <i>Circus melanoleucos</i> (Pennant, 1769)	Accipitridae	Accipitriformes	Least Concern	Schedule-I
17	Indian Spotted Eagle <i>Clanga hastata</i> (Lesson, 1831)	Accipitridae	Accipitriformes	Vulnerable	Schedule-I

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