Avifaunal changes 2002–2021 in Kirala Kele Wildlife Sanctuary, Sri Lanka

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Between May 2018 and May 2021, we conducted 194 field visits surveying birds in Kirala Kele Wildlife Sanctuary, Southern Province, Sri Lanka (5.979°N, 80.513°E; Fig. 1). Here, we present possible avifaunal changes between our study and an earlier study (Seneviratne 2005) in the same area, from October 2002 to end of 2003, and highlight species of concern. Seneviratne conducted a series of bird surveys lasting "approximately 100 complete days" in his study (Seneviratne 2005).

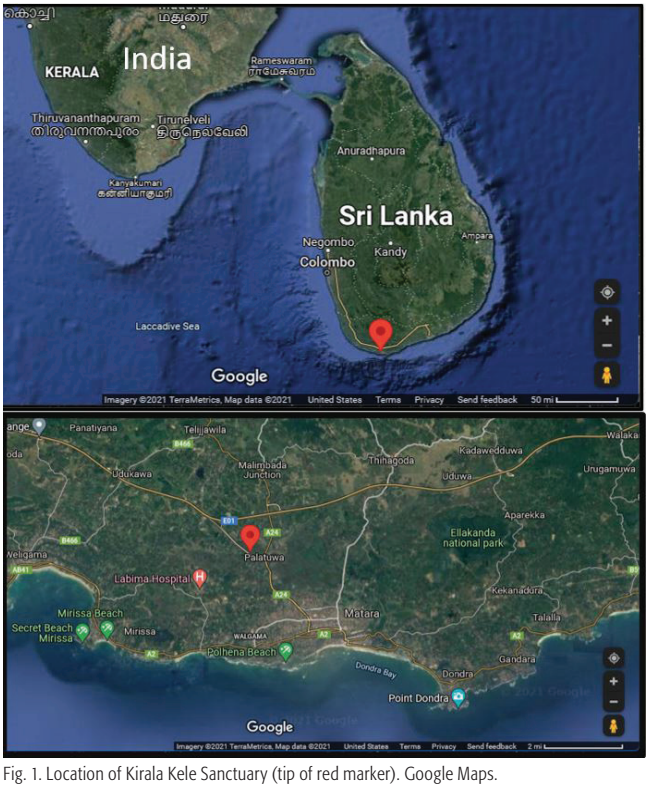

Fig. 1. Location of Kirala Kele Sanctuary (tip of red marker). Google Maps.

Kirala Kele, or Nadugala marsh, is a marshy and wooded wetland about 3 km from the town of Matara (Seneviratne 2005; Department of Wildlife 2012). It was declared a wildlife sanctuary on 08 September 2003. The sanctuary covers an area of 310 ha, with a proposed area extent up to 1800 ha (Department of Wildlife 2012). It is rich in habitat diversity, with a mosaic of marshlands, paddy fields, mangrove areas, irrigation canals, and woodlands (De Silva et al. 2015). Local people use this area for various purposes ranging from crop cultivation, fishing, source of agricultural water, and harvesting of lotus *Nelumbo nucifera* stems and flowers for commercial purposes (Seneviratne 2005). Abandoned paddy fields are used for cattle grazing. People also use the sanctuary for recreational activities such as picnicking and exercising (Fernando & Shariff 2017). The sanctuary is a well-visited eBird (2021) hotspot with a total recorded list of 204 bird species. Local schools and colleges use the area as a natural laboratory for research and nature education.

Seneviratne (2005) provided the status of all birds observed in relative frequencies (%) categories, designating them as Very Common (VC) if seen on 75–100% of visits; Common (C), 50–75%; Uncommon (UN), 25–50%; Rare (R), less than 25%; and Very Rare (VR) if seen only once or twice. He did not provide numbers of individuals observed for each species. To facilitate comparison, we used the same status codes and definitions. We are making the following assumptions about his classifications and using these assumptions in our classifications: VC if seen on 75%–100% of the visits; C if seen 50%–74%; UN, 25%–49%; R if 3 visits to 24%; and VR if seen in only one or two visits. We also indicated species that were observed in one of the two studies, which were Not Observed (NO) in the other study.

Methodology

The first author did all surveys. Each visit was designated as one survey. Survey sites were selected randomly. All accessible areas (75% of total area) of the sanctuary were covered, including all habitat types. Of the 194 surveys, 180 (93%) were by travelling along fixed trails, and the remaining 14 (7%) were done from a fixed position (travelling and stationary protocols as per eBird 2021). Fifteen surveys were done after 1800 h to cover nocturnal species. Summary statistics for the duration and distance of these surveys are in Table 1. Our surveys included at least one visit in each month of the year (Fig. 2).

Table 1. Summary statistics for survey visits

	Travelling distance (km)	Duration (min)	Stationary duration (min)
Median	3.5	71	30
Mean	4.1	84	40
Standard Deviation	2.6	54	39

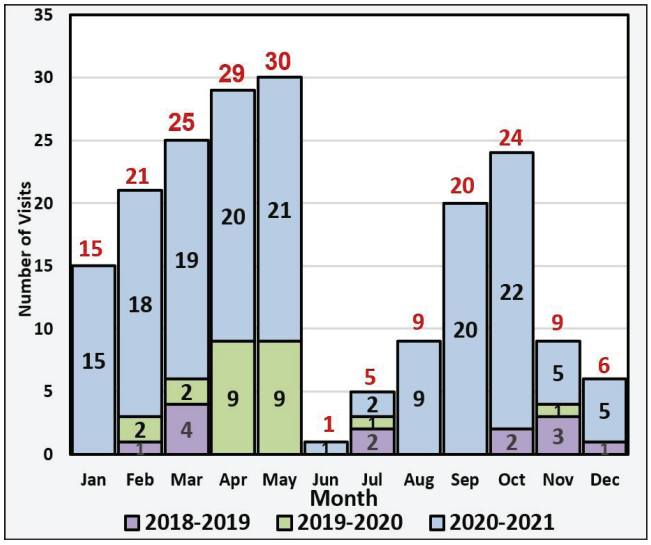

Fig. 2. Frequency of field surveys conducted in our study

Comparison of number of species

Seneviratne's (2005) surveys recorded 124 bird species. Our surveys yielded 170 species (45 migrants, 125 residents). There is an overlap of 114 species in both studies. There were 10 species in Seneviratne's (2005) 2002–2003 study that we did not find in our study, and 56 species that appeared in our study that he did not report in his, for a net of 46 more species in our study. The complete list of all 180 species from both studies is included in the Appendix. Relative frequency categories for each species, from each study, are also included along with the change in number of category levels, global population trends, and relative frequencies and high counts from our study (Appendix).

It is impossible to compare the time spent in the field, between the two studies, because of the vague statement, "approximately 100 days" in Seneviratne (2005), which gives no indication of the time of year, number, and duration of visits. Nevertheless, because of the large sample sizes spanning all months in both studies, we can make some meaningful comparisons.

We found a decline in the status of many birds during the nearly two decades that lapsed between the two studies. The total number of bird species categorized as VC and C showed a steep decline of 49% from 85 (Fig. 3A) to 42 (Fig. 3H). While five species that were originally UN or lower, moved up to C or VC, over half the species originally classified as C or VC shifted to lower categories, with 48/85 (56%) dropping to UN or below (Fig. 3FG). Analysis of 58 species categorized as VC in 2002–2003 revealed that only 19/58 (33%) maintained their frequencies under that category, while 29/58 (50%) slipped into the NO, VR, R, or UN status (Fig. 3G). While the total number of species was higher in our study, 54/56 (96%) of the new species observed in our study were in the VR or R category (Fig. 3B). It is unknown, but very likely, that many of these additional species were seen due to more time spent, and more nocturnal observations, in our study.

We further tracked the change in status of each species, between the two studies, by computing the number of levels it changed, with a negative value indicating a drop in relative frequency, and a positive value indicating an increase in frequency level (Appendix). Figure 4A gives a summary of these category changes. 77 (43%) species dropped one or more levels, 34 (19%) stayed the same level, and 69 (38%) species rose one or more levels (Fig. 4A). The mean of these changes is -0.31 (95% CI: [-0.56, -0.05]), which is significant (two-tailed t-test: $p = 0.01$). However, this is an underestimate since 56/69 (81%) of the increases were due to additional species observed in our study that were not present in the previous study. The 32 species classified as either NO or VR in both studies were observed only 0–3 times in each study. These 32 species do not represent significant changes. For a more meaningful picture, we removed these 32 species, including the 30 that went from not being observed to only being observed in one or two visits. Of the remaining 148 species, the mean change in category is significant (two-tailed t-test: $p = 0.00008$) at -0.57 (95% CI: [-0.85, -0.28]), with 39/148 (26%) increasing and 76/148 (51%) decreasing at least one frequency level (Fig. 4B). If we limit our attention to only the 105 species that were recorded by Seneviratne (2005) in at least 25% of visits, UN or above, then the mean change is -1.30 categories. Therefore, there was an overall decline in status in the avifauna of the sanctuary. These numbers raise a cautionary flag for bird conservation: either bird species have left the sanctuary, or this could indicate that local populations may be decreasing due to habitat degradation or other factors.

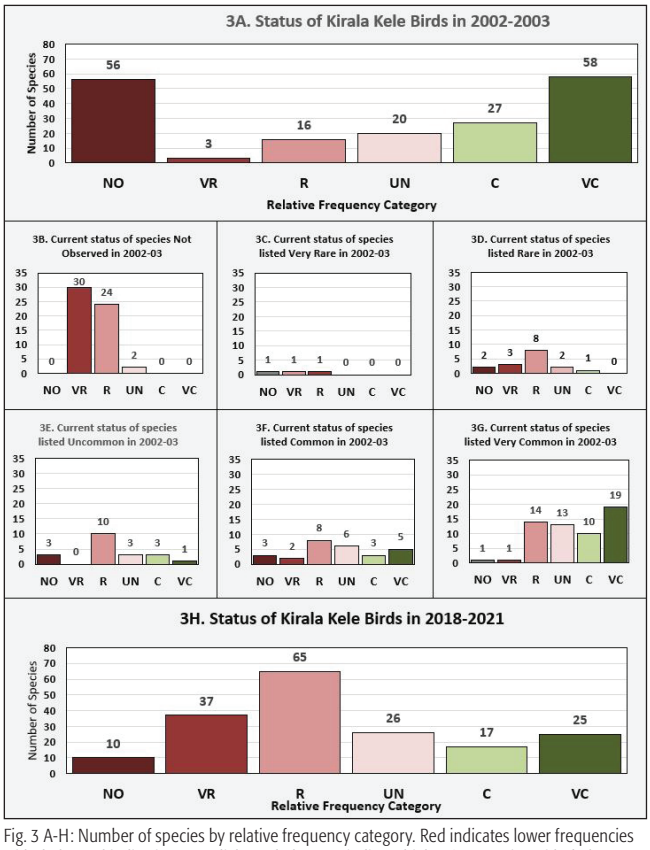

Fig. 3 A-H: Number of species by relative frequency category. Red indicates lower frequencies with darker red indicating rarer; light to dark green indicate higher frequencies with darker green indicating more common. Figures B through G show current status of species categorized as Not Observed (NO), Very Rare (VR), Rare (R), Uncommon (UN), Common (C), and Very Common (VC), respectively, in 2002-2003.

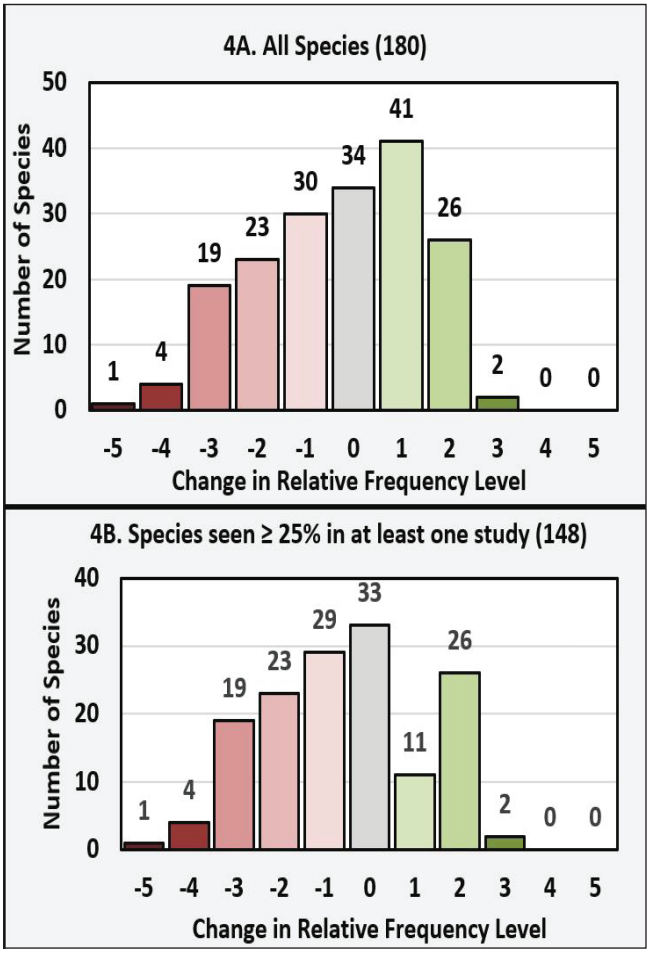

Fig. 4A-B. Changes in relative frequency level from 2002–2003 to 2021. Light to dark red indicates continuum from slight to severe decline in status; light to dark green indicates increasing improvement in status. Fig. 4B is limited to those species observed in 25% or more of the visits in at least one of the two studies.

Notable species showing decrease in status

Henceforth, species names are followed in parentheses by a reference to their position in the Appendix. For example, (A1) refers to the species on line 1 in the Appendix. We also provide global status as defined by IUCN (2021) for comparison (Appendix). Five species dropped four or five categories. The globally declining House Sparrow (A1) dropped five levels from VC to NO, and the globally stable Green Warbler (A11) dropped four levels from VC to VR. The House Sparrow was found to be "roughly stable overall" in India (SoIB 2020). We hypothesize that one of the Green Warbler's preferred habitats, heavy forest (Rasmussen & Anderton 2012), was more extensive in 2002–2003 than today, and hence the apparently drastic decline in its status. Today, such habitat is restricted to a small nook in the sanctuary, the only place where we found the endemic Brown-capped Babbler (A157). It is also possible that the drastic change in status of the Green Warbler was augmented by annual fluctuations. However, a precipitous change (VC to NO, or VC to VR) is cause for significant concern.

The globally increasing Green Bee-eater (A2) and Indian Roller (A3), and the globally decreasing Western Yellow Wagtail (A4) dropped four levels, from C in the previous study to NO in our study. Two globally decreasing species recorded as C in 2002–2003, Indian Cuckoo (A12), and Orange Minivet (A13) dropped three levels to VR in our study (Fig. 3F).

The globally decreasing Tawny-bellied Babbler (A9) was recorded as R in 2002–2003 but was NO in 2018–2021. It is showing a discernible decline in adjacent India (SoIB 2020).

Of the nine Sri Lankan endemics recorded in either study (Appendix) the Crimson-fronted Barbet (A64) is declining both globally and locally, although with a one category drop (C to UN). The Red-backed Flameback (A46) dropped two categories (VC to UN), but is stable globally.

Notable species showing gains in status

Of the species observed in both studies, only 13/114 (11%) showed an increase in relative frequency category (Appendix). No species elevated more than three levels (Fig. 4A). The two that increased three levels were the Spot-billed Pelican (A180) and feral Rock Pigeon (A179). The former is globally decreasing and was not observed in 2002–2003, but we recorded it as UN. Although wild Rock Pigeons are globally declining, feral populations are not a cause for concern. In India, the long-term and current trends of Spot-billed Pelican are designated as "Uncertain", and those of feral Rock Pigeon are designated "Strong Increase" (SoIB 2020). The only two species that were observed in both studies that gained two levels were the globally decreasing Painted Stork (A123), rising from R to C, and the globally stable Indian Peafowl (A124), rising from UN to VC. The Indian Peafowl is also showing a general increase in India, apparently due to range expansions and increases in population size (SoIB 2020). The Orange-breasted Pigeon (A113) and White-bellied Sea-eagle (A114) jumped up one category, from R to UN. Both species are decreasing globally. Interestingly, three species showing strong long-term declines in India (SoIB 2020), the globally decreasing Crested Treeswift (A139), and globally stable Small Minivet (A174) and Large Cuckooshrike (A164), were unrecorded in the previous study, but were recorded by us, albeit in the R or VR category (Appendix).

Global vs. local trends

Global population trends from the International Union for Conservation of Nature (IUCN 2021) are given for each species in the Appendix. Figure 5A-B gives a comparison of these global trends with the trends of the species in this sanctuary. Significant numbers of species are locally moving in opposite directions from global trends. Of the globally decreasing species, 34/69 (49%) are increasing locally, and of the globally increasing species, 9/21 (43%) are decreasing locally (Fig 5A). The 27 species that are declining, both locally and globally, are a particular source of concern, and they are indicated in the Appendix in red bold face names.

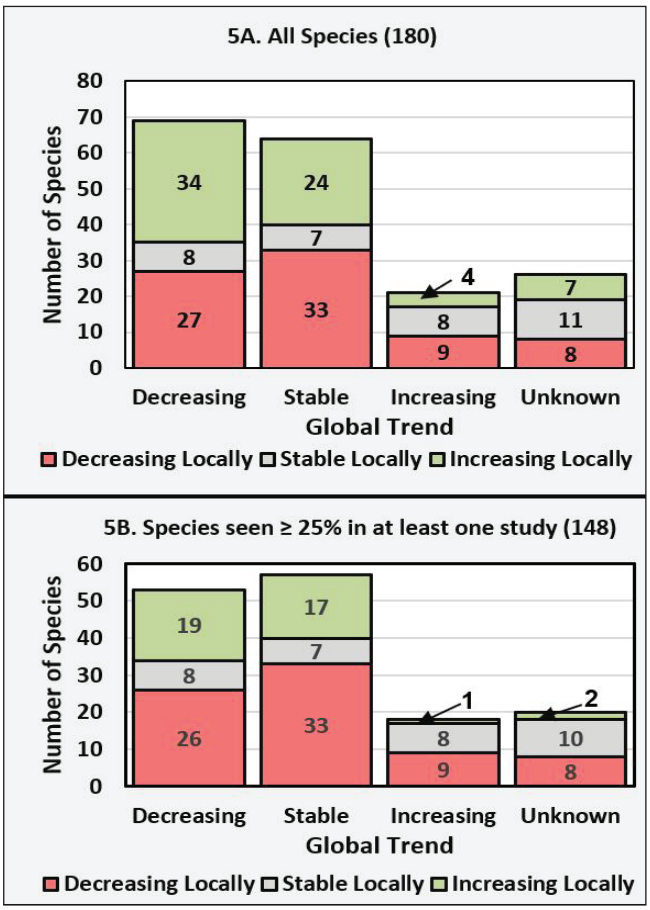

Figure 5A–B. Comparison of global trends vs. local trends. Colors of bars indicate local trends. Bars are stacked by matching global trends; so total heights of bar stacks indicate global trends.

Conservation implications

Although relative, or reporting frequency (Szabo et al. 2010) can be used as an index of abundance, it cannot be assumed to be proportional to population size (Viswanathan et al. 2020). Therefore, we are not making any conclusions about population trends in this note. Also, we are not making any final or sweeping inferences regarding bird species status in the area. Possible differences in number, duration, time of day, season of observations, and exact sites surveyed, along with any differences in observer skills, may have contributed to some of the changes in relative frequencies. Furthermore, without the actual relative frequency of observance for each species from the previous study, we cannot perform a more accurate and detailed analysis. To help mitigate these shortcomings in possible future follow-up studies, for each species we observed, we have provided the maximum number of individuals and the date of their sighting, birds per party hour, as well as the percentage of visits in which the species was observed (Appendix). Birds per party hour was computed by averaging eBird numbers for that metric for every week of study. Despite these caveats, we felt compelled to publish this information to highlight the apparent status changes between the two studies and alert administrators, researchers, and birders to possibly declining bird species.

We should extend increased surveillance to the 27 species declining both globally and locally (Appendix) and to those discussed above that have apparently experienced precipitous status declines. A similar (although rather perfunctory) alert for possibly declining species and numbers of birds in this wetland was reported by De Silva et al. (2015), who recorded 23 species of water birds, "far less than when compared to the 53 species" reported in Samarasekara et al. (2010). We placed a phrase from De Silva et al. (2015) in quotes in the previous sentence because it is unclear which 53 species they were alluding to, of the 83 species reported from five habitat categories by Samarasekara et al. (2010).

Threats to local habitats

This semi-urban area, on the outskirts of Matara (Fig.1; human population *c.*46,000), faces threats that include garbage dumping by local people and invasion of exotic plants (Wijesundara 2010; De Silva et al. 2015; Rodrigo 2017) including *Acacia* spp., *Salvinia molesta*, Water Hyacinth *Eichhornia crassipes*, and *Lantana camera*. Also, our observations reveal that some animals, such as feral pigs *Sus scrofa*, domestic cats *Felis domesticus*, stray dogs *Canis familiaris* **[12]**, the introduced Red-eared Turtle *Trachemys scripta*, and Tank Cleaners *Hypostomus plecostomus* (an exotic fish), are possible threats to local wildlife.

12. Stray dog with a White-breasted Waterhen (A109), taken in Kirala Kele on 30 September 2021 by Thusitha Weerasingha.

Clearance of land for agriculture is reducing, or fragmenting habitat for wildlife. Farmers set fire to reed beds, which are breeding habitats of Streaked Weaver (A27) and rails (Rallidae). According to a local farmer, Gray-headed Swamphen (A96) and Eurasian Moorhen (A40) consume fertilizers in the form of pellets, which end up killing them, and the scavengers that eat their carcasses. Animal poaching is another threat to the wildlife of this area. We have observed poaching of Porcupine *Hystrix indica*, Wild Hare *Lepus nigricollis*, Wild Boar *Sus scrofa*, Gray-headed Swamphen, and ducks, for human consumption. Also, highway construction through the sanctuary has resulted in road kills and reduced or compromised habitat for wildlife.

Need for continued monitoring

In neighbouring India, 79% of 867 selected bird species are decreasing (SoIB 2020). A similar situation may exist undetected in Sri Lanka, highlighting the dire need for repeated surveys of specific bird-rich localities in the island. Such surveys can provide baseline data that can be compared in the future. Follow-up studies of this kind are rare in the tropics because of lack of systematic quantitative data from the past. Similar follow-up investigations have yielded valuable insights on effects of the ongoing anthropogenic climate change on birds (Freeman &

Freeman 2014; Freeman et al. 2018). We hope that our study leads to continued monitoring of this, and other vulnerable or threatened habitats in the island.

Acknowledgments

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Appendix

List of species (180) observed in both studies (Seneviratne 2005, and ours), along with their global status and the apparent status change in the sanctuary between 2002 and 2021. Global population trends (D = Decreasing, I = Increasing, S = Stable, UN = Unknown) are from IUCN (2021). [e] = endemic to Sri Lanka; red = declines in status, black = no change, and green = improvement in status). Category change indicates the number of categories of change from 2005 to present. **Red bold face** names indicate species declining both locally and globally. NA = Not Applicable.

	Species		Max. No. 2018–2021	Date of Max. Count (d-m-y)	Birds/ Party Hour 2018-21	% of visits 2018–2021	Status 2002–2003	Status 2018–2021	Global population trend	Category change
10 species observed in 2002–2003 but not observed in 2018–2021										
1	**House Sparrow**	*Passer domesticus*	0	NA		0	VC	NO	D	-5
2	Green Bee-eater	*Merops orientalis*	0	NA		0	C	NO	I	-4
3	Indian Roller	*Coracias benghalensis*	0	NA		0	C	NO	I	-4
4	**Western Yellow Wagtail**	*Motacilla flava*	0	NA		0	C	NO	D	-4
5	Cinereous Tit	*Parus cinereus*	0	NA		0	UN	NO	I	-3
6	Jerdon's Bushlark	*Mirafra affinis*	0	NA		0	UN	NO	S	-3
7	**Oriental Skylark**	*Alauda gulgula*	0	NA		0	UN	NO	D	-3
8	Eurasian Marsh-Harrier	*Circus aeruginosus*	0	NA		0	R	NO	I	-2
9	**Tawny-bellied Babbler**	*Dumetia hyperythra*	0	NA		0	R	NO	D	-2
10	**Great Knot**	*Calidris tenuirostris*	0	NA		0	VR	NO	D	-1
114 species observed in both 2002–2003 and 2018–2021										
11	Green Warbler	*Phylloscopus nitidus*	3	17 Oct 20	0.04	0.5	VC	VR	S	-4
12	**Indian Cuckoo**	*Cuculus micropterus*	1	17 Oct 20	0.03	1.0	C	VR	D	-3
13	**Orange Minivet**	*Pericrocotus flammeus*	4	28 Jan 21	0.10	1.0	C	VR	D	-3
14	**Alexandrine Parakeet**	*Psittacula eupatria*	8	19 May 21	1.39	7.7	VC	R	D	-3
15	Baya Weaver	*Ploceus philippinus*	650	23 Jan 21	8.88	14.4	VC	R	S	-3

	Species		Max. No. 2018–2021	Date of Max. Count (d-m-y)	Birds/ Party Hour 2018-21	% of visits 2018–2021	Status 2002–2003	Status 2018–2021	Global population trend	Category change
16	Chestnut-headed Bee-eater	*Merops leschenaulti*	12	2 May 21	0.73	9.3	VC	R	I	-3
17	**Common Sandpiper**	*Actitis hypoleucos*	6	30 Oct 20	0.64	8.8	VC	R	D	-3
18	**Garganey**	*Spatula querquedula*	350	23 Oct 20	13.85	19.6	VC	R	D	-3
19	House Crow	*Corvus splendens*	50	21 Feb 21	2.75	17.0	VC	R	S	-3
20	Indian Robin	*Copsychus fulicatus*	1	21 Apr 20	0.05	1.6	VC	R	S	-3
21	**Indian White-eye**	*Zosterops palpebrosus*	6	2 Jan 21	0.48	8.3	VC	R	D	-3
22	**Marsh Sandpiper**	*Tringa stagnatilis*	45	15 Jan 21	3.93	22.2	VC	R	D	-3
23	**Northern Pintail**	*Anas acuta*	1	4 Feb 21	0.10	1.6	VC	R	D	-3
24	Paddyfield Pipit	*Anthus rufulus*	6	23 Jan 21	0.79	18.0	VC	R	S	-3
25	Pale-billed Flowerpecker	*Dicaeum erythrorhynchos*	8	5 Nov 20	0.48	19.6	VC	R	S	-3
26	Pin-tailed Snipe	*Gallinago stenura*	6	4 Sep 20	0.48	6.2	VC	R	U	-3
27	Streaked Weaver	*Ploceus manyar*	42	23 Feb 21	4.86	23.2	VC	R	S	-3
28	**Curlew Sandpiper**	*Calidris ferruginea*	28	3 Nov 20	1.79	5.7	C	R	D	-2
29	Jerdon's Leafbird	*Chloropsis jerdoni*	2	28 Apr 20	0.37	4.6	C	R	S	-2
30	Little Stint	*Calidris minuta*	28	15 Jan 21	1.46	4.6	C	R	I	-2
31	**Pacific Golden-Plover**	*Pluvialis fulva*	54	22 Jan 21	4.28	11.3	C	R	D	-2
32	Asian Brown Flycatcher	*Muscicapa dauurica*	5	17 Oct 20	0.45	10.8	C	R	S	-2
33	**Black Bittern**	*Ixobrychus flavicollis*	3	4 May 20	0.36	13.9	C	R	D	-2
34	**Black-crowned Night-Heron**	*Nycticorax nycticorax*	25	18 Sep 20	0.95	11.3	C	R	D	-2
35	Clamorous Reed Warbler	*Acrocephalus stentoreus*	2	28 Feb 21	0.11	3.6	C	R	S	-2
36	Asian Openbill	*Anastomus oscitans*	24	5 Nov 20	1.84	46.0	VC	UN	U	-2
37	Barn Swallow	*Hirundo rustica*	95	30 Oct 20	11.88	44.3	VC	UN	D	-2
38	**Brown Shrike**	*Lanius cristatus*	12	5 Nov 20	0.91	28.9	VC	UN	D	-2
39	Common Iora	*Aegithina tiphia*	12	9 May 20	1.24	40.7	VC	UN	U	-2
40	Eurasian Moorhen	*Gallinula chloropus*	12	20 Mar 21	1.53	33.0	VC	UN	S	-2
41	Greater Coucal	*Centropus sinensis*	4	2 May 20	0.83	43.8	VC	UN	S	-2
42	Little Swift	*Apus affinis*	41	17 Jan 21	2.61	37.6	VC	UN	I	-2
43	Loten's Sunbird	*Cinnyris lotenius*	10	26 Feb 21	1.25	44.3	VC	UN	S	-2
45	Purple-rumped Sunbird	*Leptocoma zeylonica*	11	28 Jan 21	1.94	48.5	VC	UN	S	-2
46	Red-backed Flameback[e]	*Dinopium psarodes*	4	28 Jan 21	0.97	25.8	VC	UN	S	-2
47	Whiskered Tern	*Chlidonias hybrida*	350	24 Mar 19	3.64	34.0	VC	UN	S	-2
48	White-browed Fantail	*Rhipidura aureola*	4	26 Feb 21	0.82	27.3	VC	UN	S	-2
49	Forest Wagtail	*Dendronanthus indicus*	1	8 Nov 20	0.01	0.5	R	VR	S	-1
50	**Gull-billed Tern**	*Gelochelidon nilotica*	1	1 Feb 20	0.0	0.5	R	VR	D	-1
51	**Little Grebe**	*Tachybaptus ruficollis*	2	20 Mar 19	0.09	1.0	R	VR	D	-1
52	**Black-tailed Godwit**	*Limosa limosa*	1450	24 Jan 21	19.04	6.2	UN	R	D	-1
53	Ashy Woodswallow	*Artamus fuscus*	7	20 May 21	0.53	9.8	UN	R	S	-1
54	**Asian Emerald Dove**	*Chalcophaps indica*	2	3 May 20	0.10	2.6	UN	R	D	-1
55	Blyth's Reed Warbler	*Acrocephalus dumetorum*	12	26 Dec 20	0.97	21.1	UN	R	I	-1
56	Common Redshank	*Tringa totanus*	50	12 Sep 20	2.79	17.7	UN	R	U	-1
57	Crested Serpent-Eagle	*Spilornis cheela*	1	13 Oct 20	0.15	4.6	UN	R	S	-1
58	Lesser Sand-Plover	*Charadrius mongolus*	19	23 Jan 21	1.10	6.2	UN	R	U	-1

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59	Rosy Starling	*Pastor roseus*	450	31 Jan 21	11.77	13.9	UN	R	U	-1
60	Shikra	*Accipiter badius*	3	29 Apr 20	0.73	21.1	UN	R	S	-1
61	Sri Lanka Woodshrike[e]	*Tephrodornis affinis*	3	9 May 20	0.32	9.3	UN	R	S	-1
62	Common Kingfisher	*Alcedo atthis*	8	30 Oct 20	0.85	35.6	C	UN	U	-1
63	Common Tailorbird	*Orthotomus sutorius*	6	26 Dec 20	1.39	36.6	C	UN	S	-1
64	**Crimson-fronted Barbet**[e]	*Psilopogon rubricapillus*	20	20 Sep 20	1.41	47.4	C	UN	D	-1
65	Indian Paradise-Flycatcher	*Terpsiphone paradisi*	12	30 Oct 20	0.95	32.0	C	UN	S	-1
66	Tricolored Munia	*Lonchura malacca*	50	24 Mar 19	5.79	33.0	C	UN	S	-1
67	**Watercock**	*Gallicrex cinerea*	12	9 May 20	1.43	36.1	C	UN	D	-1
68	Asian Koel	*Eudynamys scolopaceus*	12	3 May 20	2.43	70.1	VC	C	S	-1
69	**Black-headed Ibis**	*Threskiornis melano-cephalus*	167	25 Feb 21	16.71	55.2	VC	C	D	-1
70	Black-hooded Oriole	*Oriolus xanthornus*	19	9 May 21	3.34	68.0	VC	C	S	-1
71	Blue-tailed Bee-eater	*Merops philippinus*	64	28 Feb 21	8.28	54.1	VC	C	S	-1
72	Brown-headed Barbet	*Psilopogon zeylanicus*	8	26 Dec 20	1.58	62.9	VC	C	S	-1
73	Oriental Magpie-Robin	*Copsychus saularis*	6	30 Oct 20	1.27	52.1	VC	C	S	-1
74	Pied Kingfisher	*Ceryle rudis*	7	2 Sep 20	1.95	64.0	VC	C	U	-1
75	Scaly-breasted Munia	*Lonchura punctulata*	235	22 Jan 21	13.93	54.6	VC	C	S	-1
76	White-browed Bulbul	*Pycnonotus luteolus*	10	24 Apr 20	2.01	52.6	VC	C	S	-1
77	Zitting Cisticola	*Cisticola juncidis*	24	20 Feb 21	6.15	72.2	VC	C	I	-1
78	Common Tern	*Sterna hirundo*	2	30 Oct 20	0.08	0.5	VR	VR	U	0
79	Cinnamon Bittern	*Ixobrychus cinnamomeus*	4	27 Oct 20	0.41	10.3	R	R	S	0
80	Eurasian Spoonbill	*Platalea leucorodia*	73	9 May 20	4.75	24.2	R	R	U	0
81	Greater Painted-Snipe	*Rostratula benghalensis*	1	20 Mar 19	0.07	2.1	R	R	D	0
82	Indian Pitta	*Pitta brachyura*	1	16 Apr 20	0.09	6.7	R	R	D	0
83	Little Tern	*Sternula albifrons*	5	26 Oct 20	0.12	3.6	R	R	D	0
84	Indian Scops-Owl	*Otus bakkamoena*	3	25 Feb 21	0.41	1.6	R	R	S	0
85	Pied Cuckoo	*Clamator jacobinus*	11	28 Oct 20	0.72	19.1	R	R	S	0
86	Ruddy-breasted Crake	*Zapornia fusca*	3	26 Oct 20	0.95	21.1	R	R	D	0
87	Sri Lanka Green-Pigeon[e]	*Treron pompadora*	20	30 Oct 20	1.50	25.3	UN	UN	D	0
88	Wood Sandpiper	*Tringa glareola*	88	23 Jan 21	14.06	44.3	UN	UN	S	0
89	Yellow Bittern	*Ixobrychus sinensis*	6	9 May 20	0.97	25.3	UN	UN	U	0
90	Indian Cormorant	*Phalacrocorax fuscicollis*	44	21 Feb 21	2.82	54.1	C	C	U	0
91	Plain Prinia	*Prinia inornata*	22	5 Nov 20	2.55	55.7	C	C	S	0
92	Stork-billed Kingfisher	*Pelargopsis capensis*	8	5 Nov 20	1.62	54.1	C	C	D	0
93	Black-winged Stilt	*Himantopus himantopus*	130	17 Sep 20	17.98	78.4	VC	VC	I	0
94	Cattle Egret	*Bubulcus ibis*	790	25 Mar 21	76.36	80.0	VC	VC	I	0
95	Common Myna	*Acridotheres tristis*	180	12 Sep 20	22.79	85.6	VC	VC	I	0
96	Gray-headed Swamphen	*Porphyrio poliocephalus*	96	5 Nov 20	18.85	82.5	VC	VC	U	0
97	Great Egret	*Ardea alba*	50	5 Nov 20	10.32	79.9	VC	VC	U	0
98	Indian Pond-Heron	*Ardeola grayii*	137	7 April 21	15.01	83.0	VC	VC	U	0
99	Large-billed Crow	*Corvus macrorhynchos*	300	11 Sep 20	39.5	84.5	VC	VC	S	0
100	Lesser Whistling-Duck	*Dendrocygna javanica*	4500	2 Nov 20	477.14	88.1	VC	VC	D	0
101	Little Cormorant	*Microcarbo niger*	38	21 Feb 21	5.68	84.0	VC	VC	U	0

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102	Little Egret	*Egretta garzetta*	160	30 Oct 20	13.91	79.9	VC	VC	I	0
103	Purple Heron	*Ardea purpurea*	28	5 Nov 20	4.82	85.0	VC	VC	D	0
104	Red-vented Bulbul	*Pycnonotus cafer*	31	20 Mar 21	9.20	83.5	VC	VC	I	0
105	Red-wattled Lapwing	*Vanellus indicus*	40	5 Nov 20	5.93	86.0	VC	VC	U	0
106	Rose-ringed Parakeet	*Psittacula krameri*	50	20 Feb 21	8.83	77.8	VC	VC	I	0
107	Spotted Dove	*Streptopelia chinensis*	64	5 Nov 20	10.62	86.0	VC	VC	I	0
108	White-bellied Drongo	*Dicrurus caerulescens*	22	5 Nov 20	3.24	82.0	VC	VC	U	0
109	White-breasted Waterhen	*Amaurornis phoenicurus*	67	5 Nov 20	7.43	84.0	VC	VC	U	0
110	White-throated Kingfisher	*Halcyon smyrnensis*	22	5 Nov 20	4.44	86.0	VC	VC	I	0
111	Yellow-billed Babbler	*Turdoides affinis*	24	13 Sep 20	8.78	75.8	VC	VC	S	0
112	Grey-headed Fish-Eagle	*Haliaeetus ichthyaetus*	2	9 May 20	0.13	3.6	VR	R	D	1
113	Orange-breasted Green-Pigeon	*Treron bicinctus*	18	15 Jan 21	2.15	37.1	R	UN	D	1
114	White-bellied Sea-Eagle	*Haliaeetus leucogaster*	4	22 Jan 21	1.15	44.9	R	UN	D	1
115	Gray Heron	*Ardea cinerea*	26	15 Jan 21	2.21	61.9	UN	C	U	1
116	Green Imperial-Pigeon	*Ducula aenea*	56	5 Nov 20	2.69	67.5	UN	C	D	1
117	Sri Lanka Hanging-Parrot[e]	*Loriculus beryllinus*	31	13 Dec 20	2.81	50.0	UN	C	S	1
118	Asian Palm-Swift	*Cypsiurus balasiensis*	82	30 Oct 20	6.78	80.4	C	VC	S	1
119	Brahminy Kite	*Haliastur indus*	128	8 Oct 20	10.02	85.6	C	VC	D	1
120	Intermediate Egret	*Ardea intermedia*	95	2 Nov 20	17.68	77.8	C	VC	D	1
121	Oriental Darter	*Anhinga melanogaster*	120	28 Sep 20	4.97	82.0	C	VC	D	1
122	Sri Lanka Swallow[e]	*Cecropis hyperythra*	85	19 Oct 20	5.84	77.3	C	VC	S	1
123	Painted Stork	*Mycteria leucocephala*	325	1 Feb 20	20.75	61.3	R	C	D	2
124	Indian Peafowl	*Pavo cristatus*	43	30 Oct 20	5.42	84.5	UN	VC	S	2
56 species not observed in 2002–2003 but observed in 2018–2021										
125	Ashy-crowned Sparrow-Lark	*Eremopterix griseus*	18	23 Jan 21	0.17	0.5	NO	VR	S	1
126	Bank Swallow	*Riparia riparia*	2	26 Oct 20	0.04	0.5	NO	VR	D	1
127	Booted Eagle	*Hieraaetus pennatus*	1	21 Feb 21	0.01	0.5	NO	VR	U	1
128	Brahminy Starling	*Sturnia pagodarum*	1	27 Oct 20	0.01	0.5	NO	VR	U	1
129	Brown Fish-Owl	*Ketupa zeylonensis*	1	26 Sep 20	0.03	1.0	NO	VR	D	1
130	Brown Wood-Owl	*Strix leptogrammica*	1	11 Sep 20	0.06	1.0	NO	VR	D	1
131	Brown-backed Needletail	*Hirundapus giganteus*	1	26 Feb 21	0.04	0.5	NO	VR	D	1
132	Brown-breasted Flycatcher	*Muscicapa muttui*	1	19 Oct 20	0.02	0.5	NO	VR	D	1
133	Brown-capped Woodpecker	*Yungipicus nanus*	1	9 May 20	0.01	0.5	NO	VR	I	1
134	Common Greenshank	*Tringa nebularia*	1	8 Oct 18	0.08	1.0	NO	VR	S	1
135	Common Hawk-Cuckoo	*Hierococcyx varius*	1	28 Oct 20	0.03	1.0	NO	VR	S	1
136	Common Ringed Plover	*Charadrius hiaticula*	2	23 Jan 21	0.02	1.0	NO	VR	D	1
137	Common Snipe	*Gallinago gallinago*	1	1 Feb 20	0.02	1.0	NO	VR	D	1
138	Cotton Pygmy-Goose	*Nettapus coromandelianus*	2	30 Dec 18	0.0	0.5	NO	VR	S	1
139	Crested Treeswift	*Hemiprocne coronata*	1	20 Sep 20	0.08	1.0	NO	VR	D	1
140	Dark-fronted Babbler	*Rhopocichla atriceps*	1	5 May 20	0.02	0.5	NO	VR	D	1
141	Daurian Starling	*Agropsar sturninus*	16	28 Jan 21	0.20	1.0	NO	VR	U	1

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142	Eurasian Kestrel	*Falco tinnunculus*	1	7 Nov 18	0.04	0.5	NO	VR	D	1
143	Gray-headed Lapwing	*Vanellus cinereus*	3	22 Oct 18	0.0	0.5	NO	VR	D	1
144	Green Sandpiper	*Tringa ochropus*	1	12 Nov 18	0.0	0.5	NO	VR	I	1
145	Indian Golden Oriole	*Oriolus kundoo*	1	24 Feb 21	0.08	0.5	NO	VR	U	1
146	Lesser Yellownape	*Picus chlorolophus*	1	26 Jul 20	0.02	0.6	NO	VR	S	1
147	Malabar Pied Hornbill	*Anthracoceros gingalensis*	3	12 May 21	0.13	0.5	NO	VR	D	1
148	Pallid Harrier	*Circus macrourus*	1	26 Oct 20	0.01	0.5	NO	VR	D	1
149	Slaty-breasted Rail	*Lewinia striata*	1	25 Feb 19	0.06	0.5	NO	VR	I	1
150	Sri Lanka Grey Hornbill[e]	*Ocyceros gingalensis*	2	28 Jan 21	0.02	0.5	NO	VR	S	1
151	Sri Lanka Spurfowl[e]	*Galloperdix bicalcarata*	2	18 May 21	0.07	1.0	NO	VR	D	1
152	Temminck's Stint	*Calidris temminckii*	1	22 Jan 21	0.02	1.0	NO	VR	U	1
153	Whimbrel	*Numenius phaeopus*	1	20 Mar 19	0.02	1.0	NO	VR	D	1
154	Yellow-wattled Lapwing	*Vanellus malabaricus*	1	17 Nov 18	0.0	0.5	NO	VR	S	1
155	Black-headed Cuckooshrike	*Lalage melanoptera*	5	28 Oct 20	0.61	16.5	NO	R	S	2
156	Brown Boobook	*Ninox scutulata*	3	27 Apr 21	0.21	5.1	NO	R	D	2
157	Brown-capped Babbler[e]	*Pellorneum fuscocapillus*	1	6 Sep 20	0.15	7.7	NO	R	S	2
158	Changeable Hawk-Eagle	*Nisaetus cirrhatus*	2	9 May 20	0.27	7.2	NO	R	D	2
159	Gray-bellied Cuckoo	*Cacomantis passerinus*	17	28 Oct 20	0.56	7.7	NO	R	S	2
160	Great Cormorant	*Phalacrocorax carbo*	3	13 Feb 21	0.15	2.6	NO	R	I	2
161	Indian Swiftlet	*Aerodramus unicolor*	7	29 Oct 20	0.07	5.7	NO	R	D	2
162	Jerdon's Nightjar	*Caprimulgus atripennis*	25	26 Sep 20	1.78	7.2	NO	R	S	2
163	Knob-billed Duck	*Sarkidiornis melanotos*	23	20 Feb 21	1.63	17.5	NO	R	D	2
164	Large Cuckooshrike	*Coracina macei*	4	14 Jan 21	0.29	5.7	NO	R	D	2
165	Lesser Cuckoo	*Cuculus poliocephalus*	2	28 Oct 20	0.03	2.1	NO	R	S	2
166	Little Ringed Plover	*Charadrius dubius*	23	24 Jan 21	0.50	4.1	NO	R	S	2
167	Long-toed Stint	*Calidris subminuta*	34	23 Jan 21	0.50	3.0	NO	R	U	2
168	Oriental Honey-buzzard	*Pernis ptilorhynchus*	3	13 Dec 20	0.34	13.4	NO	R	S	2
169	Oriental Pratincole	*Glareola maldivarum*	1	22 Oct 18	0.14	1.6	NO	R	D	2
170	Pallas's Grasshopper-Warbler	*Locustella certhiola*	6	16 Jan 21	0.68	22.2	NO	R	D	2
171	Peregrine Falcon	*Falco peregrinus*	1	26 Mar 20	0.22	6.2	NO	R	S	2
172	Purple Sunbird	*Cinnyris asiaticus*	2	21 Apr 20	0.05	2.6	NO	R	S	2
173	Ruff	*Calidris pugnax*	2	1 Feb 20	0.13	3.1	NO	R	D	2
174	Small Minivet	*Pericrocotus cinnamomeus*	6	16 Apr 20	0.75	15.5	NO	R	S	2
175	Striated Heron	*Butorides striata*	2	28 Apr 20	0.17	6.2	NO	R	D	2
176	Tickell's Blue Flycatcher	*Cyornis tickelliae*	2	9 May 20	0.23	11.9	NO	R	S	2
177	White-rumped Munia	*Lonchura striata*	18	26 Feb 21	1.81	18.6	NO	R	S	2
178	White-winged Tern	*Chlidonias leucopterus*	25	24 Mar 19	0.42	5.7	NO	R	S	2
179	Rock Pigeon (feral)	*Columba livia*	28	30 Oct 20	2.62	31.4	NO	UN	U	3
180	Spot-billed Pelican	*Pelecanus philippensis*	45	21 Feb 21	5.26	47.4	NO	UN	D	3