Abundance and Seasonal Migration of Birds at the Port of Spain Sewage Ponds

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ABSTRACT

The Port of Spain sewage ponds offer an opportunity to study wetland birds in a relatively constant habitat. Twenty-five visits were made between 1985 and 1986, and all species or seen or heard along a standard route were recorded. Of 107 species recorded, 55 were associated with the sewage facility and 34 with the surrounding mangrove. The remaining species utilized both habitats. The species list included 58 residents, 40 non-residents and nine species with both migrant and resident populations. The presence of Black-necked Stilts throughout the year with nesting in June and July was confirmed. Late or early dates are recorded for Least Sandpiper, Spotted Sandpiper, Red Knot, White-rumped Sandpiper, Black Tern, Prothonotary Warbler, American Redstart and Barn Swallow. Local movement is suspected for the Yellow-breasted Crake.

INTRODUCTION

Wastewater treatment ponds are often areas with rich avian diversity as they provide a man-made wetland with a continuous supply of nutrients. As wastewater is generated in areas of high population density, treatment facilities may serve as small sanctuaries with abundant food and no hunting. In Trinidad and Tobago there are three sewage treatment facilities which support high populations of wetland birds: Port of Spain and Trincity sewage ponds in Trinidad and the Bon Accord sewage facility in Tobago.

The composition of the bird communities in Trinidad's wetlands is well documented. Checklists have been published for Caroni swamp (Bacon 1970, ffrench 1977) and Nariva swamp (Worth 1973) and species from all major wetlands considered by Ramcharan and ffrench (1988). A small wetland at Galeota Point was described by (Morgan 1984). There is, however, a lack of baseline data on the abundance of species other than a subjective assessment given by ffrench (1980,1991). An objective assessment was attempted by Ramcharan and ffrench (1988) but the methods and criteria used offer little improvement over ffrench (1980,1991) and they omitted a large number of species which would usually be associated with wetlands. James et al. (1984) describe all the wetlands areas of Trinidad but their treatment of the status and distribution of the birds is based on few

observations and for many species is contrary to ffrench (1980,1991). No studies have focused on the seasonal composition of wetland birds. However, ffrench (1980, 1991) compiles sightings from a great range of sources, including his own, to present the seasonality of each species.

This study was conducted to document the abundance and seasonality of birds at the Port of Spain sewage ponds and to compare the observed seasonality of migrant species to that described by ffrench (1980, 1991). The Port of Spain sewage ponds pro-



Figure 1. Diagrammatic representation of the Port of Spain Sewage ponds.

vide an excellent site for monitoring migrant waders, being more stable and predictable than the natural habitats that it approximates. There are no tidal effects and seasonal differences are minimal. Visibility and accessibility are relatively constant.

Description of study site

The Port of Spain sewage processing facility comprises 50 ha, divided into four small and two large ponds, (Figure 1). It was constructed in 1962-1963 and is located just north of the Caroni River mouth and south of Port of Spain (Gerald 1985). The site is surrounded by live mangroves on three sides with dead mangroves to the north. The sea is visible from the northwestern corner. Sewage enters the system into small anaerobic ponds at the north and works its way by gravity to the larger facultative ponds, from which it enters the mangroves and the Caroni River.

Table 1. Resident birds of Trinidad recorded at the Port of Spain Sewage Ponds, October 1985 - October 1986

Species		Frequency of occurrence	Greatest Number	Predominant Habitat
Tachybaptus dominicus	Least Grebe	0.32	8	Pond open water
Bubulcus ibis	Cattle Egret	1.00	>200	Pond and roadside vegetation, pond mudbanks
Nycticorax nycticorax	Black-crowned Night-heron	0.04	2	Mangrove edges
Nyctanassa violacea	Yellow-crowned Night-heron	0.08	4	Mangrove edges
Ixobrychus exilis	Least Bittern	0.04	1	Pond vegetation
Coragyps atratus	Black Vulture	0.88	>30	Dead mangrove
Cathartes aura	Turkey Vulture	0.04	1	Airspace
Buteogallus anthracinus	Common black Hawk	0.32	2	Dead Mangrove
Milvago chimachima	Yellow-headed Caracara	0.24	3	Dead mangrove
Rallus longirostris	Clapper Rail	0.52	7	Mangrove roots
Aramides sp.	Wood-Rail	0.04	1	Mangrove roots
Porzana flaviventer	Yellow-breasted Crake	0.36	10	Pond vegetation
Porphyrula martinica	Purple Gallinule	0.76	18	Pond vegetation and open water
Jacana jacana	Wattled Jacana	0.96	>200	Pond vegetation
Zenaida auriculata	Eared Dove	0.08	>200	All vegetation
Columbina talpacoti	Ruddy Ground-dove	0.96	>20	Roadside vegetation
Leptotila verreauxi	White-tipped Dove	0.64	2	Roadside vegetation
Forpus passerinus	Green-rumped Parrotlet	0.76	10	Mangrove branches
Amazona amazonica	Orange-winged Parrot	0.04	2	Mangrove branches
Coccyzus minor	Mangrove Cuckoo	0.08	1	Mangrove branches
Piava minuta	Little Cuckoo	0.16	1	Mangrove branches
Crotophaga major	Greater Ani	0.68	5	Mangrove branches
Crotophaga ani	Smooth-billed Ani	0.80	0	Mangrove roadside and pond vegetation
Tapera naevia	Striped Cuckoo	0.44	1	Mangrove, roadside and pond vegetation
Chaetura brachvura	Short-tailed Swift	0.08	,	Pond airsnace
Reinarda squamata	Fork-tailed Palm-Swift	0.16		Pond airspace
Anthracothorax viridicula	Green-throated Mango	0.16	1	Mangrove branches
Amazilia tobaci	Copper-rumped Humminghird	0.44	2	Mangrove marking and pond vegetation
Chlomcenile senes	Pyamy Kingfisher	0.04	1	Mangrove edges
Vinhorbynchus picus	Straight-hilled Moodcreener	0.08	1	Mangrove branches
Synallaxis cinnamomaa	String-brassted Spinetail	0.04	1	Pond and roadside vegetation
Certhiavis cinnamomea	Vellow-throated Spinetail	0.92	6	Pond and roadside vegetation
Sakasabarus canadansis	Risck-crosted Antshrika	0.36	2	Manarova branchas
Eluvicota pica	Pied Water-turant	1.00	5	All vegetation
Arundinicola leucocenhala	White-beaded Marsh-tyrant	0.88	6	All vegetation
Turannus melanchaliaus	Tropical Kingbird	0.88	0	Rend and readside vegetation
Dites que euleburetue	Creat Kiskadaa	0.00		All vegetation
Telmemuies Peruventria	Vellow breasted Elvesteber	0.10		Managene branchas
Flagning Para Parter	Yellow-breasted Flycatcher	0.32	2	Mangrove branches
Elaenia navogaster	Service Elizenta	0.20	2	Dand and readride us actation
Sublegatus modestus	Scrub Flycatcher	0.20	10	Pond and roadside vegetation
l'achycineta albiventer	white-winged Swallow	0.48	10	Mangrove branches
Progne chalybea	Grey-breasted Martin	0.36		Pond vegetation and airspace
Stelgidopteryx ruficollis	Southern rough-winged Swallow	0.04		Pond airspace
Mimus gilvus	Tropical Mockingbird	0.76		All vegetation
Cyclarhis gujanensis	Rufous-browed Peppershrike	0.52		All vegetation
Molothrus bonariensis	Shiny Cowbird	0.76		Mangrove branches
Quiscalus lugubris	Carib Grackle	0.96	>50	All vegetation and roads
Agelaius icterocephalus	Yellow-hooded Blackbird	0.88	>50	All vegetation and roads
lcterus nigrogularis	Yellow Oriole	0.76	2	Pond and roadside vegetation
Sturnella militaris	Red-breasted Blackbird	0.04	2	Mangrove branches
Geothlypis aequinoctialis	Masked Yellowthroat	0.04	1	Pond and roadside vegetation
Coereba flaveola	Bananaquit	0.12		Mangrove branches
Conirostrum bicolor	Bicoloured Conebill	0.60	6	Mangrove branches
Thraupis episcopus	Blue-grey Tanager	0.48		Mangrove branches
Thraupis palmarum	Palm Tanager	0.08		Mangrove branches
Saltator coerulescens	Greyish Saltator	0.04		Mangrove branches
Paroaria gularis	Red-capped Cardinal	0.04	1	Mangrove branches
Volatinia jacarina	Blue-black Grassquit	0.72	8	Roadside vegetation

Species		Frequency of occurrence	Greatest number	Predominant habitat
Casmerodius albus	Great Egret	0.60	35	Pond vegetation
Egretta thula	Snowy Egret	0.96	50	Pond mudbanks
Egretta caerulea	Little blue Heron	0.72	15	Pond vegetation and mudbanks
Egretta tricolor	Tricoloured Heron	0.92	14	Pond vegetation and mudbanks
Butorides striatus	Striated Heron	0.96	12	Pond vegetation and mangrove roots
Dendrocygna autumnalis	Black-bellied Whistling-duck	0.60	24	Pond vegetation
Charadrius collaris	Collared Plover	0.20	17	Pond mudbanks, roadways
Himanotopus mexicanus	Black-necked Stilt	0.88	>100	Pond vegetation and mudbanks, roadways
Tyrannus dominicensis	Grey Kingbird	0.04	1	All vegetation

Table 2. Resident birds with migrant populations recorded at the Port of Spain Sewage Ponds October 1985 - October 1986

At the time of the study the infrastructure was grossly neglected. This was to the benefit of the bird life. The anaerobic ponds had high levels of sediment, to the extent that an island developed around the inflow pipe that supported wading birds, herons and gulls. Other areas of these anaerobic ponds were covered with a surface crust that supported small sandpipers and plovers. In the large ponds there was no surface scum and in some areas the water looked no different from natural ponds. A wide fringe of vegetation extended into all ponds, including large floating mats of Paspalum serpentinum, and Eichhornia sp., clumps of the ferns Acrostichum sp., Blechnum sp. and Ceratopteris sp. and an exotic Typha sp. This was particularly so in the southwest pond where a considerable area was covered with a thick stand of the Acrostichum sp. Other vegetation of the ponds and along roadways included sedges, grasses and herbaceous weed species typical of the area.

METHODS

The Port of Spain sewage ponds were visited on 25 occasions between October 1985 and October 1986. The time of each visit was approximately 6:30 am to 9:00 am. The routine on most visits started with an examination of birds at the sewage inlet at point **a**, following this observers traced the path $\mathbf{b} - \mathbf{b}$ described by the dotted line in Figure 1. The observ-

ing party ranged from one to six persons; most visits involved two persons. All species seen or heard from the ponds or surrounding mangrove were recorded. During the latter part of the study, an attempt was made to count or estimate the numbers of each species.

For each species, the frequency of occurrence (the number of visits for which it was recorded divided by 25) and the greatest number recorded on any single visit, were used to indicate their abundance. Habitat designation was based on accumulated experience with each species, and aimed to separate the marsh species from those typical of mangrove forest. Habitat categories included: pond airspace, open water, pond vegetation, pond mud-banks, canal edges, roadways, roadside vegetation, mangrove roots, mangrove branches and mangrove edges.

The birds were categorized into resident species (those which breed in Trinidad, but may be absent for part of the year), non-resident species (those which do not breed in Trinidad even if they visit for several months) and species with both resident and migrant populations. Categories were based on ffrench (1991) with minor modification. At the time of the study, the Scarlet Ibis was not known to be breeding in Trinidad and was therefore included with the non-residents. Most of the non-resident species are northern visitors, which represent wintering birds. Some non-breeding

Table 3. Seasonal occurance of resident birds with migrant populations at the Port of Spain Sewage Ponds, October 1985 - October 1986

Species	Date of visit	85.10.06	85.11.03	85.11.17	85.12.06	86.01.19	86.02.02	86.02.16	86.03.15	86.03.29	86.04.27	86.05.18	86.06.01	86.06.22	86.07.13	86.07.24	86.08.09	86.08.30	86.09.14	86.10.05
Casmerodius albus	Great Egret	x	×	x					x		x			x				x		-
Egretta thula	Snowy Egret	хх	хх	×	x	x	x	x	х	хx	хx	×	хx	x	x	x	x	x	×	×
Egretta caerulea	Little blue Heron	хх	×	x	x	x	х	x		хх		x	x		x	х	x	×	x	X
Egretta tricolor	Tricoloured Heron	x x	XX	x	x	×	x		x	хх	хх	х	хх	x	x	х		x	хx	x
Butorides striatus	Striated Heron	хх	XX	x	x	х	x	x	x	хх	хx	x	x	x	x	x	×	x	хx	x
Dendrocygna autumnalis	Black-bellied Whistling-duck	хх	хх	x			х				X				x	х	×	x	хх	x
Charadrius collaris	Collared Plover													x	x	x	x		x	
Himanotopus mexicanus Tyrannus dominicensis	Black-necked Stilt Grev Kingbird	x x	x	x	x	x	x	x	x		хx	x	xx	x	x		x	x	хх	×

Table 4. Non-resident birds of Trinidad recorded at the Port of Spain Sewage Ponds, October 1985 - October 1986

		Frequency	Greatest	Predominant habitat
Species		of occurrence	number	
Ardea herodias	Great blue Heron	0.04	1	Mangrove edges
Eudocimus ruber	Scarlet Ibis	0.68	>100	Mangrove roots
Dendrocygna bicolor	Fulvous Whistling-duck	0.52	37	Pond vegetation
Anas discors	Blue-winged Teal	0.16	6	Mangrove edges
Pandion haliaetus	Osprey	0.96	6	Dead Mangrove, Pond airspace
Falco peregrinus	Peregrine Falcon	0.16	1	Dead mangrove, pond airspace
Falco columbarius	Merlin	0.20	1	Dead mangrove, Pond airspace
Porzana carolina	Sora	0.28	2	Pond vegetation
Pluvialis squatarola	Black-bellied Plover	0.16	2	Pond mudbanks
Charadrius semipalmatus	Semipalmated Plover	0.40	10	Pond mudbanks
Arenaria interpres	Ruddy Turnstone	0.16	4	Pond mudbanks and roadways
Tringa solitaria	Solitary Sandpiper	0.40	12	Pond vegetation
Tringa flavipes	Lesser Yellowlegs	0.92	>50	Pond mudbanks
Tringa melanoleuca	Greater Yellowlegs	0.80	4	Pond mudbanks
Actitis macularia	Spotted Sandpiper	0.92	12	Pond mudbanks, Mangrove roots
Catoptrophorus semipalmatus	Willet	0.76	26	Canal edges
Calidris canutus	Red Knot	0.48	70	Pond mudbanks
Calidris minutilla	Least Sandpiper	0.56	>20	Pond mudbanks
Calidris fuscicollis	White-rumped Sandpiper	0.32	5	Pond mudbanks
Calidris melanotos	Pectoral Sandpiper	0.32	15	Pond mudbanks
Calidris pusilla	Semipalmated Sandpiper	0.72	>20	Pond mudbanks
Calidris mauri	Western Sandpiper	0.84	>60	Pond mudbanks
Numenius phaeopus	Whimbrel	0.84	20	Canal edges
Limosa fedoa	Marbled Gotwit	0.04	1	Pond mudbanks
Limnodromus griseus	Short-billed Dowitcher	0.44	100	Pond mudbanks
Gallinago gallinago	Common Snipe	0.12	1	Roadways
Larus fuscus	Lesser black-backed Gull	0.04	1	Pond mudbanks
Larus atricilla	Laughing Gull	0.80	>30	Pond mudbanks
Chlidonias niger	Black Tern	0.60	5	Pond airspace
Phaetusa simplex	Large-billed Tern	0.28	3	Pond airspace
Sterna nilotica	Gull-billed Tern	0.12	2	Pond airspace
Sterna superciliaris	Yellow-billed Tern	0.12	8	Pond airspace
Rynchops niger	Black Skimmer	0.52	3	Pond surface,
Tyrannus savana	Fork-tailed Flycatcher	0.44	10	Pond and roadside vegetation
Riparia riparia	Bank Swallow	0.12	4	Pond airspace
Hirundo rustica	Barn Swallow	0.72	20	Pond airspace and vegetation
Protonotaria citrea	Prothonatory Warbler	0.12	1	Mangrove trees
Dendroica petechia	Yellow Warbler	0.44	6	Mangrove trees
Seiurus noveboracensis	Northern Waterthrush	0.64		Mangrove roots
Setophaga ruticilla	American Redstart	0.28	1	Mangrove trees

individuals, however, may remain in the wintering grounds for the entire year. Most of the resident species with seasonal influxes arrived from South America.

RESULTS

During the one-year period, 107 species were recorded, seventy-one of which were noted on five or more occasions. Of the 107 species, 55 were associated with the sewage ponds and 34 were characteristic of mangrove forest. The remaining species utilized both habitats. There were 58 resident species recorded at the sewage facility. Their abundance and habitat use is presented in Table 1. Nine species with resident and migrant populations were recorded. Their abundance and habitat is presented in Table 2, and their seasonal occurrence is shown in Table 3. There were 40 non-resident species recorded at the sewage ponds. Their abundance and habitat is presented in Table 4 and their seasonal occurrence, compared with that presented by ffrench (1991), is shown in Table 5. The expected period of occurrence, extracted from ffrench (1991), spans the earliest and latest recorded dates, with individual records in between indicated by an "o".

Three species of interest stand out; the Black-necked Stilt, the Black-bellied Whistling-duck and the Yellow-breasted Crake. Black-necked Stilts were

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Species	Date of visit	85.	85. 85.	85.		86.	86.	86.	86.	86.	86.	86.	86.	86.	86.	86.	86.	86.	86.	86.
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Anas discors	Blue-winged Teal		×	x							CLUB LAST								хx	
Pandion haliaetus	Osprey	хx	XXX	X		×	x	×	×	хx	хx	x	x	x	х	x	×	×	XX	×
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Tringa flavipes	Lesser Yellowlegs	хx	xxx	x	R. W. W. W.	x	x	x	x	хx	хx	x	x	20182	x	x	x	x	XX	×
Tringa melanoleuca	Greater Yellowlegs	xx	XXX	×	Sector and a	x	x	x	x	хx		X		x		x	x	×	XX	×
Actitis macularia	Spotted Sandpiper	xx	XXX	Service -	Service and Acres	X	X	x	X	x	хx	X	XX	x	x	X	x	x	XX	×
Catoptrophorus semipalmatus	Willet	хx	XXX	x		X	x	x	X	хx			X	102.5	x	1000	x	x	XX	×
Calidris canutus	Red Knot	x		x		х					хх	X	x			х		X	XX	X
Calidris minutilla	Least Sandpiper	x	xx		possible		100	x		x	XX	X	хх	possible		x	x		x	×
Calidris fuscicollis	White-rumped Sandpiper	×	×	The second		pro	bable	-	-	ELC-T-Y	100 100	х	х	- 10.00	x -	prol	bable		XX	- x
Calidris melanotos	Pectoral Sandpiper	хx	XXX					0			0						x	x		x
Calidris pusilla	Semipalmated Sandpiper	хx	XXX								ХХ		XX	x	X	x	x	x	хx	×
Calidris mauri	Western Sandpiper	XX	XXX	x		x	X		X	X	x	X	хх	X	X	x	x	x	XX	x
Numenius phaeopus	Whimbrel	хx	XXX	100		Ren	х	x	x	хх	X	5	X	X	X	X	X	x	XX	x
Limosa fedoa	Marbled Gotwit	102 5 11			-														1	×
Limnodromus griseus	Short-billed Dowitcher	x	XXX	X	Sales Contra	The second										X	x	x	XX	×
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Larus fuscus	Lesser black-backed Gull	x	-																	
Larus atricilla	Laughing Gull	хх	XXX			x	X		×	×	XX	X	x	x	x	x	×		хx	×
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Rynchops niger	Black Skimmer	x	x			1.1					X	х	XX	X	x	x	x	x	X	x
Tyrannus savana	Fork-tailed Flycatcher	x	ox							0 0		1	хх	X	X	x	x		XX	×
Riparia riparia	Bank Swallow				0	C	X		o x		0		x							
Hirundo rustica	Barn Swallow	xx	x x	x		x	X	x	X	XX	XX	X		x				32.04	XX	×
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Dendroica petechia	Yellow Warbler	x	XXX	- Barrow	S a set	x	X	x	12.2.3	x								1	XX	x
Seiurus noveboracensis	Northern Waterthrush	×	x x x	x	S. Carlos	x	X	X	x	хx	ХX	x	x					1		×
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Table 4. Seasonal occurrence of non-resident birds at the Port of Spain Sewage Ponds, October 1985 - October 1986. Light Shading denotes expected period of occurrence, "o" denotes individual site records.

recorded all months of the year. High numbers (>50) were observed in the months September to December, with numbers gradually diminishing until March 29 and April 6 when no Stilts were seen. In May, there appeared to be an influx of migrants when a flock of 20 apparently exhausted birds (which seemed reluctant to fly off when approached) was recorded, with numbers increasing thereafter. Nesting was observed during June and July. Black-bellied Whistling-ducks were observed on 15 occasions, with twelve records from July to November and three records between December and June. The Yellow-breasted Crake was recorded on nine occasions. Six records were of single birds but between May 18 and June 22, ten, seven and five individuals were recorded.

DISCUSSION

The presence of non-resident migrants closely reflects the previously observed status (ffrench 1991) although this study was for just one year at one location. This demonstrates the value of the sewage ponds as a location for monitoring such species.

The data on the Black-necked Stilt shows the species to be present throughout the year but with highest numbers between May to December. This supports the suggestion in ffrench (1991) that the Stilts "probably migrate to the continent outside of the breeding season." Prior to the development of the Caroni Rice Project, the Port of Spain sewage ponds probably represented a major breeding site for the Black-necked Stilt in Trinidad.

Some local movement is suspected for the Yellowbreasted Crake. All records were of birds seen and there was no apparent change in the vegetation, which could make the birds more visible. It is possible that by the end of the dry season, Crakes were attracted to the ponds as alternative habitat dried out. Crakes are generally difficult to observe and the sewage ponds present an opportunity for more work.

The Black-bellied Whistling duck is described by ffrench (1991) as "resident with some local migration evident, commonest during the wet season". This is confirmed with twelve records from July to November and only three from December to June. However, records of the Black-bellied Whistlingduck are similar to those for the Fulvous Whistling duck. Since they often associate it is possible that they may migrate together. The Fulvous Whistling-duck is described by ffrench (1991) as an occasional visitor. Data from this study suggest that visits of the latter may be increasing in frequency.

Most of the Sandpipers recorded at the sewage ponds regularly overwinter in Trinidad, and it is not surprising that a few non-breeding birds remain throughout the year. Records of the Least Sandpiper extend into June; while this was deemed "possible" (ffrench 1991) there were no previous records for this month. The record of a Spotted Sandpiper on June 22 falls in between the previous extreme dates.

Passage migrants like the Red Knot, White-rumped Sandpiper and Pectoral Sandpiper, are less likely to be recorded throughout the year. The records of each of these migrants reflects their status as passage migrants but with early and late dates for the Red Knot and early dates for the White-rumped Sandpiper. The records of the White-rumped Sandpiper in July, September and October are the first for these months. The White-rumped Sandpipers southward passage through the USA spans July to early December with return passage from April to mid June (Hayman et. al. 1986). The records of Red Knots in December and January may represent over-wintering birds. While the Red Knot is considered to be a passage migrant there are populations which over-winter in the southern USA (Hayman et. al. 1986).

Four records of Black Terns from April 27 to June 1 are all earlier than previously recorded, although a "few spring records" have been made (ffrench 1991).

Sightings of the Prothonotary Warbler and American Redstart are later than previously recorded. The Barn Swallow on June 22 is the latest.

Future studies at the Port of Spain sewage ponds should include census counts on migrant birds, and birds of uncertain status. The few individuals recorded during summer months are not as important ecologically as the major influxes each winter. It would be useful to establish the nesting periods of common residents, but the nature of the habitat makes investigation of nests difficult.

As further studies become available it would be interesting to compare the wader community at the sewage ponds with that from freshwater (e.g. Caroni rice project) and estuarine mudflats (e.g. Brickfield).

Future studies would benefit from concentrating on fewer species and the inclusion of census counts, as it is the overall seasonal pattern that should be highlighted rather than individual out-of-season sightings. A description of the seasonal changes in the environment will also assist in determining whether a species's absence is due to a lack of appropriate environment rather than a migration pattern.

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