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THE BIRDS OF KENT RIDGE PARK, SINGAPORE

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ABSTRACT. - Studies were made of the bird diversity in Kent Ridge Park, Singapore for an initial three year period from September 1992 to August 1995 and for a second six month period from September 1995 to February 1996. The park was visited on 616 days and 151 bird species were recorded during the first study and on 95 days during the second study that added six new bird species. The most important record is of a female/immature Narcissus Flycatcher (*Ficedula narcissina elisae)* which is a new record for Singapore. Breeding records, changes in habitat and species diversity, and illegal bird trapping were also noted and are commented on. The continued loss of buffer zone habitat combined with the destruction of natural habitat in the park itself may have had a detrimental effect on the resident bird diversity.

KEYWORDS. - Urban birds, checklist, Kent Ridge Park, Singapore.

INTRODUCTION

Urban birds have attracted considerable ornithological attention (e.g. Emlen, 1974; Huhtalo, 1978; Lancaster & Rees, 1979; Luniak, 1980; Mills et al., 1989; Munyenyembe et al., 1989). It has been suggested that some urban habitats can provide refuges for the native birds whose habitats have been reduced (Rosenberg et al., 1987).

Singapore contains numerous urban parks containing heterogeneous habitats. Bird fauna of these parks is relatively poorly studied (Malayan Nature Society, 1991). I studied bird community of an urban park, Kent Ridge Park, within Singapore. My objectives were to determine bird diversity in this park over three years and to qualitatively examine how vegetation management affected the bird fauna.

STUDY AREA AND METHODS

The study was conducted at Kent Ridge Park (1°18'N, 103°47'E) and its immediate environs in Singapore. The park is on a steeply sloped ridge (altitude 65 m), that runs on a north-west

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south-east axis about 0.5 km inland from the southern coast in the southern central part of the island. Its area is approximately 47 ha but when the immediate environs are included the total area is probably about thrice this figure. Although Kent Ridge was originally cleared of tropical lowland rain forest in the nineteenth century for rubber plantations and other agricultural cultivation, the habitat now almost certainly dates from the 1940's and is a mixture of secondary growth, locally known as *"belukar"*, open parkland, and cleared areas planted with exotic flowering shrubs (Malayan Nature Society, 1991). Typical trees and shrubs include Simpoh Ayer *Dillenia suffructicosa*, Tiup Tiup *Adinandra dumosa*, Albizia *Albizia falcataria,* Tembusu *Fagraea fragrans,* Acacia *Acacia auriculiformis*, and Casuarina *Casuarina equisetifolia*. Several species of pitcher plant *Nepenthes* spp occur in the park that are found nowhere else in Singapore. There are two areas of water, a small pond and a larger lake. The shallow pond is circular, about 15 m in diameter, and has been known to dry up completely during periods of drought. The wedge-shaped lake, which supports good numbers of fish, is about 200 m long and about 35 m at its widest point with a catchment stream running into it at its north-western end. The main threat to the lake must be the siltation that occurs as a result of storms and heavy rain when huge amounts of topsoil are washed down the steeply sloping hillside into the water.

The environs are the area immediately surrounding the park and include Singapore Science Park, adjacent to the north, the site for Singapore Science Park Phase 2 to the west, and Prince George's Park which is a continuation of the ridge on the western side of South Buona Vista Road.

The study was conducted from September 1992 to August 1995 and the area was visited on 616 days. The majority of observations were made during early morning walks around the park between 0715h and 0830h. The walks generally followed the paved paths in a clockwise direction as this caused least problems with the rays from the early morning sun. The environs were generally visited either at weekends or in the early evening. A list of bird species seen and/or heard was made on a daily basis but each species was only recorded once a day regardless of the number of visits made to the park. A daily diary was kept in which records of particular interest were entered. The nomenclature used here follows Inskipp et al. (1996). The scientific names of bird species are in Table 1.

A list of birds breeding, or suspected of breeding, is shown in Table 2. To qualify for inclusion in this category either nests, birds carrying nesting material, nests containing young, or newly fledged young were found. Also included is a list of species that may have bred in the park but the possibility of their young only visiting the park after fledging cannot be discounted. Also on this list are adults with well-grown young, adults holding territory in suitable habitat during the breeding season, and birds showing courtship feeding and behaviour.

RESULTS

Table 1 lists the records of the 151 bird species recorded in descending order of the total number of sightings of each species.. Fig. 1 shows the number of bird sightings expressed as a percentage of the total number of visits. By dividing the pie into slices of relative abundance it can be seen that there are very few records for many species. Only 18 species were recorded on more than 50% of the visits which gives an indication of the status of the resident birds in the park. Forty species were only recorded once or twice. Fig. 2 shows that of the 151 bird species recorded, 35 are resident in the park, 25 are "escapes" or free-flying

Table 1. A checklist of the bird species of Kent Ridge Park (Singapore) and its environs for the 3-year period from September 1992 to August 1995. Numbers refer to the total number of sightings per year together with a cumulative total.
Year 1 = Sept. 1992 - Aug. 1993. Year 2 = Sept. 1993 - Aug. 1994. Year 3 = Sept. 1994 - Aug. 1995. Number of daily visits per year: Year 1 = 219. Year 2 = 177. Year 3 = 220. Records marked * are for either escaped, introduced, or feral species or free-flying birds probably from the Jurong Bird Park. The terms used regarding the status of birds are: PM = passage migrant, R = resident, ex-R = ex-resident, SV = summer visitor, V = visitor, and WV = winter visitor. The term visitor (V) includes visiting or overflying birds normally resident in Singapore, nomadic species, and visiting "escapes" or free-flying birds probably from the Jurong Bird Park. The terms winter and summer refer to northern hemisphere seasons. Due to the difficulty in separting Edible-nest Swiftlet and Black-nest Swiftlet all swiftlet records were consolidated into one entry.

Species		*Status*	*Year 1*	*Year 2*	*Year 3*	*Total*
*White-vented Myna	*Acridotheres javanicus*	R	205	171	220	596
Yellow-vented Bulbul	*Pycnonotus goiavier*	R	201	170	218	589
Black-naped Oriole	*Oriolus chinensis*	R	201	171	214	586
Scarlet-backed Flowerpecker	*Dicaeum cruentatum*	R	199	169	218	586
Pink-necked Green Pigeon	*Treron vernans*	R	197	168	208	573
White-throated Kingfisher	*Halcyon smyrnensis*	R	197	163	206	566
House Swift	*Apus affinis*	V	192	156	186	534
Asian Glossy Starling	*Aplonis panayensis*	R	164	162	203	529
Dark-necked Tailorbird	*Orthotomus atrogularis*	R	169	152	188	509
Pacific Swallow	*Hirundo tahitica*	R	186	121	142	449
Oriental Magpie Robin	*Copsychus saularis*	R	147	133	160	440
White-breasted Waterhen	*Amaurornis phoenicurus*	R	170	126	131	427
Brown-throated Sunbird	*Anthreptes malacensis*	R	128	93	163	384
White-crested Laughingthrush	*Garrulax leucolophus*	R	33	97	200	330
Large-billed Crow	*Corvus macrorhynchos*	V	82	102	145	329
Eurasian Tree Sparrow	*Passer montanus*	R	47	120	155	322
Striped Tit Babbler	*Macronous gularis*	R	98	101	117	316
Abbott's Babbler	*Malacocincla abbotti*	R	135	69	109	313
Common Iora	*Aegithina tiphia*	R	87	85	129	301
Olive-backed Sunbird	*Nectarinia jugularis*	R	100	100	98	298
*House Crow	*Corvus splendens*	V	102	61	130	293
Olive-winged Bulbul	*Pycnonotus plumosus*	R	108	79	88	275
Banded Woodpecker	*Picus miniaceus*	R	80	93	78	251
Common Kingfisher	*Alcedo atthis*	WV	81	76	89	246
Dollarbird	*Eurystomus orientalis*	WV/R	83	63	82	228
Blue-tailed Bee-eater	*Merops philippinus*	WV	72	77	76	225
Barn Swallow	*Hirundo rustica*	PM/WV	41	83	100	224
Spotted Dove	*Streptopelia chinensis*	R	98	48	71	217
*Hwamei	*Garrulax canorus*	R	76	63	76	215
Edible-/Black-nest Swiftlet	*Collocalia fuciphaga/maxima*	V	59	62	85	206
Asian Koel	*Eudynamys scolopacea*	R	41	75	86	202
Golden-bellied Gerygone	*Gerygone sulphurea*	R	46	47	76	169
Common Tailorbird	*Orthotomus sutorius*	R	89	44	36	169
*Rock Pigeon	*Columba livia*	V	36	60	72	168
Paddyfield Pipit	*Anthus rufulus*	ex R/V	144	22	1	167
*Japanese White-eye	*Zosterops japonicus*	R	35	52	75	162
Common Myna	*Acridotheres tristis*	R	75	31	53	159
Blue-throated Bee-eater	*Merops viridis*	PM/SV	54	37	62	153
Black-capped Kingfisher	*Halcyon pileata*	WV	63	38	46	147
Collared Kingfisher	*Todiramphus chloris*	V	45	66	34	145
Brahminy Kite	*Haliastur indus*	V	59	22	63	144
Little Heron	*Butorides striatus*	ex R/V	71	31	16	118
Peaceful Dove	*Geopelia striata*	V	53	19	40	112
Common Flameback	*Dinopium javanense*	V	35	22	51	108
Ashy Minivet	*Pericrocotus divaricatus*	PM/WV	37	38	18	93

Species		*Status*	*Year 1*	*Year 2*	*Year 3*	*Total*
Purple-backed Starling	*Sturnus sturninus*	PM/WV	15	31	43	89
Pied Triller	*Lalage nigra*	V	32	31	25	88
Scaly-breasted Munia	*Lonchura punctulata*	ex R/V	50	13	9	72
Yellow Bittern	*Ixobrychus sinensis*	ex R/V	52	1	14	67
Crimson Sunbird	*Aethopyga siparaja*	R	21	28	17	66
Grey-rumped Treeswift	*Hemiprocne longipennis*	V	24	12	24	60
*Greater Necklaced Laughingthrush	*Garrulax pectoralis*	ex R/V	32	15	12	59
Greater Coucal	*Centropus sinensis*	V	21	8	26	55
Long-tailed Parakeet	*Psittacula longicauda*	V	23	15	14	52
Black Baza	*Aviceda leuphotes*	PM/WV	13	13	25	51
Asian Brown Flycatcher	*Muscicapa dauurica*	PM/WV	13	8	30	51
Japanese Sparrowhawk	*Accipiter gularis*	PM/WV	11	21	17	49
*Tanimbar Cockatoo	*Cacatua goffini*	V	24	5	20	49
Arctic Warbler	*Phylloscopus borealis*	PM/WV	14	16	18	48
Large-tailed Nightjar	*Caprimulgus macrurus*	R	30	6	11	47
Rufous-tailed Tailorbird	*Orthotomus sericeus*	V	18	10	11	39
Asian Palm Swift	*Cypsiurus balasiensis*	V	13	10	10	33
Rufous Woodpecker	*Celeus brachyurus*	V	15	8	8	31
Lesser Coucal	*Centropus bengalensis*	V	8	9	13	30
Spotted Wood Owl	*Strix seloputo*	R	16	7	7	30
Fork-tailed Swift	*Apus pacificus*	PM/WV	11	12	6	29
Laced Woodpecker	*Picus vittatus*	R	12	5	10	27
Oriental Honey-buzzard	*Pernis ptilorhyncus*	PM	13	4	8	25
White-bellied Sea-eagle	*Haliaeetus leucogaster*	V	7	7	8	22
Coppersmith Barbet	*Megalaima haemacephala*	R	13	4	5	22
Yellow-rumped Flycatcher	*Ficedula zanthopygia*	PM	0	2	20	22
Indian Cuckoo	*Cuculus micropterus*	PM	9	5	7	21
Purple-throated Sunbird	*Nectarinia sperata*	SV	12	2	6	20
Sunda Pygmy Woodpecker	*Dendrocopos moluccensis*	ex R/V	9	3	6	18
*Javan Munia	*Lonchura leucogastroides*	ex R/V	11	5	2	18
Asian Paradise-flycatcher	*Terpsiphone paradisi*	PM	2	1	14	17
*Red-whiskered Bulbul	*Pycnonotus jocosus*	V	11	3	2	16
Drongo Cuckoo	*Surniculus lugubris*	PM	13	2	0	15
*Rose-ringed Parakeet	*Psittacula krameri*	V	14	0	0	14
Brown Shrike	*Lanius cristatus confusus/superciliosus*	PM	12	0	1	13
Peregrine Falcon	*Falco peregrinus*	WV	9	3	1	13
Jambu Fruit Dove	*Ptilinopus jambu*	V	5	1	5	11
Black-shouldered Kite	*Elanus caeruleus*	V	7	1	0	8
*Great Hornbill	*Buceros bicornis*	V	7	1	0	8
Black Drongo	*Dicrurus macrocercus*	PM	4	0	3	7
*Yellow-crested Cockatoo	*Cacatua sulphura sulphura*	V	6	0	0	6
Crow-billed Drongo	*Dicrurus annectans*	PM	0	1	5	6
Eastern Crowned Warbler	*Phylloscopus coronatus*	PM	2	0	4	6
Cinnamon Bittern	*Ixobrychus cinnamomeus*	PM	1	1	3	5
*Lesser Whistling-duck	*Dendrocygna javanica*	V	0	4	1	5
Long-tailed Shrike	*Lanius schach*	V	3	0	2	5
Baya Weaver	*Ploceus philippinus*	V	4	1	0	5
Black Bittern	*Dupetor flavicollis*	PM	0	0	4	4
Crested Goshawk	*Accipiter trivirgatus*	V	0	3	1	4
*Palm Cockatoo	*Probosciger aterrimus*	V	4	0	0	4
Red-rumped Swallow	*Hirundo daurica*	PM	0	0	4	4
*Golden-fronted Leafbird	*Chloropsis aurifrons*	V	0	2	2	4
Siberian Blue Robin	*Luscinia cyane*	WV	0	0	4	4
*Cattle Egret	*Bubulcus ibis*	V	0	0	3	3
Changeable Hawk-eagle	*Spizaetus cirrhatus*	V	3	0	0	3
Oriental Pratincole	*Glareola maldivarum*	PM	1	0	2	3
*Pied Imperial Pigeon	*Ducula bicolor*	V	2	1	0	3
Emerald Dove	*Chalcophaps indica*	V	0	1	2	3

Species		*Status*	*Year 1*	*Year 2*	*Year 3*	*Total*
Large Hawk-cuckoo	*Hierococcyx sparverioides*	PM	2	0	1	3
Blue-winged Leafbird	*Chloropsis cochinchinensis*	V	0	0	3	3
Greater Racket-tailed Drongo	*Dicrurus paradiseus*	V	0	2	1	3
Siberian Thrush	*Zoothera sibirica*	PM	0	0	3	3
Eyebrowed Thrush	*Turdus obscurus*	PM	0	0	3	3
Black-browed Reed Warbler	*Acrocephalus bistrigiceps*	PM	0	0	3	3
Blue-and-white Flycatcher	*Cyanoptila cyanomelana cumatitis*	PM	0	0	3	3
Tiger Shrike	*Lanius tigrinus*	PM	0	1	2	3
Grey Heron	*Ardea cinerea*	V	0	0	2	2
Great Egret	*Casmerodius albus*	V	0	0	2	2
Von Schrenck's Bittern	*Ixobrychus eurhythmus*	PM	0	0	2	2
Chinese Sparrowhawk	*Accipiter soloensis*	PM	0	2	0	2
Slaty-breasted Rail	*Gallirallus striatus*	R	2	0	0	2
Red-legged Crake	*Rallina fasciata*	R	2	0	0	2
*Great-billed Parrot	*Tanygnathus megalorhynchos*	V	2	0	0	2
Hodgson's Hawk-cuckoo	*Hierococcyx fugax nisicolor*	PM	0	1	1	2
Rusty-breasted Cuckoo	*Cacomantis sepulcralis*	V	0	0	2	2
Grey Nightjar	*Caprimulgus indicus*	WV	1	0	1	2
Brown-backed Needletail	*Hirundapus giganteus*	PM	0	1	1	2
Silver-backed Needletail	*Hirundapus cochinchinensis*	PM	1	0	1	2
Asian House Martin	*Delichon dasypus*	PM	0	0	2	2
*Red-billed Blue Magpie	*Urocissa erythrorhyncha*	V	0	0	2	2
Oriental Reed-warbler	*Acrocephalus orientalis*	PM	2	0	0	2
Zitting Cisticola	*Cisticola juncidis*	V	2	0	0	2
Narcissus Flycatcher	*Ficedula narcissina elisae*	PM	0	0	2	2
Forest Wagtail	*Dendronanthus indicus*	PM	0	1	1	2
White-rumped Munia	*Lonchura striata*	V	1	0	1	2
White-headed Munia	*Lonchura maja*	V	2	0	0	2
Purple Heron	*Ardea purpurea*	V	0	0	1	1
Malayan Night Heron	*Gorsachius melanolophus*	PM	0	0	1	1
Rufous-bellied Eagle	*Hieraaetus kienerii*	PM	0	1	0	1
Thick-billed Green Pigeon	*Treron curvirostra*	V	0	1	0	1
*Yellow-naped Amazon	*Amazona orchocephala parvipes*	V	1	0	0	1
*Grey Parrot	*Psittacus erithacus*	V	1	0	0	1
*Rainbow Lorikeet	*Trichoglossus haematodus*	V	1	0	0	1
Plaintive Cuckoo	*Cacomantis merulinus*	V	0	0	1	1
Little Bronze Cuckoo	*Chrysococcyx minutillus*	V	0	0	1	1
Collared Scops Owl	*Otus bakkamoena*	R	1	0	0	1
*Black-throated Laughingthrush	*Garrulax chinensis*	V	1	0	0	1
Ferruginous Flycatcher	*Muscicapa ferruginea*	PM	0	0	1	1
Mugimaki Flycatcher	*Ficedula mugimaki*	PM	0	0	1	1
Grey Wagtail	*Montacilla cinerea*	PM	0	1	0	1
Yellow Wagtail	*Montacilla flava*	PM	1	0	0	1
*Black-winged Starling	*Sturnus melanopterus tricolor*	V	0	0	1	1
White-shouldered Starling	*Sturnus sinensis*	PM	0	1	0	1
Hill Myna	*Gracula religiosa*	V	0	0	1	1
*Chestnut-flanked White-eye	*Zosterops erythropleurus*	V	0	0	1	1
Black-headed Munia	*Lonchura malacca*	V	1	0	0	1

A list of additional bird species seen in Kent Ridge Park and its environs between September 1995 and February 1996. The number of daily visits = 95.

Species		*Status*
Chinese Pond Heron	*Ardeola bacchus*	PM
Black-crowned Night Heron	*Nycticorax nycticorax*	V
Commond Buzzard	*Buteu buteo japonicus*	PM
Common Sandpiper	*Actitis hypoleucos*	PM
Yellow-browed Warbler	*Phylloscopus inornatus*	WV
Brown-streaked Flycatcher	*Muscicapa williamsoni*	PM

Table 2. A list of bird species found breeding in Kent Ridge Park or its environs between September 1992 and August 1995. To qualify for inclusion in this list either nests, nests containing young, or newly fledged young have been found. Records marked " are from Singapore Science Park Phase 2 Site. Records marked ° are from Singapore Science Park.

Species	
Sunda Pygmy Woodpecker	*Dendrocopos moluccensis*
Banded Woodpecker	*Picus miniaceus*
"Laced Woodpecker	*Picus vittatus*
White-throated Kingfisher	*Halcyon smyrnensis*
"Spotted Wood Owl	*Strix seloputo*
"Large-tailed Nightjar	*Caprimulgus macrurus*
Spotted Dove	*Streptopelia chinensis*
Pink-necked Green Pigeon	*Treron vernans*
"Slaty-breasted Rail	*Gallirallus striatus*
White-breasted Waterhen	*Amaurornis phoenicurus*
Black-naped Oriole	*Oriolus chinensis*
Common Iora	*Aegithina tiphia*
Oriental Magpie Robin	*Copsychus saularis*
Asian Glossy Starling	*Aplonis panayensis*
°Common Myna	*Acridotheres tristis*
°Pacific Swallow	*Hirundo tahitica*
Yellow-vented Bulbul	*Pycnonotus goiavier*
Olive-winged Bulbul	*Pycnonotus plumosus*
Japanese White-eye	*Zesterops japonicus*
Common Tailorbird	*Orthotomus sutorius*
Dark-necked Tailorbird	*Orthotomus atrogularis*
White-crested Laughingthrush	*Garrulax leucolophus*
Greater Necklaced Laughingthrush	*Garrulax pectoralis*
Hwamei	*Garrulax canoris*
Abbott's Babbler	*Malacocincla abbotti*
Striped Tit Babbler	*Marconous gularis*
Scarlet-backed Flowerpecker	*Dicaeum cruentatum*
Brown-throated Sunbird	*Anthreptes malacensis*
Olive-backed Sunbird	*Nectarinia jugularis*
Crimson Sunbird	*Aethopyga siparaja*
Eurasian Tree Sparrow	*Passer montanus*
°Paddyfield Pipit	*Anthus rufulus*
Javan Munia	*Lonchura leucogastroides*
Scaly-breasted Munia	*Lonchura punctulata*

The following species may have bred in Kent Ridge Park or its environs between September 1995 and August 1995 but the possibility of the young only visiting the Park after fledging cannot be discounted, also included are adults holding territory in suitable habitat during the breeding seaon and those showing courtship feeding or behaviour: Coppersmith Barbet (*Megalaima haemacephala*), Dollarbird (*Eurystomus orientalis*), Brahminy Kite (*Haliastur indus*), Yellow Bittern (*Ixobrychus sinensis*), Golden-bellied Gerygone (*Gerygone sulphurea*), White-vented Myna (*Acridotheres javanicus*), and Rufous-tailed Tailorbird (*Orthotomus sericeus*).

birds, leaving the balance of 91 as either visitors or passage migrants.

Records of interest include White-crested Laughingthrush, a non-native species, which has gone from a single bird in 1992 to a healthy breeding population in 1995. By the end of the survey this group of social birds had split into at least two distinct flocks with an estimated total population of about 30 birds. Their ability to establish themselves in a vacant ecological niche has allowed them to become well entrenched not just in the park but throughout suitable habitat elsewhere in Singapore. Before the advent of the White-crested Laughingthrush the park was home to the Greater Necklaced Laughingthrush, another non-native species, after half a dozen were released on 3 November 1992. The demise of this species as a resident is probably due to their displacement by the White-crested Laughingthrush.

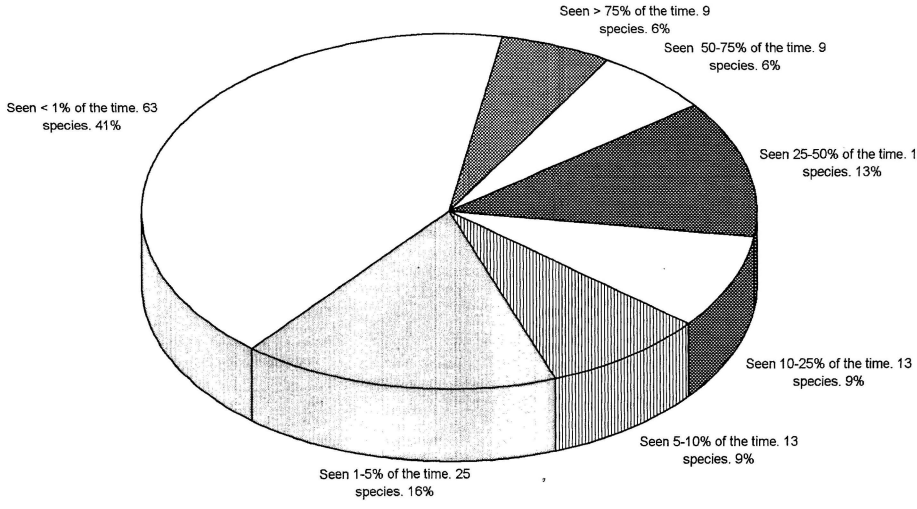

Fig. 1. The number of species sightings expressed as percentage of the total number of visits.

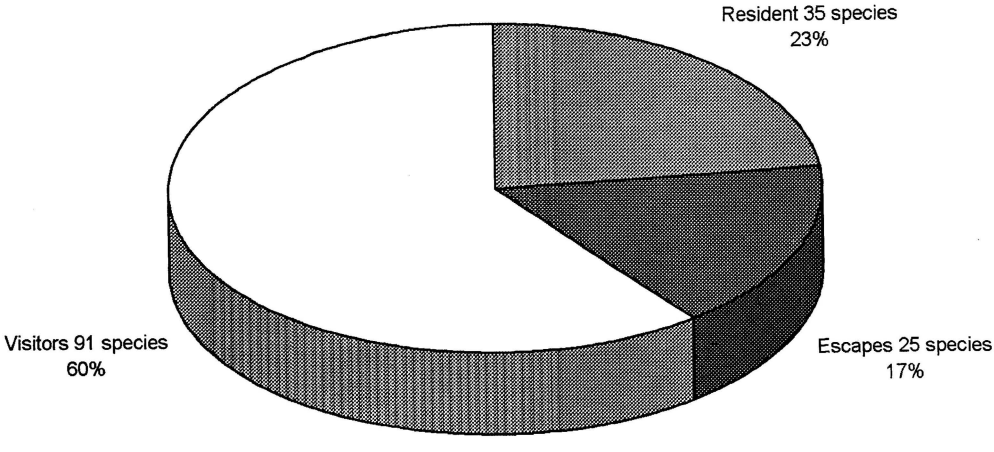

Fig. 2. A chart showing the bird species breakdown by status catagory.

The Asian Koel is another species with a booming population. Once a rare bird in Singapore its increase in numbers is probably due to the increasing number of crows *Corvus* spp on whom it is probably a brood parasite (Bucknill & Chasen, 1927). The Eurasian Tree Sparrow was absent from the area until construction began on a vacant site at Singapore Science Park in 1993. Attracted to the site and the workers' dormitories in the first place this species now seems a permanent feature of the area although all construction has now ceased. A flock of between 50 and 60 birds was seen on 4 September 1994. A species completely absent during the winter months is the Purple-throated Sunbird which may help to strengthen the hypothesis that this species may be migratory (Subharaj, 1988). As all the records were between early May and early September this species has been treated as a summer visitor.

Table 2 shows a list of 34 bird species that bred in the park together with an additional seven species that may have bred. A pair of Spotted Wood Owls bred annually during the period of the survey fledging one young each year.

During the autumn months the park seems particularly attractive to migrants with good numbers of cuckoos, warblers, thrushes, and flycatchers present from time to time. Southward migrating raptors probably use the updrafts generated by the ridge to help them gain altitude in order to cross the Strait of Malacca. By far the most important record for migrants was that of Narcissus Flycatcher, the first time it had been recorded in Singapore (Lamont, 1994). A female/immature of the *elisae* race was seen on 22 September and again on 4 October 1994. The autumnal arrival of the Black-capped Kingfisher heralds an interesting situation in which it probably displaces the White-throated Kingfisher from its usual haunts.

From time to time vegetation was managed by the Parks and Recreation Department that may have affected the bird fauna. The removal of waterside vegetation in April 1993 by this department caused two resident species, Little Heron and Yellow Bittern, to desert the area and they are now only occasional visitors. Many of the larger trees have fallen due to storms or landslides and this, combined with the growth of the *"belukar"*, has changed the character of the area considerably.

During the period of the survey a considerable amount of construction was started in the buffer zones around the park. This may have had a significant effect on the avifauna of the area and many scrub and open grassland species either vanished or were only apparent in reduced numbers. A possible outcome of this habitat change was that sightings of the Paddyfield Pipit declined from 144 in Year 1 to 22 in Year 2 and finally to only one in Year 3. All the open grassland munias also showed decreasing numbers probably due to habitat loss in the surrounding areas

Illegal bird trapping occurred throughout the entire period of this study and will continue to do so until the appropriate legislation is efficiently enforced by the authorities. Trapping reached a peak each spring when many birds were singing to protect breeding territory. The two species most sought after by bird trappers were the Hwamei and the Oriental Magpie Robin both species noted for their fine songs.

DISCUSSION

From the large number of species recorded during this survey, about half of the total species recorded from Singapore, clearly this site is an important area for resident, visiting, and

migrant species of birds. Resident species are those probably most at risk through alterations to their breeding habitat by anthropogenic changes to the park environment. These changes are largely man made and seem to be undertaken without sufficient realisation as to the consequences of these actions.

The distribution of the resident birds in the park, 22 species from around the lake area and 24 from the ridge, is fairly even and comes as something of a surprise as the area around the lake nearly always seems to have more activity. It is probable that bird species around the lake are more concentrated whereas from the top of the ridge a considerable vista can be observed and the birds are more widely scattered.

One of the surprises of the study was the large number of bird species that are normally resident in Singapore that visit the park. It is probably because Kent Ridge Park is on a ridge and with Clementi Woods to the north-west and Faber Park to the south-east it forms part of a green corridor along which birds can travel. This would certainly help to explain the high number of visiting birds that are normally resident in Singapore but do not breed in the park. Presumably the park lacks either the suitable habitat or food resources for these species to remain there on a permanent basis yet is sufficiently attractive for them to visit for short periods. It is also indicative that some resident species may have large hunting ranges. Examples include Crested Goshawk, Changeable Hawk Eagle, Emerald Dove (King, 1975), and Blue-winged Leafbird.

The park hosts good numbers of passage migrants which are probably least affected by changes in the park as their stay is typically short and provided their food and habitat requirements are met there is no reason to suppose that their numbers will diminish. The loss of buffer zones and other suitable habitat in the area may actually tend to concentrate them into the remaining suitable habitat. There is no doubt as to the attractiveness of the area to migrants as there are many records of species that are usually regarded as uncommon or rare in Singapore. Besides Narcissus Flycatcher, the first for Singapore, rare passage migrants like Mugimaki Flycatcher and Blue-and-White Flycatcher (Lamont, 1994) also occur in the park.

Apart from changes in the park itself habitat loss in the surrounding buffer zone may have an affect to the avifauna of the park. As would be expected grass and scrubland species have suffered most from this but there is no doubt that visiting residents must be affected in some way as well because there is a tendency for the park itself to become more isolated from other green areas. The continuing loss of undergrowth and low shrub cover gives cause for concern for the future of Abbott's Babbler that is dependent on this type of habitat.

Final conclusions to protect the avifauna of the park include the recommendation that suitable habitat be provided for the resident species. This includes the introduction and reintroduction of suitable native species of plants, shrubs, and trees rather than the planting of exotic species. The loss of many of the larger trees gives rise to apprehension especially as there seems to be no plan to replant or replace them. The main difficulty here is the long time taken for suitable trees to reach maturity. The waterside habitat should be allowed to regenerate in order to attract water birds back into the area. This would also help to prevent siltation of the lake during heavy rainstorms and allow it to return to its former clarity rather than retain its present muddy brown appearance. The reintroduction of water plants eradicated in 1992-3 would help this situation as well. The creation of an island in the centre of the lake and planting it with suitable flora would provide a secure breeding area for some bird species

while visually enhancing the area. The prevention of illegal bird trapping would also be a very positive step and this could easily be accomplished by employing a suitable person armed with a mobile phone who could then act as a ranger as well as a security officer preventing vandalism, littering, and other antisocial behaviour. With the loss of so much buffer zone habitat it is doubly important to preserve the remaining area in the best possible way.

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