Avian Assemblages of Urbanized Habitats in North-central Namibia

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Abstract

Studies were conducted by means of the line transect method in 4 towns (Ondangwa, Ongwediva, Oshakati, Outapi) and 12 larger villages in Ovamboland, north-central Namibia. In overall, 59 residential bird species were recorded. In particular across settlement, the number varied from 6 to 34 ($\bar{x} = 20.2; sd = 9.99$). The Simpson's Diversity Index varied from $D = 0.61$ to $D = 0.93$. Overall, dominants comprised 68.1% of all pairs recorded ($N = 2105$), with *Passer domesticus* accounted for 32.2% (eudominant). Other dominant species included: *Uraeginthus angolensis, Cypsiurus parvus, Corvus albus, Streptopelia senegalensis* and *Urocolius indicus*. Subdominants (5 species) comprised 14.2%. Bird assemblage in Ruacana proved to be fairly distant from that in other Ovambo settlements. Latitudinal trends have been shown for the proportion between *Pycnonotis tricolor* and *P. nigricans* and *Passer diffusus* and *P. domesticus* species. *Passer domesticus* almost totally replaced *Passer diffusus*, while *Streptopelia senegalensis* almost totally replaced *Streptopelia capicola* in the urbanized habitats of the north-central Namibia.

Keywords: urban ecology, avian communities, latitudinal gradient, *Pyctonotis nigricans, Pycnonotis tricolor, Passer domesticus, Passer diffusus, Streptopelia*, Oshakati, Ongwediva, Outapi.

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1 Introduction

So called urban ecology plays an increasingly important role in both environmental and human sciences. It is simply because more and more people live in cities and towns. Urban environment is an arena of two conflicting forces: rapid industry development versus increasing quality of human life. The level of human live in urbanized environment is often well-reflected by the level of biodiversity preservation. In general, the better biodiversity is preserved, the higher is the general human life. Biodiversity studies in cities and towns may provide, therefore, important information not only for nature conservation, but also for proper urban planning.

The most often used components of biodiversity in such studies are lichens and birds. In Europe, avian assemblages in urban environment have been very intensively studied in the last few decades (Kalcey and Rheinwald 2005; Dunn and Weston 2008). In southern Africa, these have largely been neglected. Quantitative data from this region are only available from Bloemfontein (Kopij 2001a, 2004), Bethlehem in eastern Free State (Kopij 1997), and from Lesotho (Kopij 2000, 2001b, 2006, 2012).

In this paper, results are presented on bird diversity in towns located in the most urbanized part of Namibia. An attempt is made to: 1) characterize the bird diversity in this urbanized environment, 2) compare the avian assemblages in towns and in villages, 3) compare avian assemblages in urbanized and natural habitats, 4) record seasonal differences in avian assemblages in urbanized environment, 5) record any latitudinal changes in the proportion of related species. Results of this study may also help to better understand the urbanization mechanisms in African wildlife.

2 Materials and Methods

2.1 Study Area

Studies were carried out in Omusati and Oshana Regions in Ovamboland, north-central Namibia. Sixteen settlements (4 towns and 12 larger villages) were selected for this study. All towns and villages, except for Ruacana, were located in the Cuvelai Drainage System. The towns are relatively young. Ondangwa, as a royal seat, is the oldest one; in 1870 first Christian mission in Ovamboland was founded there. The second oldest is Oshikuku, where first Roman Catholic mission in Ovamboland was founded in 1924. Since 1966, Oshakati became the capitol of Ovamboland (Ongwediva as a town was founded only in 1992). Rua-

cana had only 17 households (including 14 South African Defence Force) in 1988, while in 2011 the population of this settlement had already 2985 people.

The Cuvelai occupies 14 773 km^2, 5 957 km^2 is cleared or fenced, while 1 926 km^2 is transformed into cultivated land. It comprises a network of hundreds of meandering oshanas (canals), separated by sodic sands covered with Koakoland (Mopane) Savanna (Mendelsohn et al. 2000). In 2000, c. 563 000 people lived in this area.

Although Ruacana is situated in the Omusati region [which is one of the five regions of Ovamboland], its natural vegetation represents different type than that in all other towns and settlements surveyed in this study. The vegetation, Western Kalahari, falls under the Dry Acacia Savanna biome (Giess 1971).

The climate in the Cuvelai Drainage System is semiarid. Almost all rains (96%) falls in summer (November-April), with two-thirds of the fall in January-March. The amount of rain varies greatly from year to year, usually within 405-550 mm per annum (Mendelson and Weber 2011). Recent average annual rainfall [mm] in some of the towns surveyed was as follow: Ondangwa: 450 (in 2010/11 summer: 1000); Oshakati: 472; Outapi: 440 (in 2010/11 summer: 723). The average temperature of the coolest months (June-August) is 17°*C* and that of the warmest months (October-January) 25°*C*. The average annual rainfall in Ruacana is lower (426 mm) than in other Ovambo towns (450-550 mm) (Mendelsohn et al. 2000), but in 2010/11 summer, the rainfall was exceptionally high (960 mm).

2.2 Methods

Studies were conducted during the years 2011-2013, both in the centres (mostly shopping and business centres) and on the peripheries (mostly suburb residential areas) of these settlements. In each town, except for Ondangwa, three counts were conducted, while in villages, single counts were made (Table 1).

The line transect method in American version (without belts) was employed to assess the species composition, dominance structure, abundance index and relative population density for all resident bird species (Bibby et al. 1992). Transects were designed along streets. Counts were conducted while walking slowly in the mornings, usually from c. 7 a.m. till c. 10 a.m. (Table 1). Most waterbirds and Palearctic migrants were excluded from counting, as they were not resident in these settlements.

For each settlement, the following parameters were used to describe avian assemblages: 1) species diversity (number of species recorded; species diversity index); 2) number of potentially resident pairs recorded (*N*); 3) index of abundance calculated as the percentage

Table 1: Towns and settlements in Ovamboland, where bird diversity was surveyed.

No.	Name of town or settlement	Co-ordinates	Human Population	Number of species	Simpson's Diversity Index	Date and time of counts
1	Ondangwa	1755S, 1557E	22 822	22	0.85	17.02.2012: 08.00-09.15
2	Ongwediva	1747S, 1546E	20 260	26	0.83	08.05.2011: 07.10-08.40
3						27.08.2011: 08.40-10.00
4						16.12.2012: 08.30-08.50
5	Oshakati	1748S, 1542E	36 500	34	0.84	25.07.2011: 07.35-10.05
6						08.10.2011: 07.40-09.45
7						11.08.2012: 07.05-09.05
8	Oshikuku	1738S, 1528E	2 761	26	0.89	29.05.2011: 06.30-08.40
9	Outapi	1731S, 1500E	6 437	30	0.82	01.05.2011: 08.05-09.05
10						15.05.2011: 07.15-08.45
11						20.04.2013: 07.00-08.30
12	Tsandi	1745S, 1453E	c. 2 000	11	0.75	05.05.2011: 08.20-09.00
13	Okalongo	1726S, 1520E	c. 1000	10	0.87	07.12.2012: 09.00-09.50
14	Okahao	1753S, 1506E	1665	10	0.61	20.04.2013: 10.50-11.30
15	Onesi	1734S, 1440E	c. 2000	6	0.79	31.07.2011: 13.20-13.40
16	Ruacana	1725S, 1418E	2 985	27	0.93	13.04.2013: 10.20-11.40

of the number of resident pairs of the most numerous species (I); 4) dominance expressed as the proportion of resident pairs of a given species to the total number of all resident pairs of all species recorded, expressed as a percentage (*%D*). Dominant species is defined here as comprising at least 5% of the total number of all resident pairs; while subdominant that comprising 2-4.9% of that total. Differences in the densities between particular species in the same settlement were tested with X^2-test. The number of recorded resident pairs was taken into account for the testing. The nomenclature of bird species follows that of Hockey et al. (2005).

Two indices were used to compare diversity of avian assemblages: Sorensen's Coefficient (*I*), and Simpson's Diversity Index (*D*):

$$I = \frac{2C}{A+B}$$

such that
A the number of bird species in season *A*,
B the number of bird species in season *B*,
C the number of bird species common to both seasons.

$$D = 1 - \sum 2\frac{n}{N},$$

where:

n total number of pairs of particular bird species;
N total number of pairs of all bird species; and
if $D = 0$ there is no diversity, while there is infinite diversity if $D = 1$.

3 Results and Discussion

Overall, 59 residential bird species were recorded in all 16 settlements (Appendix 1). In particular count the number of species ranged from 6 to 27 ($\overline{x} = 17.4; sd = 6.44$). In particular settlement, the number varied from 6 to 34 ($\overline{x} = 20.2; sd = 9.99$). The highest number of species was recorded in Oshakati ($n = 34$), the lowest in Onesi ($n = 6$). The bigger was the settlement, the higher was the number of bird species recorded in it (Fig. 1), a relationship recorded also in urbanized environment in Lesotho (Kopij, 2011). Nevertheless, it seems there was some nonlinear relationship as evidenced by the small R^2, which suggests a weak linear relationship. Be as it may, the higher number of species in Ongwediva, Oshakati and Outapi than in other settlements can also be accounted on the fact that much more time was spent on counting birds in these towns than elsewhere.

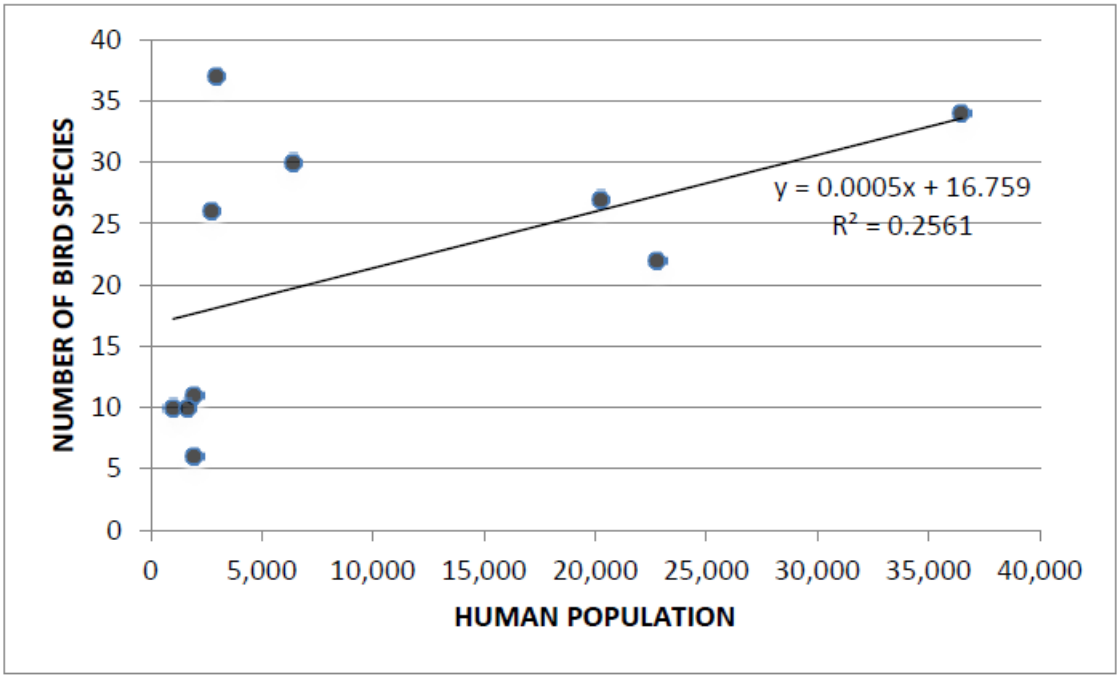

Figure 1: Relationship between the settlement size (human population) and the number of bird species recorded in Ovamboland.

The numbers of resident species recorded in each settlement represent minimal value. The maximal value can be determined only through intense research throughout the year. Some species may breed in these settlements erratically (in some years only), so even year-to-year studies are required to record such species. The numbers of resident species in particular settlements could have been, therefore, underestimated. However, the main purpose of this study was not to determine the number of all resident bird species, but to compare avian assemblages in urbanized environment along latitudinal gradient and between dry and wet season. In such comparisons, the group of dominant and subdominant species matter much more than any other groups. The method employed in this study allows for identifying such groups.

The Simpson's Diversity Index varied from $D = 0.61$ in Okahao to $D = 0.93$ in Ruacana (Table 1). In three towns in the western part (Ondangwa, Ongwediva and Oshakati), the index was very similar ($D = 0.83 - 0.85$). There was no relationship between the number of species and the value of Simpson's Diversity Index. For example, while there were 34 species in Oshakati, the Index was $D = 0.84$, but in Ruacana the number of species was lower ($n = 27$), but the Index was higher ($D = 0.93$). Similarly, the number of species was only 6 in Onesi, but the Index was $D = 0.79$; in Okahao the number of species was 10, but the Index was $D = 0.61$ (Table 1).

In comparison with natural habitats in north-central Namibia, the number of species recorded in urbanized habitats in this region was much lower. For example, in Ogongo area (Kopij, 2013a; Kopij, 2013b), the number of recorded species ($n = 93$) almost doubled that in urbanized habitats.

Overall, dominants in urbanized environments in the north-central Namibia comprised 68.1% of all pairs recorded ($n = 2105$), with House Species *Passer domesticus* accounted for 32.2% (eudominant). Other dominant species included: Blue Waxbill *Uraeginthus angolensis*, African Palm Swift *Cypsiurus parvus*, Pied Crow *Corvus albus*, Laughing Dove *Streptopelia senegalensis* and Red-faced Mousebird *Urocolius indicus*. Subdominants comprised 14.2% and included Black-chested Prinia *Prinia flavicans*, Black-eyed Bulbul *Pyconotis tricolor*, Little Swift *Apus affinis*, Black-throated Canary *Crithagra atrogularis*, and Southern Masked Weaver *Ploceus velatus*. The remaining 48 species comprised together 17.7% of all pair recorded.

The House Sparrow was edominant in all towns except for Ruacana, where it was not recorded at all. Also in some villages it has been classified as eudominant (Appendix 1). The House Sparrow was introduced in Durban and Port Elizabeth in the end of XIX century from a population living in India (*Passer domesticus indicus*) (Hockey et al. 2005). In the subsequent years it expanded its range, reaching Namibia from the south in 1961 (Winterbottom 1971). By 1971 it had reached the line Swakopmund-Windhoek-Gobabeb

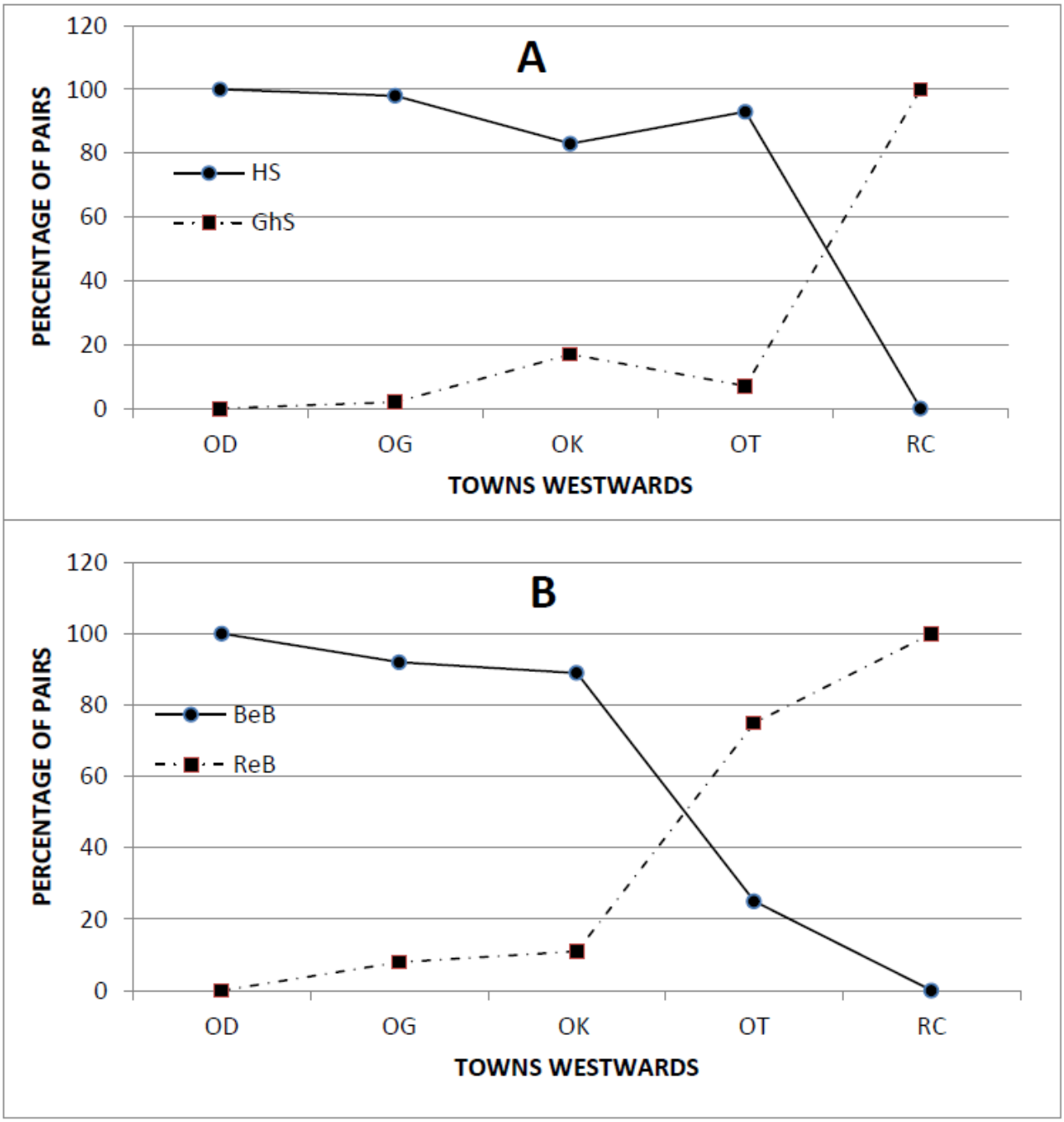

Figure 2: Percentage proportions between two congeneric sparrow (A) and bulbul (B) species. HS House Sparrow, GhS Grey-headed Sparrow, BeB Black-eyed Bulbul, ReB Red-eyed Bulbul. OD Ondagua, OG Ongwediva, OK Oshakati, OT Outapi, RC Ruacana. For the sample size (number of pairs of each species in each town) see Table 4, Appendix 1.

(Winterbottom 1971) and by 1980, most of the Ovamboland (Maclean 1993). However, it is still not established in Opuwo, Ruacana, Rundu and Katima Mulilo (own observation). In most urbanized environment in the Cuvelai Drainage System it is not only well-established, but almost totally replaced the indigenous Grey-headed Sparrow *Passer diffusus*. The other indigenous *Passer* species, the Cape Sparrow *P. melanurus*, is virtually absent in northern Namibia, from Opuwo in the west to Katima Mulilo in the extreme east (own observation).

In most towns, the Pied Crow was subdominant. In Outapi, however, it formed unusually high concentration in the dry season of 2013, where as many as 66 pairs were recorded. Although paired, they were, however, not breeding in that season. Such high concentration of this species was caused most probably by a drought, as a few months before, when most oshanas around the town were filled with water, most Pied Crows were dispersed evenly in the whole region, with only few pairs occurring in town (Appendix 1).

Only one *Streptopelia* species, the Laughing Dove *S. senegalensis*, one *Corvus* species, the Pied Crow and one canary *Serinus/Cirthagra* species, the Black-throated Canary were recorded in all settlements. This may indicate that only those representatives of the respective genera adopted to live in human settlements in the north-central Namibia. This premise is further supported by the fact that although the Cape Turtle-Dove *Streptopelia capensis* and Cape Crow *Corvus capensis* are common residents in the region (Kopij 2013a, 2013b), they were not recorded in human settlements.

In most settlements, relatively common were the Chestnut-vented Tit-Babbler *Parisoma subcaeruleum* and Red-faced Mousebird; while relatively rare were starlings (*Sturnidae*), shrikes (*Malacontidae, Lanidae*) and Fork-tailed Drongo *Dicrurus adsimilis*.

Remarkable disproportions were recorded between the numbers of resident pairs of some closely-related species: House Sparrow: Grey-headed Sparrow = 0.95 : 0.05 ($n = 715$); African Palm Swift: Little Swift = 0.74 : 0.26 ($n = 201$); Red-eyed Bulbul *Pycnonotis nigricans*: Black-eyed Bulbul = 0.41 : 0.59 ($n = 88$); Black-collared Barbet *Lybius torquatus* : Acacia Pied Barbet *Tricholaema leucomelas* = 0.58 : 0.42 ($n = 24$). Marico Sunbird *Cinnyris mariquensis* strongly dominated other sunbird species.

Although the number of species breeding in towns was much higher than that in villages, both in towns and in villages, six species were recorded as dominants, and also six as subdominants (Table 2). The House Sparrow was eudominant, with very similar proportion in towns (32%) and villages (31%). The contribution of the Laughing Dove, Red-faced Mousebird and Black-chested Prinia to the avian assemblages appears to increase eastwards.

No House Sparrows, Pied Crows, Red-eyed Bulbuls were recorded in Ruacana. In other Ovambo towns they were common, in most being classified as dominants. In Ruacana Glossy Starling *Lamprotornis nitens*, Grey-headed Sparrow, Red-eyed Bulbul, Little Swift,

Table 2: Dominant (in bold case) and subdominant species (percentage of pairs) in towns and in villages in Ovamboland.

Species	Towns	Villages
House Sparrow	**34.7**	**31.1**
Blue Waxbill	**9.5**	**12.1**
African Palm Swift	**7.1**	**8.3**
Pied Crow	**7.0**	**7.9**
Laughing Dove	**6.5**	4.1
Red-faced Mousebird	**6.3**	3.5
Black-chested Prinia	4.8	**6.3**
Grey-headed Sparrow	0.8	**5.1**
Black-eyed Bulbul	2.6	2.5
Little Swift	2.4	0.0
Black-throated Canary	2.3	2.2
Southern Masked Weaver	2.4	0.3
African Hoopoe	0.2	3.2
Dominants	71.9	70.8
Subdominants	15.5	15.8
Others	12.6	13.4
Total number of all pairs	1668	315

Rosy-faced Lovebird *Agapornis roseicollis*, Marico Flycatcher *Bradornis mariquensis* and Fork-tailed Drongo were much common than in other Ovambo towns, being classified as dominants or subdominants.

Avian assemblage in two selected towns (Ongwediva and Oshakati) differed between dry (August) and beginning of rainy season (October/November). Although the number of species recorded in both seasons was quite similar (27 and 28 respectively), Sorensen Index of Similarity was rather low ($S = 0.65$). There were, however, only four species which numbers differed significantly between the two seasons: Southern Masked Weaver, Chestnut-vented Tit-Babbler, Black-eyed Bulbul and Pied Crow (Table 3).

In urbanized environment in Lesotho (4 towns and 16 villages), the overall number of recorded species was unexpectedly higher ($n = 74$) than in north-central Namibia. Among dominant species recorded there were both Cape Turtle-Dove and Laughing Dove, Speckled Pigeon *Columba guinea*, all three sparrow species (Grey-headed, Cape and House Sparrow), and Cape Canary *Serinus canicollis* (Kopij 2011). Overall, the dominant species comprised 77% of all birds recorded, being lower in villages (61.4%) than in towns (82.0%). Especially striking was the co-existence of the indigenous Grey-headed Sparrow and House Sparrow, and Cape Turtle-Dove and the Laughing Dove. Similar co-existence of these four species was also recorded in Bloemfontein (Kopij 2001a, 2004), Bethlehem, eastern Free State (Kopij 1997), Maseru (Kopij 2000) and Roma, Lesotho (Kopij 2001b). In north-central Namibia, House Sparrow and Laughing Dove almost totally eliminated sibling species from

Table 3: Seasonal differences (August dry season, Oct./Nov. wet season) in the percentage proportion of resident birds in Ongwediva and Oshakati.

Species	August	Oct./Nov.	X^2	p
House Sparrow	35.8	35.0	0.03	> 0.05
Blue Waxbill	9.0	10.0	0.13	> 0.05
Red-faced Mousebird	8.6	8.8	0.01	> 0.05
African Palm Swift	8.0	5.8	0.91	> 0.05
Laughing Dove	5.5	7.7	0.99	> 0.05
Black-chested Prinia	5.2	5.4	0.01	> 0.05
Southern Masked Weaver	**4.8**	**1.2**	**5.85**	**0.05***
Chustnut-vented Tit-Babbler	**4.4**	**0.4**	**8.77**	**0.01****
Dark-capped Bulbul	**4.2**	**0.8**	**6.14**	**0.05***
Little Swift	4.2	7.7	2.68	> 0.05
Pied Crow	**2.1**	**0.0**	**5.45**	**0.05***
Marico Sunbird	1.7	2.7	0.61	> 0.05
Black-throated Canary	1.0	3.5	3.36	> 0.05
Black-collared Barbet	1.0	0.4	0.80	> 0.05
Grey-headed Sparrow	0.6	0.0	1.64	> 0.05
Feral Pigeon	0.6	1.5	0.99	> 0.05
Namaqua Dove	0.6	2.3	2.50	> 0.05
Little Bee-eater	0.4	0.0	1.09	> 0.05
Red-headed Finch	0.4	0.0	1.09	> 0.05
African Hoopoe	0.2	0.4	0.13	> 0.05
Scaly-feathered Finch	0.2	0.4	0.13	> 0.05
Rattling Cisticola	0.2	1.5	2.63	> 0.05
Acacia Pied Barbet	0.2	0.0	0.55	> 0.05
Tinkling Cisticola	0.2	0.0	0.55	> 0.05
Blacksmith Lapwing	0.2	0.0	0.55	> 0.05
Swallow-tailed Bee-eater	0.2	0.0	0.55	> 0.05
Chat Flycatcher	0.2	0.0	0.55	> 0.05
Red-eyed Bulbul	0.0	0.4	1.00	> 0.05
Glossy Starling	0.0	0.4	1.00	> 0.05
Greater Striped Swallow	0.0	0.4	1.00	> 0.05
Shikra	0.0	0.8	2.00	> 0.05
Yellow-billed Kite	0.0	0.4	1.00	> 0.05
Diederick	0.0	0.4	1.00	> 0.05
Grey Hornbill	0.0	0.4	1.00	> 0.05
Malachite Kingfisher	0.0	0.4	1.00	> 0.05
White-breasted Swallow	0.0	0.8	2.00	> 0.05
Cape Reed Warbler	0.0	0.4	1.00	> 0.05

the urbanized environment. This may indicate much stronger food competition between these species under tropical than temperate conditions.

Although urbanized environment has been created relatively recently in the north-central Namibia, a number of species have already developed strong urbanization mechanism (e.g. African Palm Swift, Pied Crow, Chestnut-vented Tit-Babbler, Blue Waxbill, Red-faced Mousebird, Laughing Dove), others still appear to be not adopted to live under such conditions (e.g. Black Crow, Cape Turtle-Dove, canaries, flycatchers, shrikes, bush-shrikes, starlings).

Certainly many of these changes are caused ultimately by competition. For example, the introduction of House Sparrow in urbanized environment of the north-central Namibia, almost totally replaced the indigenous Grey-headed Sparrow. In the absence of the former species, it occurs in high densities in urbanized environment (e.g. in Ruacana, Rundu, Katima Mulilo). Probably, also due to competition, the Laughing Dove has replaced the Cape Turtle-Dove, and the Pied Crow replaced the Black Crow. In general, in the ever changing urbanized environment, some species became well-adopted and increase in numbers, while others cannot adopt to live there and slowly disappear from this dramatically changing arena.

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Appendix

This section contains further details of the study area, summary of avian assemblage, and selected pictures of the avian assemblage in the study area.

Table 4: Resident bird assemblages in Ovambo towns and villages in 2011-2013.

Species ↓	Ond.‡	Ongwediva			Oshakati			Os.	Outapi			Ts.	Ol.	Ok.	On.	Ru.	Total		
Count number (see Tab. 1)→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	N	Index	Dom.
House Sparrow	62	30	61	25	66	82	110	44	33	39	71	26	3	25			677	100.0	32.16
Blue Waxbill	23	8	10	4	22	9	33	20	4	24	21	14	4			13	209	30.9	9.93
African Palm Swift	24	1	4		15	29	34	4	1	11		22				4	149	22.0	7.08
Pied Crow	5	8	6			1	4	15	4	22	66	1		7	2		141	20.8	6.70
Laughing Dove	22	11	8	2	18	26	18	10		1	2		3			16	137	20.2	6.51
Red-faced Mousebird	13	3	11	7	16	12	30	7	2	8	3	1	1	2		3	119	17.6	5.65
Black-chested Prinia	9	4	12	4	10	15	13	13	2	10	1	2	2	2	1	1	101	14.9	4.80
Black-eyed Bulbul	5	5	7		2	7	13	8	3	2							52	7.7	2.47
Little Swift					20		20									12	52	7.7	2.47
Black-throated Canary	9	3	2	9	3	3	4	3	5	1	1			1	1	5	50	7.4	2.38
Southern Masked Weaver			13		3	13	10			1				1		2	43	6.4	2.04
Grey-headed Sparrow			3					9	3	5	3	3	4			8	38	5.6	1.81
Red-eyed Bulbul	3	1			1	3		1		2	13		1	1	1	9	36	5.3	1.71
Tit-Babbler	4		16	1			5	3									29	4.3	1.38
Marico Sunbird	1		1	2	5	3	7	3		1	1					3	27	4.0	1.28
Feral Pigeon	1	3			4	1	3		1		8					2	23	3.4	1.09
Glossy Starling						1								1		16	18	2.7	0.86
Namaqua Dove		1	1		6	2	2		2		1				1		16	2.4	0.76
Black-collared Barbet		1	1	1		1	4	3		1	2						14	2.1	0.67
African Hoopoe					1	2	1	6				1			3		14	2.1	0.67
Southern Red Bishop	2	10										2					14	2.1	0.67
Scaly-feathered Finch	2		1		1			1		6	1		1		1		14	2.1	0.67
Rattling Cisticola	3			3	1	3	1				2						13	1.9	0.62
Marico Flycatcher								3		2	1					4	10	1.5	0.48
Acacia Pied Barbet	2		1			1		3	1							2	10	1.5	0.48
Greater Striped Swallow					1			1	5			2					9	1.3	0.43
Red-breasted Swallow									6	2	1						9	1.3	0.43
Tinkling Cisticola	1		1						5	1	1						9	1.3	0.43
Little Bee-eater			1			1	1	3					1				7	1	0.33
Rosy-faced Parrot								2								5	7	1	0.33
Lilac-breasted Roller						1				1	2					1	5	0.7	0.24
Red-billed Firefinch								1		1	2						4	0.6	0.19
Shikra					2											2	4	0.6	0.19
Yellow-billed Kite	2			1									1				4	0.6	0.19
Fork-tailed Drongo																3	3	0.4	0.14
Diederick	1			1					1								3	0.4	0.14
Familiar Chat	1															2	3	0.4	0.14
Grey Hornbill					1											2	3	0.4	0.14
Red-headed Finch			2			1											3	0.4	0.14
Gabar								1								1	2	0.3	0.1
Blacksmith Lapwing							1							1			2	0.3	0.1
Malachite Kingfisher					1						1						2	0.3	0.1
Swallow-tailed Bee-eater			1					1									2	0.3	0.1
White-breasted Swallow					2												2	0.3	0.1
White-tailed Shrike																2	2	0.3	0.1
Brubru						1											1	0.1	0.05
Cape Reed Warbler				1													1	0.1	0.05
Grey Kestrel											1						1	0.1	0.05
African Pipit								1									1	0.1	0.05
Chat Flycatcher							1										1	0.1	0.05
Kitlitz's Plover														1			1	0.1	0.05
Lanner Falcon																1	1	0.1	0.05
Plum-coloured Starling																1	1	0.1	0.05
Puffback																1	1	0.1	0.05
Scarlet-chested Sunbird						1											1	0.1	0.05
Black-crowned Tchagra	1																1	0.1	0.05
Village Indigobird								1									1	0.1	0.05
Yellow-billed Oxpecker									1								1	0.1	0.05
Golden Bishop									1								1	0.1	0.05
Number of species recorded	22	14	21	12	23	23	21	26	18	20	22	11	10	10	6	27			
Number of pairs recorded	196	89	163	52	208	218	314	168	78	145	205	75	21	42	9	122	2105		

‡Ond=Ondangwa; Os=Oshikuku;
Ts=Tsandi;Ol=Okalongo; Ok=Okahao;
On=Onesi; Ru=Ruacana.

Figure 3: Top: An aerial view of Ondangwa suburbs in the rainy season; Bottom: Onesi, a rural setting around large baobabs.

Figure 4: Top: Laughing Dove, characteristic is quite uniform brownish plumage; Bottom: Cape Turtle-Dove, diagnostic is uniform ashy plumage with a subtle black collar.

Figure 5: Top: House Sparrow, a species introduced from India; Bottom: Grey-headed Sparrow, an indigenous species.

Figure 6: Top: Glossy Starling was unexpectedly rather a rare species in urbanized environment; Bottom: A pair of Lesser Striped Swallow. The male (with longer tail feathers) is above.

Figure 7: Top: A family of the Rosy-faced Lovebird; Bottom: Red-eyed Bulbul, its numbers increase westwards in northern Namibia.