

POPULATION DENSITIES OF SELECTED BIRD SPECIES IN THE CITY OF WINDHOEK, NAMIBIA

Grzegorz Kopij

Department of Vertebrate Ecology, Wrocław University of Environmental & Life Sciences; ul. Kozuchowska 5b, 51-631 Wrocław, Poland

✉ gregorius.kopijus@gmail.com;  Grzegorz Kopij <https://orcid.org/0000-0001-7614-1983>

Густота населення деяких видів птахів у місті Віндхук, Намібія. - Г. Копій. - Беркут. 31 (1-2). 2022. - Дослідження проводилися у 2011–2016 рр. Всі знахідки птахів із гніздовою чи територіальною поведінкою наносилися на карту масштабу 1:1000. Загалом у внутрішній частині м. Віндхук у центральній частині Намібії (близько 50 км²) обліковано 56 нечисленних видів (< 1 пари/100 га). Майже у половині з них (27 видів) виявлено лише 1–2 пари (0,02–0,04 пар/100 га). Низькою була густота населення хижаків, птахів-носорогів, чайок, дятлів, ракшоподібних, воронів, синиць та навколородних птахів. Нечисленні види, що гніздяться у м. Віндхук, виявлені і в інших містах на півдні Африки. Однак, щільність їх населення відрізняється від міста до міста. Це може свідчити про те, що урбанізація окремих видів проходить з різною швидкістю в різних регіонах Південної Африки.

Ключові слова: Південна Африка, міська орнітологія, густота населення, урбанізація.

Abstract. Studies were conducted in the years 2011–2016. In total, 56 uncommon (< 1 pair/100 ha) bird species were counted in the inner part of the city of Windhoek (c. 50 km²), central Namibia. Almost half (n = 27) of bird species were represented by 1–2 pairs only (0.02–0.04 pairs/100 ha). The Acacia Pied Barbet nested at a density of 0.5 pairs/100 ha, Rosy-faced Lovebird – 0.5, Crimson-breasted Shrike – 0.3, Ring-necked Dove – 0.2, Swallow-tailed Bee-eater – 0.2, Rock Kestrel – 0.1, Fork-tailed Drongo – 0.1, Pied Crow – 0.1. Relatively low densities of raptors, hornbills, lapwings, woodpeckers, coraciiforms, corvids, tits and waterbirds were recorded. Uncommon species breeding in Windhoek were also recorded in other towns in southern Africa. However, their population densities differ markedly from town to town. This may indicate that urbanization of particular species undergoes with different speed in different regions of southern Africa.

Key words: South Africa, urban ornithology, population density, urbanization.

Introduction

Windhoek (Photo 1–4) is a capital of Namibia, situated in the central part of the country. Due to the diversification of habitats, the city attract wildlife living in the surrounding Highland Savanna. It would be of great interest to study the urbanization process of various component of the wildlife, showing the extent and mechanism of this process, and the role the city may play in nature conservation, environmental education and ecotourism.

However, to date little is known about this wildlife (Barnard, 1998; Kopij, 2014b). Hauptfleisch et al. (2021) recorded 17 snake species, showing exact distribution of 509 records. A few papers on lizards in Windhoek were also published (Heideman, 1994, 1995, 2002). Amutenya (2004) and Mfuni et al. (2013) studied small mammals and their flea ectoparasites in selected sites in Windhoek. The most intensively studied group of animals are however, birds, as they are in most other towns around the world. Complete checklists based on several years of observations or ringing were published for three sites (Brown, 1997; Kaestner, 1997; Thomson, 2019). However, even in regard to birds, to date quantitative studies were conducted only in the Botanic Gardens (Kopij, 2021c). In Africa at large, there is a lack of quantitative data on population densities of birds breeding in urbanized habitats (Brown et al., 1982–2004; Hockey et al., 2005).

The aim of this study was to estimate population densities of selected bird species in the inner part of the city of Windhoek, and comparing these with population densities recorded in other cities and towns in southern Africa. If the counts will be repeated after some time, results may provide data for population trend estimations. Subsequently this may elucidate the urbanization mechanisms of birds, which constitute the most important aspects of urban ecology and nature conservation.

Study area

Windhoek is located in central Namibia, in Khomas Highlands, c. 1700 m a.s.l. The city was founded in 1890, as German colonial headquarter. It is divided today in 39 suburbs (districts) and townships (locations). In 1971, the population was roughly estimated at 50,000, but by the year 2020 it rose to 431,000. There are at present 3 tertiary institutions, 29 secondary schools and 58 primary schools. The presented study was conducted in the inner part of Windhoek confined by the Western bypass in the south and west, industry area in the north, and the city outskirts in the east. The total surface of the area is c. 50 km² (Fig. 1–2).

Windhoek has a semi-arid climate, with over 300 sunny days per year, and the annual average temperature above 18 °C (relatively mild due to altitude influence). The coldest month is July, with an average temperature of 13.1 °C, while the hottest month is December, with average temperature of 23.5 °C. The precipitation is abundant during the rainy season (November – April), and minimal during the winter season (May – October). The average annual precipitation is 367.4 mm, with lows of 106.7 mm. in the 2018/19 rainy season, and 97 mm in 1929/1930.¹ During the years 2011–2016, the mean annual rainfall was 494 mm; in 2011 – 1222 mm, 2012 – 417 mm, 2013 – 343 mm, 2014 – 475 mm, 2015 – 197 mm, 2016 – 311 mm. Monthly variation of the rainfall during the years 2011–2016 is shown in Fig. 3.²

From the south, east and west, Windhoek is surrounded by rocky, mountainous areas.

The natural vegetation represents tree and shrub savanna, composed mainly of *Acacia heroensis*, *A. mellifera*, *A. hebeclada hebeclada*, *Catophractes alexandri*, *Dichrostachys*

¹ <https://en.wikipedia.org/wiki/Windhoek>

² <https://weather.namsearch.com/wdhrainsummary.php>

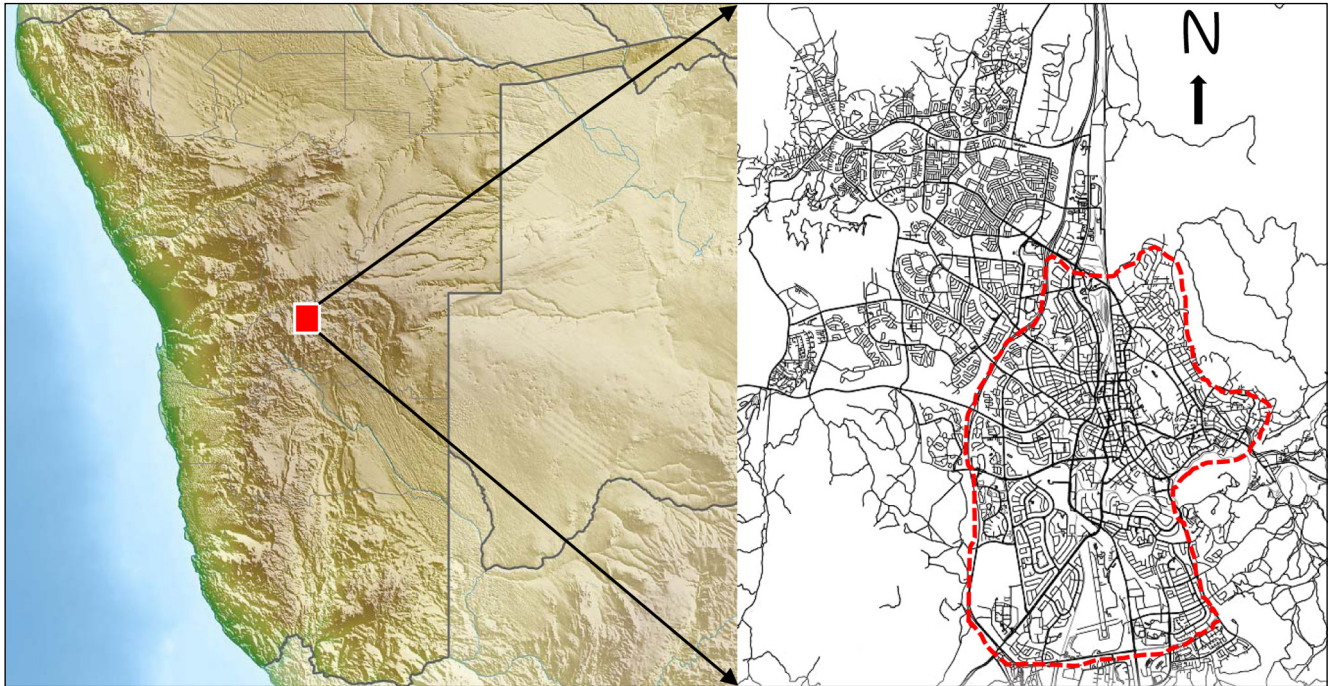


Fig. 1. Location of the study area in Namibia (on the left) and within the city of Windhoek (on the right), the study area demarcated with red broken line.

Рис. 1. Розміщення району досліджень у Намібії (зліва) та в межах м. Віндхук (справа), територія досліджень позначена червоною пунктирною лінією.

cinerea, interlaced with open short bushland with mesic grassland species, such as *Themeda triandra*, *Brachiaria serrata*, *Stipagrostis uniplumis*, *Eragrostis nindensis*, *Microchloa caffra* and *Monelytrum luederitzianum*, dwarf shrub *Leucosphaera bainsii*, *Ericcephalus luederitzianus* and other species. Taller trees are common in river valleys.

This natural vegetation is, however, removed in most places and replaced with other tree and shrub species. Among indigenous, the following species were often planted: *Acacia erioloba*, *A. rubescens*, *A. galpini*, *A. karoo*, *A. nigrescens*, *A. siberiana*, *A. tortilis*, *Albizia anthelmitica*, *A. versicolor*, *Boscia albitrunca*, *Catophractes alexandri*, *Combretum* spp., *Diospyros lycioides*, *Euclea* spp., *Grewia* spp., *Kigelia*

africana, *Melianthus comosus*, *Maerua juncea*, *Moringa ovalifolia*, *Olea europaea*, *Salvadora persica*, *Lucium* spp., *Sclerocarya birrea*, *Searsia lancea*, *Terminalia* spp., *Zizyphus mucronata*. More common African exotic species planted in Windhoek include *Acacia xanthophloa*, *Bauhinia tomentosa*, *Buddleja salinga*, *Celtis africana*, *Dovialis cafra*, *Kiggelaria africana*. Among more common non-African exotics are the following species: *Gleditschia triacanthos*, *Schinus molle*, *Eucalyptus* spp., *Phoenix canariensis* palm, *Washingtonia filifera* palm, *Cupressus* spp., *Thuja* spp., *Pinus* spp. There are also numerous *Aloe* spp., and other succulents. All these trees, and shrubs are planted in gardens on home yards, as well as in some public places, such as parks (e.g. Zoo Park, Parliament Gardens, Oudstrydes Memorial, Urban Park, Square Park, Palm Trek Park, Aloe Park), sport fields (e.g. Affies Park,



Fig. 2. The study area: inner Windhoek.

Рис. 2. Район досліджень: внутрішня частина м. Віндхук.

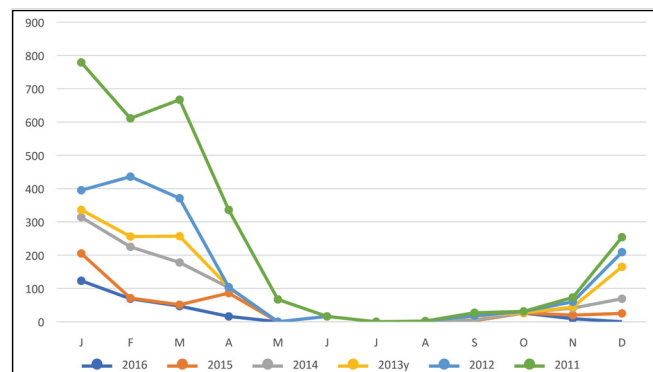


Fig. 3. Precipitation in Windhoek (in mm) during the years 2011–2016.

Рис. 3. Оподи в м. Віндхук (у мм) у 2011–2016 рр.



Photo 1–4. Inner Windhoek: north-eastern suburbs (upper left), Werner hill city centre (upper right), *Washingtonia filifera* palms in suburbs (lower left), natural *Acacia* vegetation (lower right).

Фото 1–4. Внутрішній Віндхук: північно-східне передмістя (зверху зліва), Werner hill city centre (зверху справа), пальми *Washingtonia filifera* в передмісті (знизу зліва), природна акацієва рослинність (знизу справа).

iFun Family Park, Vertigo Skate Park), cemeteries (e.g. in Hochland) and along some streets.

There are no water bodies and no permanent rivers in the inner part of the city. There are, however, numerous swimming pools and small water tanks on private home yards. In sport fields, grass is mowed on a regular basis and irrigated in dry season.

Methods

A simplified version of the territory mapping method has been employed (Bibby et al., 2012). Studies were conducted during the years 2011–2016, more often in dry than rainy season, usually in mornings, while walking slowly along streets. Most suburb district were surveyed 2–3 times during that period. Birds were identified both visually and by calls. All birds showing breeding (e.g. breeding display, nest building, food carried for chicks) or/and territorial behaviour (e.g. singing males, fighting individuals) were plotted on a map 1:1000 (Fig. 4).

Only less common bird species (< 1 pair/100 ha; in total 56 species) were counted. Most non-passerine species have

been therefore included in this study, except for the Laughing Dove (*Streptopelia senegalensis*), Rock Dove (*Columba livia*), Speckled Pigeon (*C. guinea*), and swifts (Apodidae; Bradfield's Swift is however included). Among passerines most species were excluded, except for crows (Corvidae), shrikes (Malaconotidae, Lanidae), tits (Paridae), Fork-tailed Drongo, Pririt Batis, Rockrunner (*Achaetops pycnopygius*), Barred Wren-Warbler, Green-winged Pytilia (*Pytilia melba*), Red-billed Firefinch, Black-faced Waxbill, Pink-billed Lark (*Spizocorys conirostris*), Cape Wagtail, and Yellow Canary.

In this study, breeding pair, not an individual, was a census unit (Bibby et al., 2012). One or two adult birds (usually male and female in species with sex dimorphism) recorded at the same site (unless males were not singing) were interpreted as one breeding pair. A family (a pair with offspring) or an occupied nest were interpreted as one breeding pair. Special attention was paid to singing males, especially a few males singing at the same time. This was important in the case of more common species, where few pairs might nest close to each other, and it was not easy to distinguish them as separate. In the case of the Rosy-faced Lovebird and Bradfield's Swift, nesting sites were identified and the number of breeding pairs

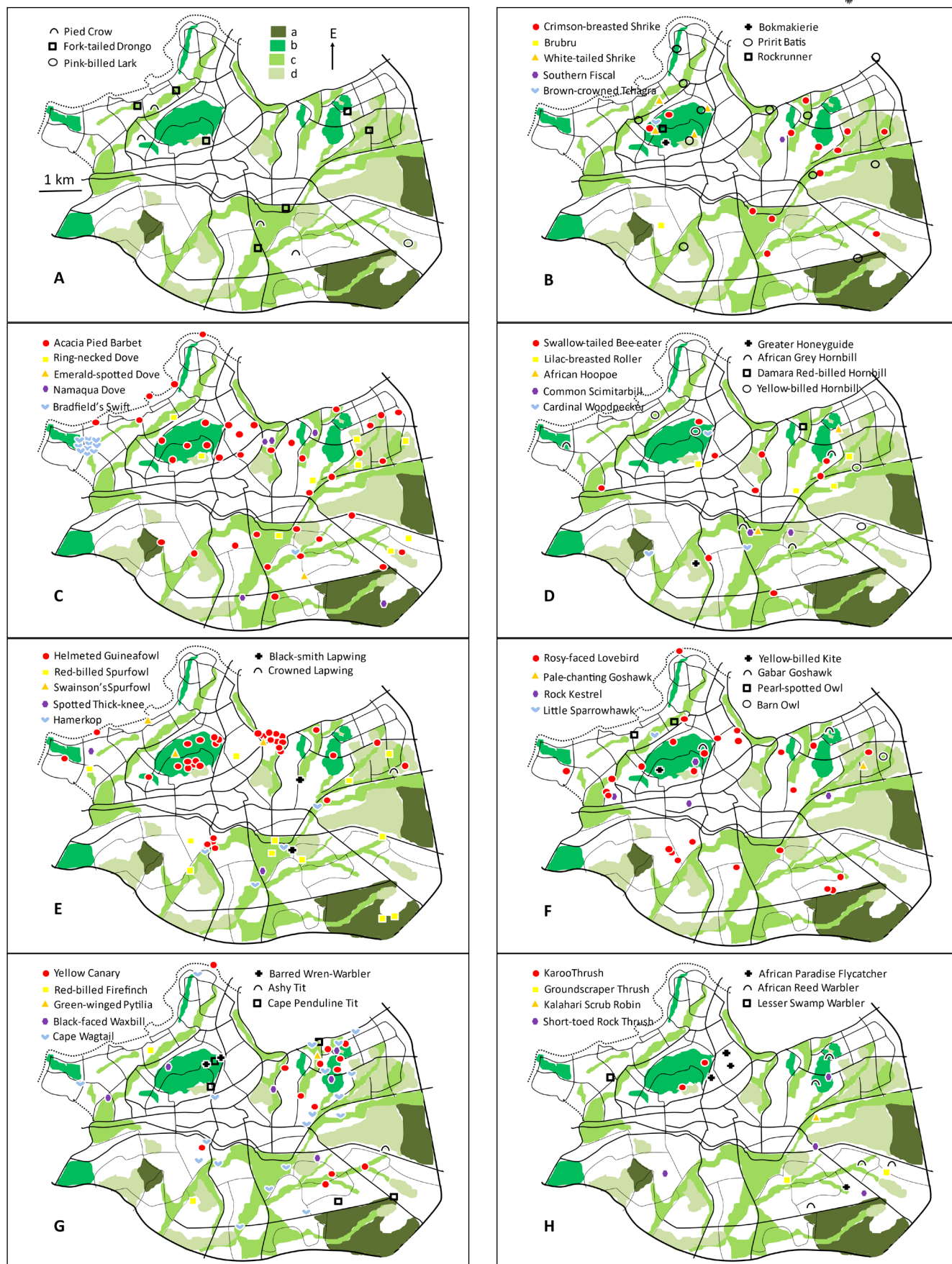


Fig. 4. Distribution of breeding pairs/occupied territories of selected bird species in Windhoek during the years 2011–2016.
a – acacia savanna, b – hilly shrublands, c – riparian tree and shrub vegetation, d – grassy areas.

Рис. 4. Поширення гніздових пар/зайнятих територій деяких видів птахів у м. Віндхук у 2011–2016 рр.

a – акацієва савана, b – чагарники на пагорбах, c – прибережна деревна й чагарникова рослинність, d – трав'янисті ділянки.



Table 1

Population densities of selected less common bird species in Windhoek during the years 2011–2016
Густота населення деяких нечисленних видів птахів у м. Віндхук у 2011–2016 рр.

Common name	Scientific name	Number of pairs	Pairs/100 ha	Abundance index
African Pied Barbet	<i>Tricholaema leucomelas</i>	38	0.76	100.0
Helmeted Guineafowl	<i>Numida meleagris</i>	33	0.66	86.8
Rosy-faced Lovebird	<i>Agapornis roseicollis</i>	25	0.50	65.8
Cape Wagtail	<i>Motacilla capensis</i>	18	0.36	47.4
Yellow Canary	<i>Crithagra flaviventris</i>	13	0.26	34.2
Crimson-breasted Shrike	<i>Laniarius atrococcineus</i>	13	0.26	34.2
Red-billed Spurfowl	<i>Pternistes adspersus</i>	12	0.24	31.6
Bradfield's Swift	<i>Apus bradfieldi</i>	11	0.22	28.9
Pirit Batis	<i>Batis pirit</i>	10	0.20	26.3
Ring-necked Dove	<i>Streptopelia capicola</i>	9	0.18	23.7
Swallow-tailed Bee-eater	<i>Merops hirundineus</i>	9	0.18	23.7
Fork-tailed Drongo	<i>Dicrurus adsimilis</i>	7	0.14	18.4
Black-faced Waxbill	<i>Estrilda erythronotos</i>	6	0.12	15.8
Namaqua Dove	<i>Oena capensis</i>	5	0.10	13.2
African Reed Warbler	<i>Acrocephalus baeticatus</i>	5	0.10	13.2
Cape Penduline Tit	<i>Anthoscopus minutus</i>	5	0.10	13.2
Hamerkop	<i>Scopus umbretta</i>	4	0.08	10.5
Lilac-breasted Roller	<i>Coracias caudatus</i>	4	0.08	10.5
Southern Yellow-billed Hornbill	<i>Tockus leucomelas</i>	4	0.08	10.5
African Grey Hornbill	<i>Lophoceros nasutus</i>	4	0.08	10.5
Rock Kestrel	<i>Falco rupicolus</i>	4	0.08	10.5
Short-toed Rock Thrush	<i>Monticola brevipes</i>	4	0.08	10.5
Pied Crow	<i>Corvus albus</i>	4	0.08	10.5
White-tailed Shrike	<i>Lanioturdus torquatus</i>	4	0.08	10.5
African Paradise Flycatcher	<i>Terpsiphone viridis</i>	4	0.08	10.5
Pearl-spotted Owl	<i>Glaucidium perlatus</i>	3	0.06	7.9
Cardinal Woodpecker	<i>Dendropicos fuscescens</i>	3	0.06	7.9
Groundscraper Thrush	<i>Turdus litsitsirupa</i>	3	0.06	7.9
Spotted Thick-knee	<i>Burhinus capensis</i>	2	0.04	5.3
Blacksmith Lapwing	<i>Vanellus armatus</i>	2	0.04	5.3
Common Scimitarbill	<i>Rhinopomastus cyanomelas</i>	2	0.04	5.3
Gabar Goshawk	<i>Micronisus gabar</i>	2	0.04	5.3
African Hoopoe	<i>Upupa africana</i>	2	0.04	5.3
Red-billed Firefinch	<i>Logonosticta senegala</i>	2	0.04	5.3
Barred Wren-Warbler	<i>Calamonastes fasciolatus</i>	2	0.04	5.3
Karoo Thrush	<i>Turdus smithi</i>	2	0.04	5.3

was estimated by close observations conducted near these sites.

Three parameters were used to characterize abundance of species: the number of breeding pairs recorded in the whole studied area (c. 5000 ha); population density, i.e. number of breeding pairs per 100 ha; relative abundance expressed as the percentage of a given species in relation the most common one recorded in this study, i.e. African Pied Barbet, as the most common species with 38 pairs recorded, has the score '100'.

Scientific names of species are given in table 1, or in the text (when first mentioned) for species not listed in Table 1.

Results

Among 56 selected bird species, 29 (52.7%) were passerines and 27 (47.3%) non-passerines. Relatively high population densities of the Rosy-faced Lovebird, Acacia Pied Barbet, and Helmeted Guineafowl were recorded in Windhoek. On the other hand, relatively low densities of the following species were shown: Ring-necked Dove, Namaqua Dove, Rock Kestrel, Pied Crow, and Fork-tailed Drongo.

Only single breeding pairs were recorded for 20 species: Southern Pale-chanting Goshawk (*Melierax canorus*), Little Sparrowhawk (*Accipiter minullus*), Yellow-billed Kite (*Milvus*



Table 2

aegyptius), Barn Owl (*Tyto alba*), Swainson's Spurfowl (*Pternistes swainsonii*), Damara Red-billed Hornbill (*Tockus damarensis*), Greater Honeyguide (*Indicator indicator*), Emerald-spotted Dove (*Turtur chalcospilos*), Crowned Lapwing (*Vanellus coronatus*), Diderick Cuckoo (*Chrysococcyx caprius*), Kalahari Scrub Robin (*Cercotrichas paena*), Lesser Swamp Warbler (*Acrocephalus gracilirostris*), Green-winged Pytilia, Ashy Tit (*Melaniparus cinerascens*), Bokmakierie (*Telophorus zeylonus*), Brown-crowned Tchagra (*Tchagra australis*), Brubru (*Nilais afer*), Southern Fiscal (*Lanius collaris*), Pink-billed Lark, Rockrunner.

Only 10 (0.2 pairs/100 ha) occupied territories of raptors were identified. They were represented by five species. Two species of owls were recorded: single pair of the Barn Owl and 3 pairs of the Pearl-spotted Owlet (Photo 5). There were virtually no waterbird species breeding in the study area, although non-breeding waterbirds were present throughout the year, e.g. Egyptian Goose (*Alopochen aegyptica*), Cattle Egret (*Bubulcus ibis*).

Large terrestrial birds, i.e. these which nest on the ground (gallinaceous species, nightjars, Crowned Lapwing, Blacksmith Lapwing, Spotted Thick-knee), reached low overall population density in Windhoek (1.0 pairs/100 ha), with the Helmeted Guineafowl comprising 2/3 of them.

Shrikes were represented by six species, but they nested in low overall densities (0.42 pairs/100 ha). Even the most common shrike species, the Crimson-breasted Shrike (Photo 6), reached a density of merely 0.3 pairs/100 ha. Also the Fork-tailed Drongo nested in a low density of 0.14 pairs/100 ha.

Pigeons were represented by the indigenous Speckled Pigeon, the exotic Rock Dove and three non-*Columba* species: Ring-necked Dove, Namaqua Dove and Emerald-spotted Dove. The Rock Dove was common in the city centre, while the Speckled Pigeon was common in the suburbs. Non-*Columba* doves were overwhelmingly dominated by the Laughing

Population densities (pairs/100 ha) of selected bird species in three southern African cities

Густота населення (пар/100 га) деяких видів птахів у трьох південно-африканських містах

Species	Bloemfontein	Maseru	Windhoek
Ring-necked Dove	32.1 ¹	>5.7	0.2
African Hoopoe	0.6 ²	0.2	0.04
African Acacia Barbet	0.7 ³	0.2	0.8
Crowned Lapwing	4.0 ⁴	0.0	0.02
Blacksmith Lapwing	1.4 ⁴	0.1	0.04
Helmeted Guineafowl	2.5 ¹	0.0	0.7
Swainson's Spurfowl	0.3 ³	0.15	0.02
Spotted Thick-knee	0.3 ⁵	0.05	0.04
Hamerkop	0.02 ¹	0.0	0.08
Rock Kestrel	0.0 ¹	0.0	0.08
Namaqua Dove	0.0 ¹	0.0	0.1
Cape Wagtail	0.4 ¹	<0.5	0.4
Yellow Canary	0.3 ¹	0.0	0.3
Bokmakierie	1.7 ⁶	0.4	0.02
Southern Fiscal	8.9 ¹	>5.6	0.02
Size of the study area	50000 ha	2000 ha	50000 ha
Sources	Kopij ¹⁻⁶	Kopij, 2000	This study

Sources. Kopij¹⁻⁶: ¹ Kopij, 2001a, 2015; ² Kopij, 1999b; ³ Kopij, 2001a, 2015; ⁴ Kopij, Kok, 1994; ⁵ Kopij, 1997a; ⁶ Kopij 1999a.

Dove. The Ring-necked Dove was by two orders of magnitude less common than the Laughing Dove. The Emerald-spotted Dove and Namaqua Dove were together even less common than the Ring-necked Dove.

Coraciiformes and Piciformes were represented in Windhoek by four and seven species respectively (Photo 7, 8). Most of them nested, however, in low population densities. Only the piciform Acacia Pied Barbet and the coraciiform Swallow-tailed Bee-eater were more numerous (Table 1). The overall population density of coraciiform was 0.34 pairs/100 ha, while that of piciforms was 1.1 pairs/100 ha.



Photo 5. A Pearl-spotted Owlet.
Фото 5. Савановий сичик-горобець.



Photo 6. A Crimson-breasted Shrike.
Фото 6. Червоноволий гонолек.



Photo 7. A Southern Yellow-billed Hornbill.
Фото 7. Намібійський токо.

Only one parrot species, the Rosy-faced Lovebird, was recorded as breeding resident in Windhoek. However, it nested at relatively high density of 0.5 pairs/100 ha, not avoiding even the very centre of this city. Although the Pied Crow was the only representative of Corvidae in Windhoek, it nested at a low density (0.1 pair/100 ha).

Discussion

Almost half ($n = 27$) of bird species recorded in Windhoek as uncommon were represented by 1–2 pairs only. This number could even be higher if more time would have been spent on searching birds in the field. For the same reason, population densities are undoubtedly underestimated for more elusive species, such as owls, hawks *Accipiter* spp., Pirit Batis, Ashy Tit, Cape Penduline Tit, Black-faced Waxbill, African Paradise Flycatcher, Red-billed Firefinch, Barred Wren-Warbler, Kalahari Scrub Robin and Green-winged Pytilia. On another hand, due to conspicuousness and high vocal activity, estimations of population densities of several other species (e.g. Rosy-faced Parrot, Acacia Pied Barbet, Blacksmith Lapwing, Fork-tailed Drongo, Coraciiformes, Columbiformes, Lanidae and Malaconotidae) are fairly accurate.

The Rock Kestrel, Red-billed Firefinch and species from the families Bucerotidae, Coraciidae, and Corvidae nested in low densities in Windhoek. As breeding birds, they were not recorded at all in Bloemfontein (Kopij, 2001a, 2015) and Maseru (Kopij, 2000). Even in smaller towns located amidst grasslands and savannas, representatives of these families were found to be rare or absent altogether, i.e. Bethlehem (Kopij, 1997b), Roma (Kopij, 2001b, 2019b), Morija (Kopij, 2006a), Ladybrand (Kopij, 2009), Rundu (Kopij, 2021a), Grootfontein (Kopij, 2021b), Outapi (Kopij, 2019a), Ondangua (Kopij, 2021b) and others (Kopij, 2011, 2014a, 2015).

Only four pairs of the Rock Kestrel were recorded in Windhoek and none in Bloemfontein and Maseru (Table 2). Its close relative (regarded by some authorities as the same species), the Common Kestrel (*Falco tinnunculus*), nests in much higher densities in urbanized environment throughout Europe (Glutz von Blotzheim, 1966–1997; Cramp, Perrins,



Photo 8. A Lilac-breasted Roller.
Фото 8. Рожевогвола сиворакша.

1977–1994; Bauer, Berthold, 1997). The possible reason for such low population density of the Rock Kestrel in African urbanized habitats could be a limited number of suitable nesting sites, or possible competition with the Rock Dove and Speckled Pigeon for such sites. Also crows (Corvidae) nested in low densities in Windhoek and were not recorded in Bloemfontein and Maseru. In Europe, corvids are common, even abundant in urbanized habitats (Glutz von Blotzheim, 1966–1997; Cramp, Perrins, 1977–1994; Bauer, Berthold, 1997).

The Blacksmith Lapwing, Crowned Lapwing and Spotted Thick-knee were rare in Windhoek, but quite common in Bloemfontein. These ground-nesting birds, require larger open grassy areas, which are present in both cities compared. In Bloemfontein, these birds nested often together on the outskirts of sport fields or larger unbuilt areas with bare ground or sparse short grass (Kopij, Kok, 1994). In Windhoek, most such places remained unoccupied by them. They are, however, quite common in areas surrounding the city (G. Kopij, own observ.).

Although five species of raptors, and two species of owls were recorded, none reached a density higher than 1 pair/1000 ha. It is possible that the Pearl-spotted Owl was much commoner than the studies shown, but it passed undetected as surveys were not conducted in the nights, when it is most active. It is also possible that some other raptor species (e.g. Shikra (*Accipiter badius*), Lanner Falcon (*Falco biarmicus*), Spotted Eagle Owl (*Bubo africanus*), Southern White-faced Owl (*Ptilopsis granti*), African Scops Owl (*Otus senegalensis*)) could passed undetected as breeding residents. Most probably none of them, however, nested in a density higher than 1 pair/1000 ha. A similar situation prevails in most other Namibian towns (Kopij, 2014a, 2018a, 2019a, 2021a, 2021b, 2021d, 2022). The Yellow-billed Kite is the only raptor species which is relatively common (20–40 breeding pairs) in Oshakati-Onguadiva-Ondangua con-urbanization, situated in the Cuvelai Drainage System in north-central Namibia (G. Kopij, own observ.).

Most species from the order Coraciiformes and Piciformes are city avoiders in Namibia (Kopij, 2014a, 2018a, 2019a, 2021a, 2021b, 2021d, 2022). The Acacia Pied Barbet,



Black-collared Barbet, Bradfield's Hornbill, African Hoopoe and Swallow-tailed Bee-eater may become more common in some towns, but they usually breed on the peripheries, avoiding centres. They may be quite specific in nest site selection, requiring the presence of large and old trees, which are usually scarce in towns.

The Laughing Dove is virtually the only *Streptopelia* species which breed in Windhoek, although the Ring-necked Dove is common in natural savanna around the city. The same situation was recorded in towns situated in the western and north-central Namibia (Kopij, 2014a, 2018a, 2019a, 2021b, 2022). However, in most towns and cities in southern Africa (e.g. Kopij, 1994, 1997b, 2001a, 2001b, 2004, 2011, 2015, 2018b; Parker 2012), as well as in NE Namibia (Kopij, 2021a, 2021d), at least two *Streptopelia* dove species (most often Laughing and Ring-necked Dove) are common.

Out of four species of parrots occurring in Namibia (Hockey et al., 2005), only the Rosy-faced Parrot was recorded as breeding in urbanized areas (Kopij, 2014a, 2018a, 2019a, 2021a, 2021b, 2021d, 2022). It is well-adopted to this environment. In towns, such as Hentjes Bay (Kopij, 2022), and Grootfontein (Kopij, 2021a), it is a common species, nesting even in the centers. It benefits from the abundance of nesting sites (palm trees, holes and various other sites in buildings) and food provisioned by a man.

It can be concluded that uncommon species breeding in Windhoek were also recorded in other towns in southern Africa. However, their population densities differ markedly from town to town. This may indicate that urbanization of particular bird species undergoes with different speed in different regions of southern Africa.

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