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DISTRIBUTION AND ABUNDANCE OF RAPTORS IN AN ACACIA SAVANNA, NORTH-CENTRAL NAMIBIA

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Поширення та чисельність хижих птахів в акацієвій савані в Північно-Центральній Намібії. - Г. Копій. - Беркут. 33 (1-2). 2024. - Вивчалася густота населення 5 видів денних хижих птахів і 3 видів сов шляхом картування в акацієвій савані на півночі Намібії (400 га). Близько 30% досліджуваної території було змінено людиною на оброблені поля, сади, спортивні майданчики та людські поселення. Дослідження проводилися у 2017 і 2020 рр. Загальна густота населення всіх 8 видів становила 32,5 пар/1000 га у 2017 р. і 35,0 пар/1000 га у 2020 р. Більшість видів денних хижих птахів і сов, які мешкали на досліджуваній ділянці, не уникали змінених людиною частин савани. Сірий боривітер, африканська вухата сова, савановий сичик-горобець віддавали перевагу натуральним біотопам, а не трансформованій савані. Такі види як сипуха, сіра сплюшка, савановий яструб, ланер і жовтодзьобий шуліка могли частіше зустрічатися в перетвореній савані, ніж у природній, головним чином через наявність відповідних місць для гніздування. І сови, і денні хижаки показали високий територіальний консерватизм. Щільність населення, зареєстровану в цьому дослідженні, порівнювали з даними для інших районів Намібії.
Ключові слова: денні хижі птахи, сови, густота населення, біотоп, акацієва савана.

Abstract. Population densities of five species of diurnal birds of prey and three species of owls were studied by means of the territory mapping method in an acacia savanna in northern Namibia (400 ha). About 30% of the study area was modified by man into cultivated fields, orchards, sport fields and human settlements. The study was conducted in 2017 and 2020. The overall population density of all eight species was 32.5 pairs/1000 ha in 2017, and 35.0 pairs /1000 ha in 2020. Most diurnal and owl species resident in the study plot do not avoid man-modified parts of savanna. The Grey Kestrel, Marsh Owl, and Pearl-spotted Owlet appear to prefer natural rather than transformed savanna. Species such as the Barn Owl, Southern White-faced Owl, Little Sparrowhawk, Lanner Falcon and Yellow-billed Kite may prefer transformed savanna over natural one, mainly for the presence of suitable nesting sites. Both the owls and diurnal raptors showed high site fidelity. The population densities recorded in this study were compared to those recorded in other areas in Namibia.
Key words: diurnal birds of prey, owls, population density, habitat, acacia savanna.

Introduction

As top predators, raptors play an important role in ecosystems functioning, controlling population size of various animal species, such as rodents, rabbits, columbids or grasshoppers. Some raptor species, such as eagles and falcons being prone to habitat modifications, decline or disappear under expanding agriculture, urbanization or industrialization. Some others may, however, adopt the modified environment and may live in both farmlands and urbanized habitats. Few of them, e.g. Common Kestrel (*Falco tinnunculus*), Common Buzzard (*Buteo buteo*), Montagu's Harrier (*Circus pygargus*), may even thrive under such conditions (Boal, Dykstra, 2018; Kopij, 2018d). In southern Africa, the adaptation of raptors to human-modified environment appear to be an ongoing process. In South African Highveld, the Rock Kestrel (*Falco rupicolus*) is not adopted to urbanized environment, while the Black-winged Kite (*Elanus caeruleus*) thrive in farmlands (e.g. Kopij, 1996, 2001a, 2001b, 2006, 2015, 2018c, 2019b; Hockey et al., 2005). In northern Namibia, the Yellow-billed Kite (*Milvus aegypius*) thrive in urbanized environment, but the Rock Kestrel still avoid towns (Kopij, 2019a, 2020a, 2020b, 2021a, 2021b). In the coastal towns of Namibia, the Rock Kestrel is however adopted to urbanized environment (Kopij, 2018a, 2022a). The adaptation of raptors to human-modified environment in Namibia, as well as in other Africa countries is, in general, a poorly studied issue (Brown et al., 1982; Steyn, 1982; Hockey et al., 2005). Since raptors have often high conservation priority, this merits intense investigation.

The aim of the study is to estimate population densities of raptors living in a modified savanna in northern Namibia and compare these figures with those obtained in other areas in this country.

Study area

The study area was located on the University of Namibia (UNAM) Ogongo campus. It is situated in the BIOTA Observatory 'Ogongo' within the Cuvelai Drainage System, c. 50 km NW of Oshakati, Outapi district, Omusati region, North-Central Namibia (17.70° S, 15.31° E).

The Cuvelai Drainage System, where the study area is situated, is a unique ecosystem comprising a network of water canals (oshanas), mopane and acacia savannas (Mendelsohn, Weber, 2011). The study area is, however, devoid of these canals, and the natural vegetation comprises acacia savanna composed mainly of *Acacia erioloba*, *A. nilotica*, *A. fleckii*, *A. mellifera*, *Albizia anthelmintica*, *Boscia albitrunca*, *Dichrostachys cinerea*, *Colophospermum mopane*, *Combretum* spp., *Commiphora* spp., *Ficus sycomorus*, *Grewia* spp., *Hyphaene petersiana*, *Sclerocarya birrea*, *Terminalia sericea*, *Zyzyphus mucronata* (Kangombe, 2007). There is only small part of mopane savanna (composed almost entirely of young *Colophospermum mopane* shrubs) in the north-easter corner of the study area. Both savannas are utilized as a pasture for cattle, sheep and goats.

The total surface of the study area is 400 ha. Most of it (70%) constitutes natural acacia savanna, the remaining is converted into yards with buildings (17.5%), arable fields (7.5%), orchards (2.5%) and sport fields (0.5%). There are also numerous exotic trees planted in and around human settlements, such as *Kigelia africana*, *Moringa oleifera*, *Melia azedarach*, *Dodonaea viscosa*, *Eucalyptus camelduensis*. There are several permanent water bodies with standing water, and the area borders with an artificial water canal to the north and an extensive oshana (natural grassy depression filled with water in the rainy season) to the east (Photo 1).

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Photo 1. Habitats in the Ogongo study area: Acacia savanna (A) and Eucalypt hedges (B).
Фото 1. Біотопи в районі досліджень: акацієва савана (A) та евкаліптові живоплоти (B).

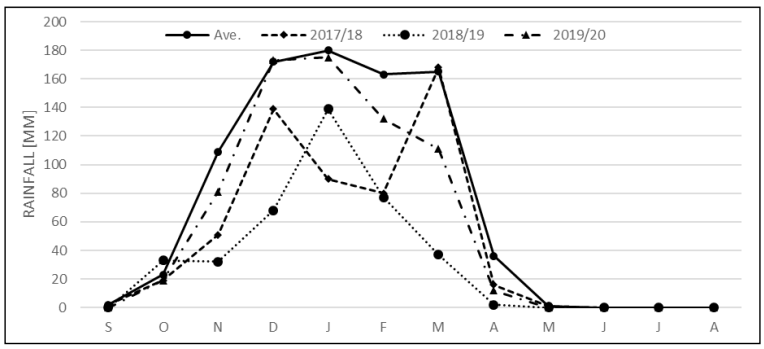

Fig. 1. Rainfall in Onguadiva in 2017–2020 with a long-term average.
Рис. 1. Опади в районі досліджень у 2017–2020 рр. з середнім багаторічним значенням.

Ogongo has semi-arid climate. The summers are sweltering and partly cloudy; the winters are short, comfortable, and clear (Mendelsohn, Weber, 2011). In 2019/2020 rainy season (September – April) the total amount of rain in nearby Onguadiva was 702 mm, in the previous rainy season – 388 mm; the long-term annual average is 724 mm (Fig. 1).*

Methods

Studies were conducted in 2017 and 2020. A territory mapping method (Bibby et al., 2012) has been applied to assess the population densities of all raptor species breeding in the study plot.

Six surveys of the whole area were conducted in 2017 (February, first half of March, second half of March, August, November, December), and nine surveys in 2020 (February, first half of March, second half of March, first half of April, second half of April, first half of May, second half of May, first half of June, second half of June). Each survey consisted 4–5 counts conducted on different days in a fragment of the study area, as to cover the whole study area.

All raptors seen or heard (especially important in the case of owls) were plotted on the map. Special attention was paid to birds showing territorial or breeding behaviour (breeding courtship, nesting material transportation, occupied nest, fledged nestlings with parents). Caution was taken to not register the same individuals by noting their movements. At least two records in a clump were required to distinguish an occupied territory (Bibby et al., 2012).

Population densities are expressed as the number of breeding pairs recorded per 1000 ha. Nomenclature of birds follow that in Hockey et al. (2005).

Table 1

Population densities of raptors in acacia savanna in Ogongo (400 ha) in 2017 and 2020
Густота населення хижих птахів в акацієвій савані в Огонго (400 га) у 2017 і 2020 рр.

Species	2017		2020	
	N	D	N	D
ACCIPITRIDAE				
Milvus aegyptius	3	7.5	3	7.5
Accipiter minullus	1	2.5	3	7.5
FALCONIDAE				
Falco ardosiaceus	0	0	2	5.0
F. biarmicus	1	2.5	0	0
STRIGIFORMES				
Tyto alba	3	7.5	4	10.0
Asio capensis	0	0	0.5	1.3
Ptilopsis granti	3	7.5	3	7.5
Glaucidium perlatum	2	5.0	2.5	6.3
Total	**13**	**32.5**	**18**	**45**

N – number of breeding pairs, D – population density (pairs/1000 ha).

* https://weatherandclimate.com/namibia/oshana/ongwediva

Results and discussion

In 2017 and 2020, four diurnal raptor and four owl species were recorded as breeding residents in the modified savanna in Ogongo (Fig. 2–3). None of these species reached a density higher than 1 pair/1000 ha (Table 1). While owl species showed the similar densities in 2017 and 2020, among diurnal raptors, such stability was recorded only in the Yellow-billed Kite.

Most diurnal raptor and owl species resident in the study area do not avoid man-modified parts of savanna. The Grey Kestrel (*Falco ardosiaceus*) (Photo 2), Marsh Owl (*Asio capensis*), and Pearl-spotted Owlet (*Glaucidium perlatum*) appear to prefer natural rather than transformed savanna. However, the Barn Owl (*Tyto alba*), White-faced Owl (*Ptilopsis granti*) (Photo 3), Lanner Falcon (*Falco biarmicus*), Little Sparrowhawk (*Accipiter minullus*) (Photo 4), and Yellow-billed Kite prefer transformed savanna over the natural one, mainly for the presence of suitable nesting sites (old tall buildings and large exotic trees).

Both owls and diurnal raptors showed high site fidelity (Fig. 2–3). All sites occupied in 2017 were either reoccupied in 2020 or abandoned (if the number of occupied territories in 2020 was lower than in 2017).

The population densities recorded in Ogongo were comparable with those recorded in other areas in Namibia (Table 2). In urbanized environment, overall raptor density varies regionally. While in Windhoek and coastal towns it is low, in Katima Mulilo it is high. In the Cuvelai Drainage System in the north-central Namibia, the overall density appears to be between the two extremes (Table 2). In the Ogongo area, the overall density of raptors is more than three times higher in the partly transformed acacia savanna, than in the neighbouring natural mopane savanna (Table 2).

Table 2

Population densities (pairs/1000 ha) of raptors in various habitats in Namibia
Густота населення (пар/1000 га) хижих птахів у різних біотопах у Намібії

Species	A	B	C	D	E	F	G	H
Surface area (ha)	**400**	**1000**	**130**	**300**	**5000**	**1020**	**280**	**476**
ACCIPITRIDAE								
Milvlus aegyptius	7.5	4.0	8.0	–	0.2	–	3.6	20.0
Accipiter minullus	7.5	1.0	–	–	0.2	–	0	3.2
A. tachiro	–	–	–	–	–	–	3.6	2.1
A. badius	–	–	–	–	–	–	–	2.1
Micronisus gabar	–	–	–	6.7	0.4	–	–	2.1
Melierax canorus	–	–	–	–	0.2	1.0?	–	–
Circus cinerascens	–	–	–	–	–	–	3.6	–
Polyboroides typus	–	–	–	–	–	–	3.6	1.1
Macheiramphus alcinus	–	–	–	–	0.2*	–	–	–
Haliaeetus vocifer	–	–	–	–	–	–	7.1	2.1*
FALCONIDAE								
Falco ardosiaceus	5.0	1.0	–	–	–	–	0	–
F. dickinsoni	–	–	–	–	–	–	–	2.1
F. biarmicus	2.5	0	–	–	–	1.0	0	1.1
F. peregrinus	–	–	–	–	–	1.0	0	2.1
F. rupicolus	–	–	–	–	0.8	2.0	0	–
STRIGIFORMES								
Tyto alba	7.5	5.0	–	3.3	>0.2	2.0?	14.3	2.1
Asio capensis	1.3	1.0	–	–	–	–	0	–
Ptilopsis granti	7.5	0	8.0	–	–	–	0	–
Glaucidium perlatum	6.3	2.0	8.0	10.0	>0.6	–	3.6	8.4
Otus senegalensis	–	–	–	6.7	–	–	1.8*	4.2*
Strix woodfordii	–	–	–	–	–	–	10.7	2.1
Bubo africanus	–	–	–	–	–	–	1.4*	1.1
Overall density	**45**	**14**	**24**	**26.7**	**2.8**	**6**	**51.9**	**55.9**
Number of species	**8**	**6**	**3**	**4**	**8**	**5**	**9**	**15**

The asterisk (*) denotes values modified as a result of further studies.

Sources:
A – Ogongo campus, Acacia savanna, this study;
B – Ogongo Game Park, Mopane sananna, Kopij (2023b);
C – Outapi, 2017, urbanized habitat, Kopij (2021a);
D – Tsummeb, 2017–19, urbanized habitat, Kopij (2021b);
E – Windhoek, urbanized habitat, Kopij (2022b);
F – coastal towns, urbanized habitat (data from three towns pooled: Walvis Bay-Swakopmund-Hentjes Bay), Kopij (2018a, 2022a, 2023a);
G – Zambezi riparian forests near Katima Mulilo, Kopij (2018c);
H – Katima Mulilo, urbanized habitat (data pooled from 4 study plots, 476 ha), Kopij (2019c, 2020a, 2020b).

In Oshakati-Onguadiva-Ondangua con-urbanization, the Yellow-billed Kite population alone has been roughly assessed at 20–40 breeding pairs (G. Kopij, own observ.). This species appears to be well-adopted to urbanized and rural environment in Namibia, as it feed on carcasses (Photo 5) and select tall exotic trees for nesting sites, which are common in urbanized areas (G. Kopij, own observ.). There are also other raptor species well-adopted to urbanized environment in Namibia, namely the Little Sparrowhawk, Barn Owl and Pearl-spotted Owlet. They might be attracted to the urbanized habitats by the abundance of food such as rodents, small passerines, carcasses scarps and by suitable nesting sites (large tress, such as gums *Eucalyptus* spp., Marula *Sclerocarya birrea* or palms *Hyphaene petersiana*; and tall buildings). Also Gabar, Shikra, Lanner Falcon and Rock Kestrel are recorded as nesting in urbanized habitats in Namibia (Table 2). The latter species is closely related to the Palearctic Common Kestrel and for long was even regarded as the same species (Hockey et al., 2005). The Common Kestrel

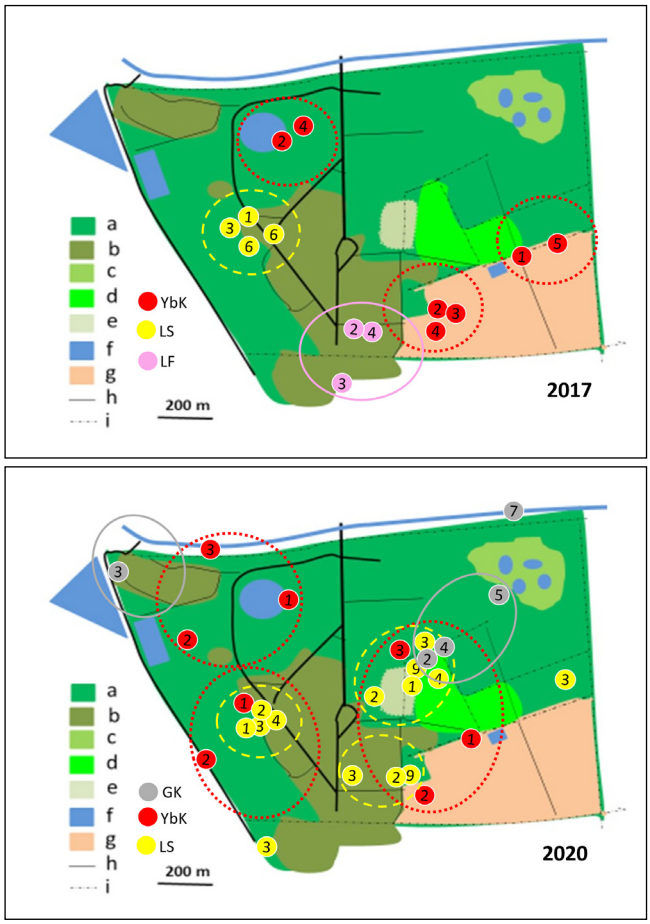

Fig. 2. Distribution of occupied territories of diurnal raptors in 2017 (above) and 2020 (below).
Рис. 2. Розміщення територій, зайнятих денними хижими птахами, у 2017 р. (зверху) та 2020 р. (знизу).
YbK – Yellow-billed Kite, LS – Little Sparrowhawk, LF – Lanner Falcon, GK – Grey Kestrel. 1, 2, 3, 4… – records of birds during survey 1, 2, 3, 4… Occupied territories are encircled. Habitats (land uses): a – acacia savanna, b – built-up area, c – acacia savanna in area around sand-pits, d – orchard, e – sport field, f – water canals, dams and sand-pits, g – arable ground, h – roads, i – fences.

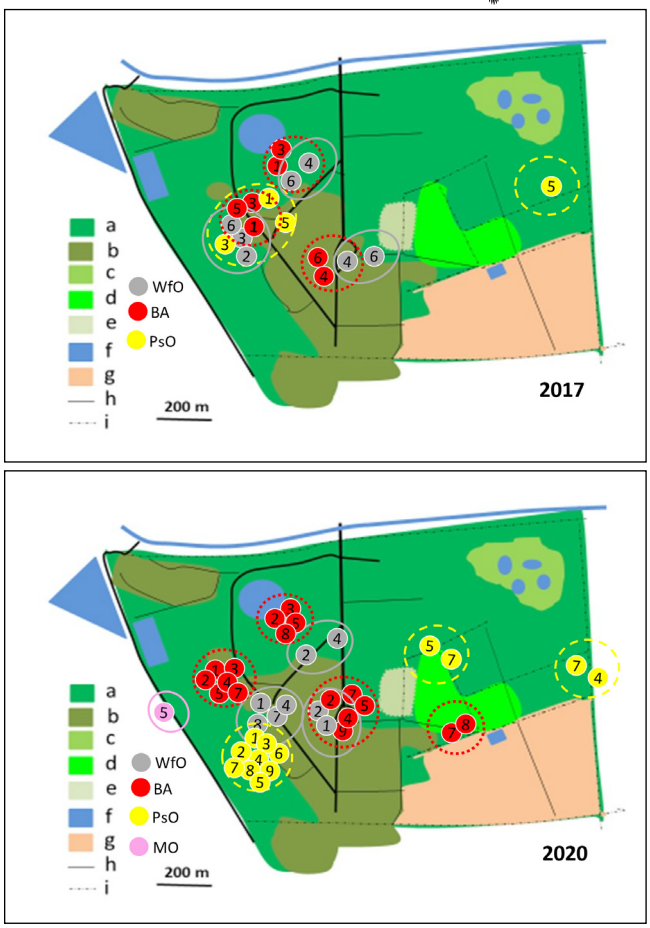

Fig. 3. Distribution of occupied territories of owls in 2017 (above) and 2020 (below).
Рис. 3. Розміщення територій, зайнятих совами, у 2017 р. (зверху) та 2020 р. (знизу).
WfO – Southern White-faced Owl, BA – Barn Owl, PsO – Pearl-spotted Owl, MO – Marsh Owl. For other explanations see Fig. 2.

Photo 2. Grey Kestrel. Фото 2. Сірий боривітер.

Photo 3. Southern White-faced Owl.
Фото 3. Сіра сплюшка.

Photo 4. Little Sparrowhawk. Фото 4. Савановий яструб.

breeds often in high densities in European cities and towns (e.g. Kopij et al., 2009), while the Rock Kestrel was find to nest in low numbers in Windhoek and coastal towns (Kopij, 2018a, 2022a, 2022b, 2023a), and was not recorded at all in towns laying further north in this country (Kopij, 2014, 2019a, 2019c, 2020a, 2020b, 2021a, 2021b), and in northern Botswana (Kopij, 2018b). Also in South African Highveld the Rock Kestrel was not recorded in urbanised areas (Kopij, 1997, 2000, 2001a, 2001b, 2006, 2015, 2019b). In general, it is still not well-adapted to urbanized environment in southern Africa, perhaps due to a competition with other raptor species.

It appears that raptors may reach in some urbanized areas in southern Africa high densities, comparable to those in the neighbouring natural areas (e.g. in forest and savanna zone), but in other areas (e.g. grasslands, semideserts), their population densities in urbanized habitats are much lower than in nearby natural areas. This interesting relationship between precipitation and relative abundance of raptors in urbanized vs. natural environment merits further investigation.

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Photo 5. Yellow-billed Kite foraging on donkey carcass.
Фото 5. Жовтодзьобі шуліки годуються на туші осла.

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