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SEASONAL CHANGES IN AVIAN COMMUNITIES IN A FARMLAND IN THE CUVELAI DRAINAGE SYSTEM, NORTHERN NAMIBIA

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Abstract

The study was conducted in Ogongo communal area. 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. Studies were carried out in late rainy season (February) in the middle of dry season (July) and at beginning of rainy season (November). The Line Transect Method has been employed to quantify avian assemblages (frequency of occurrence and relative abundance). The total length of all transects was c. 11 km. In total, 60 breeding resident and 13 non-breeding non-resident species were recorded. Among the breeding resident species 44 were recorded in late rainy season, only 13 in the middle of dry season and 42 at the beginning of rainy season. The highly significant seasonal differences in abundance were recorded for the following species: *Streptopelia senegalensis*, *Passer diffusus*, *Prinia maculosa, Cypsiurus parvus*, *Upupa africana*, *Crithagra atrogularis, Bubulcus ibis*, *Corythaixoides concolor*, *Euplectes orix*, *Coracias caudatus* and *Urocolius indicus*. Significant seasonal differences were recorded for species such as *Tricholaema leucomelas*, *Oena capensis*, *Nilaus afer*, *Cinnyris mariquensis, Bradornis mariquensis*, *Corvus capensis* and *Sylvia subcaeruleum*. For 38 other species no significant differences were recorded. In overall, six species have been classified as dominants: *Streptopelia senegelensis, Uraeginthus angolensis*, *Passer difussus, Prinia maculosa, Cypsiurus parvus* and *Bubulcus ibis*. They comprised together 64% of all pairs recorded. In all seasons granivores and insectivores comprised together more than 90% of all birds recorded. Granivores were most common in dry season, while insectivores in wet season, especially at its beginning.

Introduction

In Namibia 56% of the land falls under government control, 1% under local authorities and 43% under private control. The governmental land can be further divided into state land (c. 20% protected as national parks, game and forest reserves controlled by the Ministry of Environment and Tourism) and so called communal land (c. 30%) (Mendelsohn *et al*. 2009). The latter are usually controlled by traditional authorities and are mostly in the northern part of the country, i.e. in Damaraland, Koakoland, Owamboland, Kavangoland and in the Caprivi Strip (Mendelsohn *et al*. 2009). Today, most of the land is transformed to pasturelands for livestock. The aim of this paper was to study avian assemblages of an area well-representing such farmland. Specifically, the following parameters of these assemblages were investigated: species diversity, dominance structure, frequency of occurrence and relative abundance.

Study area

The study was conducted in a farmland situated in the central part of Ovamboland communal area near Ogongo in the Cuvelai Drainage System, c. 50 km NW of Oshakati, Outapi district, Omusati region (S17º70', E15º31'). It comprises an extensive sandy plain, c. 1100 m a.s.l., partly flooded almost annually (usually in December-June).

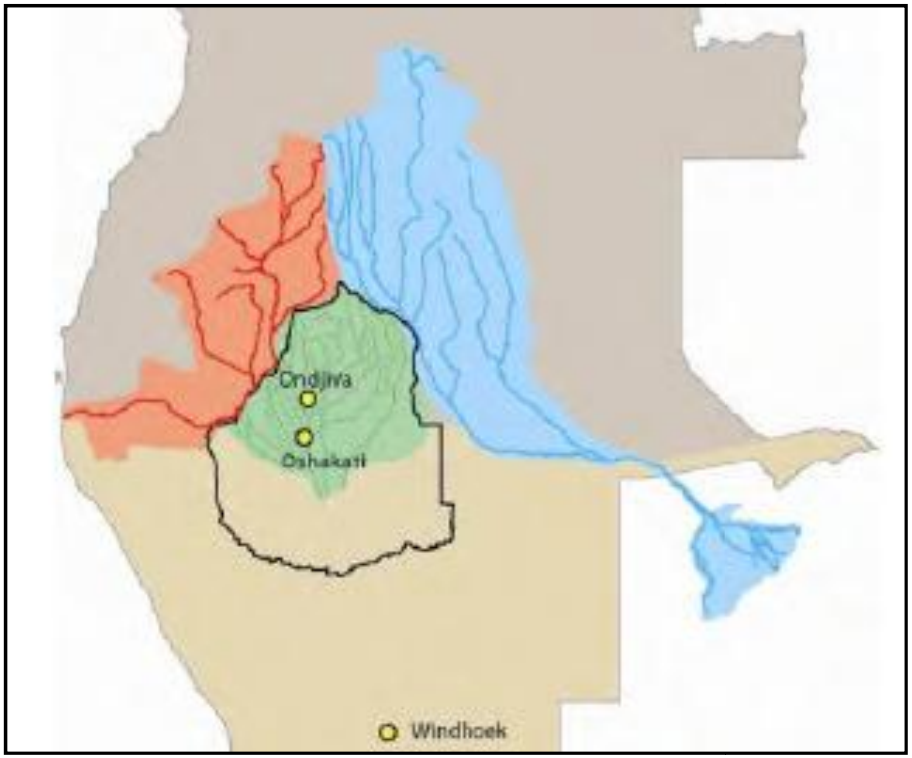

Fig 1 – The Cuvelai Drainage System in relation the other large drainage systems in northern Namibia. The Kunene (red) drains towards the Atlantic Ocean, Cuvelai (green) towards Etosha Pans and Okavango (blue) towards Makgadigadi Pans in Botswana. Souce: IWRM-Namibia 2001.

The farmland comprises small-scale agriculture fields with sorghum as main cultivated plant and cattle, sheep, goats and donkeys as main livestock. Natural vegetation in the form of a mixed *Mopane/Vachellia* savanna (dominated by shrubs and trees of *Colophospermum mopane.* and *Vachellia erioloba* with admixture of morula *Sclerocarya birrea*, *Berchemia discolor*, *Schinziophyton rautanenii* and the makaloni palms *Hyphaena petersiana*. *Vachellia nilotica, Zizyphus mucronata, Combretum* spp*., Ficus* spp*.;* Jürgens *et al.* 2010), interlaced with shallow oshans (natural, ephemeral lakes, pans, and canals) has been almost totally altered with pastures, arable grounds, village settlements, roads, etc. Larger game mammals have been eliminated, but birdlife remains still relatively rich and diverse (Kopij 2013).

The climate is semi-arid. Almost all rains (96%) fall in summer (November-April), with two-thirds in January-March. The amount of rain varies from year to year, usually within 400-500 mm per annum (Mendelson, Weber 2011). The average temperature of the coolest months (June-August) is 17˚C and that of the warmest months (October-January) 25˚C (Kopij 2013).

Methods

Studies were carried out in late rainy season (23, 25 Feb. 2012), in the middle of dry season (2, 20 July 2011) and at beginning of rainy season (2, 5 Nov. 2011). The Line Transect Method (cf. Bibby *et al.* 1992, Sutherland 1996, Kopij 2013) has been employed to quantify avian assemblages, i.e. species diversity, dominance structure, frequency of occurrence and relative abundance of all resident and breeding species. Ten transects were designed, each one was about 1 km long. Counts were conducted in the mornings from c. 07:00 till c. 11:00 by walking slowly and recording all seen and heard birds. The total length of all transects was c. 13 km. For resident birds, a breeding pair was a census unit, while for non-breeding non-resident species, the census unit was an individual.

The following parameters were used to describe the avian assemblages:

1) species diversity (number of species recorded);
2) %F – frequency of occurrence of each species, defined as the

percentage of transects, where a given species was recorded to the total number (N=10 transects) of transects surveyed;
3) %N – dominance expressed as the proportion of resident pairs of a given species to the total number of all breeding pairs of all species recorded, expressed as a percentage. Dominant species is defined here as comprising at least 5% of the total number of all breeding pairs; while subdominant that comprising 2-4.9% of that total.

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 (S), and Shannon's Diversity Index (H):
I = 2C/A+B (A – the number of bird species in area A, B – the number of bird species in area B, C – the number of bird species common to both area)
$H = -\sum p_i \times LNp_i$ where p_i – proportion of pairs belonging to *i*-species

Differences in the densities of particular species in various seasons were tested with x^2-test. The number of recorded resident pairs (for breeding species) or individuals (for non-breeding species) was taken into account for this testing.

Results and Discussion

In total, 60 breeding resident and 13 non-breeding non-resident species were recorded, which is relatively high in comparison with other similar habitats in southern Africa (Kopij 2006). Among the breeding resident species 44 were recorded in late rainy season, only 13 in the middle of dry season and 42 at the beginning of rainy season. The number of breeding species in dry season was, therefore, significantly lower than in rainy season (x^2-test: 38.3; $p<0.01$).

The highly significant seasonal differences in abundance were recorded for the following species: Laughing Dove *Streptopelia senegalensis*, Grey-headed Sparrow *Passer diffusus*, Black-chested Prinia *Prinia maculosa,* African Palm Swift *Cypsiurus parvus*, African Hoopoe *Upupa africana*, Black-throated Canary *Crithagra atrogularis,* Cattle Egret *Bubulcus ibis*, Grey Go-away Bird *Corythaixoides concolor*, Southern Red Bishop *Euplectes orix*, Lilac-breasted Roller *Coracias caudatus* and Red-faced Mousebird *Urocolius indicus*. Significant seasonal differences were recorded for species such as the Pied Barbet *Tricholaema leucomelas*, Namaqua Dove *Oena capensis*, Brubru *Nilaus afer*, Marico Sunbird *Cinnyris mariquensis*, Marico Flycatcher *Bradornis mariquensis*, Black Crow *Corvus capensis* and Chestnut-vented Tit-Babbler *Sylvia subcaeruleum*. For 38 other species no significant differences were recorded.

In overall, six species have been classified as dominants: Laughing Dove, Blue Waxbill *Uraeginthus angolensis*, Grey-headed Sparrow, Black-chested Prinia, African Palm Swift and Cattle Egret. They comprised together 64% of all pairs recorded. All of them have also the highest (>50%) frequency of occurrence on transects. Subdominants were represented by the African Hoopoe, Rattling Cisticola *Cisticola chiniana* and Black-throated Canary comprised together only 10.7% of all resident pairs.

In the middle dry season (July) dominant species (n=4) comprised slightly larger group (73.2%) than at the beginning (November; 6 species; 63.7%%) and the end of wet season (March; 6 species; 67.0%). Only the Blue Waxbill, was a dominant species in all three seasons compared.

In all seasons granivores and insectivores comprised together more

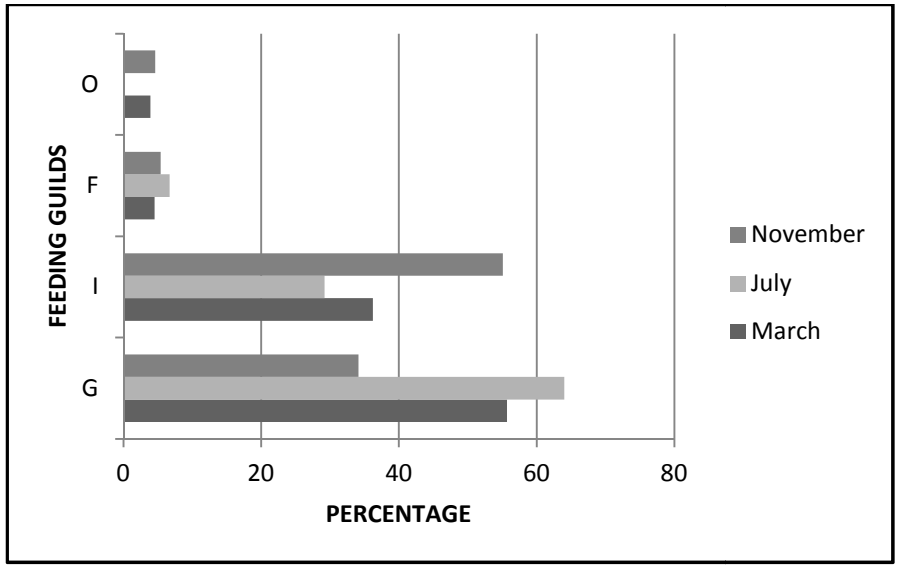

Fig 2 – Seasonal changes in main feeding guilds in the Ogongo farmlands. F – frugivores, G – granivores, I – insectivores, O – other guilds.

than 90% of all birds recorded. Granivores were most common in dry season, while insectivores in wet season, especially at its beginning (Fig. 1). While frugivores were much less numerous, they were represented in all seasons compared, birds from all other feeding guilds were recorded only in the wet season (Fig. 2).

Among 13 non-resident species, 5 were Palearctic migrants (Willow Warbler *Phylloscopus trochilus*, Spotted Flycatcher *Muscicapa striata*, Lesser Grey Shrike *Lanius minor*, European Bee-eater *Merops apiaster* and Wood Sandpiper *Tringa glareola*); six were water birds and two passerines (Table 3).

Sorensen Coefficient of assemblage similarity between March and July was S=0.32; March/November S=0.40; July/November S=0.63. However the Shannon's Diversity Index was lower in July (H=2.02) than in March (H=2.89) and November (H=2.92).

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Table. 1. Transects designed for counting resident bird species in a farmland near Ogongo.

Transect number	Co-ordinates for starting point	Co-ordinates for ending point	Habitat type
1	S144358 E151603	S174355 E151699	Mopane savanna
2	S174355 E151699	S174375 E151650	Mopane savanna
3	S174375 E151650	S174351 E151644	Mopane savanna
4	S174351 E151644	S174307 E151642	Mopane savanna
5	S174307 E151642	S174358 E151602	Mopane savanna
6	S173906 E151747	S173857 E151660	Vachellia savanna
7	S173857 E151660	S173808 E151777	Vachellia savanna
8	S173808 E151777	S173787 E151819	Vachellia savanna
9	S173787 E151819	S173827 E151839	Vachellia savanna
10	S173827 E151839	S173885 E151778	Vachellia savanna

Table 2. Seasonal changes in frequency (%F) and dominance (%N) of residential avian assemblage (number of potentially breeding pairs are given) in a farmland near Ogongo. In bold case dominant species are indicated. Level of significance: * - significant difference (p<0,05), ** - highly significant difference (p<0.01).

Species	March		July		November		Total		X^2-test
	%F	%N	%F	%N	%F	%N	%F	%N	
Blue Waxbill *Uraeginthus angolensis*	**90**	**12,3**	**80**	**31,1**	**90**	**10,2**	**87**	**15,1**	4,0
Grey-headed Sparrow *Passer diffusus*	**90**	**19,7**	40	3	**70**	**10,8**	**67**	**13,2**	63,1**
African Palm Swift *Cypsiurus parvus*	30	2,9	**50**	**14**	**80**	**16,7**	**53**	**10,2**	33,7**
Cape Turtle-Dove *Streptopelia senegalensis*	**80**	**9,3**	**80**	**22,6**	60	4,6	**73**	**10,1**	10,4**
Black-chested Prinia *Prinia flavicans*	**90**	**10,7**	0	0	**100**	**12,4**	**63**	**9,3**	40,1**
Cattle Egret *Bubulcus ibis*	**60**	**9,1**	0	0	**30**	**5,9**	**30**	**6,1**	33,0**
African Hoopoe *Upupa africana*	30	1,3	**60**	**5,5**	**70**	**7,7**	53	4,5	17,2**
Rattling Cisticola *Cisticola chinina*	**70**	**5,9**	10	0,6	40	2,2	40	3,5	23,5**
Black-throated Canary *Crithagra atrogularis*	50	2,4	0	0	60	4,3	37	2,7	13,0**
Southern Masked Weaver *Ploceus velatus*	50	2,1	30	2,4	10	0,9	30	1,7	2,8
Fork-tailed Drongo *Dicrurus adsimilis*	20	1,1	50	3,7	30	1,2	33	1,6	0,6
Grey Go-away Bird *Corythaixoides concolor*	0	0	**30**	**6,7**	20	0,6	17	1,5	16,0**
Southern Red Bishop *Euplectes orix*	40	3,5	0	0	0	0	13	1,5	26,3**

Species	March		July		November		Total		X^2-test
	%F	%N	%F	%N	%F	%N	%F	%N	
Namaqua Dove *Oena capensis*	10	0,3	30	4,9	20	0,9	20	1,4	6,4*
Acacia Pied Barbet *Tricholaema leucomelas*	60	2,1	0	0	30	0,9	30	1,3	8,8*
Pied Crow *Corvus albus*	20	1,1	0	0	60	1,9	27	1,2	5,7
Yellow-crowned Bishop *Euplectes afer*	50	2,4	0	0	0	0	17	1	18,0**
Yellow-billed Oxpecker *Buphagus africanus*	30	0,8	0	0	20	1,5	17	0,9	4,6
Cape Glossy Starling *Lamprotornis nitens*	30	0,8	0	0	30	0,9	20	0,7	3
Yellow-billed Kite *Milvus aegyptius*	30	0,8	0	0	20	0,9	17	0,7	3
Dark-capped Bulbul *Pynconotus tricolor*	20	0,8	0	0	10	0,6	10	0,6	2,8
Lilac-breasted Roller *Coracias caudatus*	0	0	30	3	0	0	10	0,6	9,8**
Long-billed Crombec *Sylvietta rufescens*	10	0,3	0	0	30	1,2	13	0,6	4,8
Red-faced Mousebird *Urocolis indicus*	0	0	0	0	30	1,5	10	0,6	9,7**
Scaly-feathered Finch *Sporopipes squamifrons*	20	0,5	0	0	30	0,9	17	0,6	2,7
Black-collared Barbet *Lybius torquatus*	20	0,5	0	0	20	0,6	13	0,5	1,9
Brubru *Nilaus afer*	0	0	0	0	40	1,2	13	0,5	7,8*
Kalahari Scrub Robin *Cercotrichas paena*	20	0,5	0	0	20	0,6	13	0,5	1,9
Marico Flycatcher *Bradornis mariquensis*	10	0,3	0	0	20	0,9	10	0,5	3,2
Marico Sunbird *Cinnyris mariquensis*	0	0	0	0	30	1,2	10	0,5	7,8*
Red-billed Buffalo Weaver *Bubalornis niger*	20	0,8	0	0	10	0,3	10	0,5	3,5
Red-billed Firefinch *Lagonosticta senegala*	20	0,5	0	0	10	0,6	10	0,5	1,9
Black-crowned Tchagra *Tchagra senegalus*	10	0,3	0	0	20	0,6	10	0,3	1,9
Cape Crow *Corvus capensis*	30	0,8	0	0	0	0	10	0,3	6,0*
Chustnut-vented Tit-Babbler *Sylvia subcaeruleum*	30	0,8	0	0	0	0	10	0,3	6,0*
Crimson-breasted Shrike *Laniarius atrococcineus*	0	0	30	1,8	0	0	10	0,3	5,9*
Golden-breasted Bunting *Emberiza flaviventris*	20	0,8	0	0	0	0	7	0,3	6,0*
Laughing Dove *Streptopelia capicola*	30	0,8	0	0	0	0	10	0,3	6,0*
Common Scimitarbill *Rhinopomastus cyanomelas*	10	0,3	10	0,6	10	0,3	10	0,3	0,0
White-tailed Shrike *Lanioturdus torquatus*	0	0	0	0	20	0,9	7	0,3	5,8
Cape Penduline Tit *Anthoscopus minutus*	10	0,3	0	0	10	0,3	7	0,2	1,1
Diederick Coockoo *Chrysococcyx caprius*	20	0,5	0	0	0	0	7	0,2	3,8
Little Bee-eater *Merops pusillus*	20	0,5	0	0	0	0	7	0,2	3,8
Swallow-tailed Bee-eater *Merops hirundineus*	0	0	0	0	10	0,6	3	0,2	3,9
African Pipit *Anthus cinnamomeus*	0	0	0	0	10	0,3	3	0,1	1,9

Species	March		July		November		Total		X^2-test
	%F	%N	%F	%N	%F	%N	%F	%N	
African Quailfinch *Ortygospiza atricollis*	10	0,3	0	0	0	0	3	0,1	2,3
Blacksmith Lapwing *Vanellus armatus*	10	0,3	0	0	0	0	3	0,1	2,3
Common Moorhen *Gallinula chloropus*	10	0,3	0	0	0	0	3	0,1	2,3
Greater Striped Swallow *Hirundo cucullata*	0	0	0	0	10	0,3	3	0,1	1,9
Hammerkop *Scopus umbretta*	0	0	0	0	10	0,3	3	0,1	1,9
Little Sparrowhawk *Accipiter minulus*	10	0,3	0	0	0	0	3	0,1	2,3
Painted Snipe *Rostratula benghalensis*	10	0,3	0	0	0	0	3	0,1	2,3
Pink-billed Lark *Spizocorys conirostris*	0	0	0	0	10	0,3	3	0,1	1,9
Red-breasted Swallow *Hirundo semirufa*	0	0	0	0	10	0,3	3	0,1	1,9
Red-headed Finch *Amadina erythocephala*	0	0	0	0	10	0,3	3	0,1	1,9
Rosy-faced Lovebird *Agapornis roseicollis*	0	0	0	0	10	0,3	3	0,1	1,9
Scarlet-chested Sunbird *Chalcomitra senegalensis*	0	0	0	0	10	0,3	3	0,1	1,9
Southern Pochard *Netta erythrophthalma*	10	0,3	0	0	0	0	3	0,1	2,3
Violet-backed Starling *Cinnyricinclus leucogaster*	10	0,3	0	0	0	0	3	0,1	2,3
Zitting Cisticola *Cisticola juncidis*	10	0,3	0	0	0	0	3	0,1	2,3
Total number of pairs recorded		**375**		**164**		**323**		**862**	

Table 3. Seasonal changes in frequency and dominance of non-residential avian assemblage in a farmland near Ogongo. In bold case Palearctic migrants are indicated.
Level of significance: * - significant difference (p<0,05), ** - highly significant difference (p<0.01).

Species	March		July		November		Total		X^2-test
	%F	%N	%F	%N	%F	%N	%F	%N	
Common Quelea *Quelea quelea*	30	50.4	0	0	40	98,1	23	74,1	131,4**
Openbill Stork *Anastomus lamelligerus*	20	22,7	0	0	0	0	7	11,4	68,7**
Chustnut Weaver *Ploceus rubiginosus*	10	10,4	0	0	0	0	3	5,2	54,1**
Wood Sandpiper *Tringa glareola*	30	6,2	0	0	0	0	10	3,1	86,1**
Black-headed Heron *Ardea melanocephala*	20	3,8	0	0	10	0,4	10	2,1	19,8**
Abdm's Stork *Ciconia abdimii*	10	1,9	0	0	0	0	3	1,0	14,6**
Little Egret *Egretta garzetta*	10	1,9	0	0	0	0	3	1,0	9,9**
Lesser Grey Shrike *Lanius minor*	20	1,5	0	0	0	0	7	0,8	7,8*

Species	March		July		November		Total		X^2-test
	%F	%N	%F	%N	%F	%N	%F	%N	
Pied Flycatcher *Muscicapa striata*	20	0,8	0	0	0	0	7	0,4	4,2
Willow Warbler *Phylloscopus trochilus*	0	0	0	0	20	0,8	7	0,4	2
European Bee-eater *Merops apiaster*	0	0	0	0	10	0,4	3	0,2	13,4**
Grey Heron *Ardea cinerea*	0	0	0	0	10	0,4	3	0,2	13,4**
Red-billed Teal *Anas erythrorhyncha*	10	0,4	0	0	0	0	3	0,2	2,1
Total number of birds		**260**		**0**		**257**		**517**	