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AVIAN DIVERSITY ON THE SANDSTONE CLIFF OUTSKIRTS OF THE MALOTI/DRAKENSBERG ‘HOT-SPOT’ AREA IN SOUTHERN AFRICA

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Avian Diversity on the Sandstone Cliff Outskirts of the Maloti/Drakensberg ‘Hot-spot’ Area in Southern Africa. Kopij G. — During the year 1999–2001, avian assemblages associated with cliffs and bushy vegetation of the Clarens Formation have been quantified by means of the line transect method (total length of transects — 107 km) in Lesotho lowlands. In total, 80 species resident in these habitats were recorded. Overall, six species were classified as dominants: *Serinus canicollis*, *Prinia maculosa*, *Streptopelia senegalensis*, *Emberiza tahapisi*, *Emberiza capensis* and *Cisticola fulvicapilla*. Together they comprised 41.4 % of all breeding pairs. Ten other species were classified as subdominants (33.9 %). Granivores were the most numerous feeding guild (31 species; 48.0 % of all pairs), followed by insectivores (27 species; 32.3 %) and frugivores (11 species; 17.4 %). The most numerous nesting guild were shrub/tree nesting birds (47.2 %). Proportions for some congeneric species were calculated. The bushy vegetation is characterized by high species diversity and relatively high population densities of some species.

Key words: avian assemblages, ‘hot spot’ area, Lesotho.

Разнообразие птиц, обитающих на скалах песчаника в «горячих точках» Малоти/Дракенберг в Южной Африке. Копий Г. — В течение 1999–2001 птичьих сообществ, связанные со скалами и кустарниковой растительностью формации Клеренса, были посчитаны с помощью метода линий трансект (общая длина трансект — 107 км) в низменности Лесото. Всего было отмечено 80 видов, обитающих в этом ареале. В целом шесть видов было классифицировано как доминирующие: *Serinus canicollis*, *Prinia maculosa*, *Streptopelia senegalensis*, *Emberiza tahapisi*, *Emberiza capensis* и *Cisticola fulvicapilla*. Вместе они составляют 41,4 % от всех гнездящихся пар. Десять других видов были классифицированы как субдоминантные (33,9 %). Растительные виды явились наиболее многочисленной группой птиц (31 вид, 48,0 % всех пар), за ними следовали насекомоядные (27 видов, 32,3 %) и хищные (11 видов, 17,4 %). Самой многочисленной гнездящейся группой были птицы, гнездящиеся в кустарнике и на деревьях (47,2 %). Были просчитаны пропорции для некоторых видов, принадлежащих к одному роду. Кустарниковая растительность характеризуется большим видовым разнообразием и относительно высокой плотностью населения некоторых видов.

Ключевые слова: скопления птиц, область «горячей точки», Лесото.

Introduction

The Eastern Mountains or Maloti/Drakensberg has been recognized as one of eight so called ‘hot-spots’ in southern Africa (Cowling, Hilton-Taylor, 1994), which are characterized by high species richness and high level of endemism (Ambrose et al., 2000). The ‘hot spot’ has an area of c. 40 000 km², almost 2/3 of which falls within Lesotho. Its outskirts constitute a prominent creamy-white sandstone cliffs of the Clarens Formation, ranging in altitude between 1600 and 1900 m a. s. l. The cliffs are selected as nesting sites by certain bird species, while the luxuriant bushy vegetation covering slopes running along the cliffs is an optimal habitat for numerous other species (Kopij, 2001 a, 2006 b). Both the sandstone cliffs and the bushy vegetation play an important role in the protection of numerous bird species in Lesotho lowlands (Kopij, 2001 a, 2006 b, 2010). The aim of this study was to investigate species diversity, dominance structure and relative abundance of bird species resident in these unique habitats.

Study area and methods

The Clarens Formation sandstone cliffs were deposited as large dunes in desert environment in the end of the Triassic Period. At present they form almost vertical walls consisting fine-grained sandstones, sandy siltstones and mudstones. The cliffs have numerous overhanging, fissures, shelves, holes, caves and similar formations. In certain eroded sites some herbaceous and bushy vegetation developed.

Slopes along the Clarens Formation are covered with natural bushy vegetation dominated by the Nana Berry *Rhus dentata*, Broom Karee *Rhus erosa*, Common Taaibos *Rhus pyroides*, Blue Guarri *Euclea crispa*, Cape Myrtle *Myrsine africana*, and Dogwood *Rhamnus prinoides*. Other species include *Buddleja salviifolia*, *Cussonia paniculata*, *Rhus burchellii*, *Rhus lancea*, *Rhus divericata*, *Rhus erosa*, *Grewia occidentalis*, *Olea europaea*, *Celtis africana*, *Heteromorpha trifolium* (Talukdar, 1995) and some exotic shrub species, such as *Nicotiana glauca*, *Rosa eglanteria*, *Acacia dealbata*, *Populus canescens* (Ambrose et al., 2000).

For the purpose of these studies, five areas with these habitats have been selected:

1) north of Roma, between Ha Mahalanyane and Boinyatso (Liphiring River Drainage) in Maseru District; c. 14 km; counts conducted on 29 September 1999 (09.20–15.30): Ha Mahalanyane-Mahale-St. Michael Mission (c. 10 km); 27 September 2001 (07.45–09.45): St. Michael Mission-Boinyatso (c. 4 km);

2) south of Roma, between Rabushabane (Liphiring River Drainage) and Ha Porane (Korokoro River Drainage) in Maseru District; c. 23 km; 15 May 1999 (11.20–13.50): Rabushabani Valley-Schalabeng-Ha Koile-Ha Klwarai-Ha Maama (c. 5 km); 28 October 1999 (8.00–14.30): Ha Maama-Ha Mashaka-Ha Mokhlema-Ha Khoarai-Ha Porane (c. 10 km); 13 July 2001 (9.55–15.00): Ha Maama Valley-Ha Lebekeng-Mateon (c. 8 km);

3) Leribe Plateau in Hlotse District; c. 18 km; 11 April 2001 (10.00–15.40): northern cliff between Levi's Nek and Ha Jonatane (c. 10 km); 1 May 2001 (10.00–15.00): western cliff (c. 8 km);

4) Berea Plateau in Teyateyaneng District; c. 25 km; 1 September 2001 (9.00–16.00): Thuba-Kuba-Ha Tlase-Ha Ntsi-Ha Fasu (c. 10 km); 3 September 2001 (10.00–14.45): Berea surroundings (c. 8 km); 8 September 2001: Ha Sekanome-Ha Papi-Mesitisi-Ha Moseka-Berea (c. 7 km);

5) Qhomane/Thloue Plateaus in Maseru District; c. 27 km; 5 December 2000 (8.00–16.00): Qhomane Plateau (c. 15 km); 27 April 2000 (9.00–15.00): Thloue Plateau (c. 12 km).

The line transect method in American version (Bibby et al., 1992) has been employed to assess the species composition, dominance structure and relative abundance of all resident (breeding) bird species. Transects were fixed on the slopes running along the sandstone cliffs. Only resident species were counted. A pair of a resident species was a census unit. Records of single birds or families were interpreted as one pair. The total length of transects was 107 km. The average walking speed on the slopes was about 1 km per 0.5 hour.

For each bird species, the following data were calculated: 1) N — number of potentially resident pairs recorded; 2) %D — 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; 3) Ind. — index of abundance calculated for each species as the percentage of the number of resident pairs of a given species to the number of pairs of the most numerous species.

The systematics, and English and scientific nomenclature of birds follow that of Hockey et al. (2005). Dominant species is defined here as being represented by at least 5 % of the total number of all breeding pairs recorded, subdominant 2–4.9 %.

Results and discussion

In total, 80 species resident in the Clarens Formation has been recorded, including 70 species around plateau cliffs and 68 species along foothill cliffs. In the particular site the number of species varied from 38 to 57 ($x = 47.8$, $SD = 8.17$). Only 21 species were common for all five sites studied; 22 species were common for three sites along foothills, while 35 species were common for both plateau sites.

Overall, six species were classified as dominants: Cape Canary *Serinus canicollis* (Swainson 1838), Koo Prinia *Prinia maculosa* (Boddaert, 1783), Laughing Dove *Streptopelia senegalensis* (Linnaeus, 1766), Cinnamon-breasted Bunting *Emberiza tahapisi* Smith, 1836, Cape Bunting *Emberiza capensis* Linnaeus, 1766, and Neddicky *Cisticola fulvicapilla* (Vieillot, 1817). Together they comprised 41.4 % of all breeding pairs. Ten other species were classified as subdominants (33.9 %). The group included: Cape Robin-Chat *Cossypha caffra* (Linnaeus, 1771), Speckled Pigeon *Columba guinea* Linnaeus, 1758, Rock Martin *Hirundo fuligula* Lichtenstein, 1842, Cape White-eye *Zosterops pallidus* Sundevall, 1850, Red-eyed Bulbul *Pycnonotus nigricans* Vieillot, 1818, Cape Turtle-Dove *Streptopelia capicola* Sundevall, 1857, Common Waxbill *Estrilda astrild* Linnaeus, 1758, African Black Swift *Apus barbatus* Sclater, 1865, Bokmakierie

Telophorus zeylonus Linnaeus, 1766, Malachite Sunbird *Nectarinia famosa* Linnaeus, 1766, Cape Sparrow *Passer capensis* Mueller, 1776 and Red-winged Starling *Onychognathus morio* Linnaeus, 1766. Further 27 species comprised each 0.1 % and less (in total 2.3 %). However, the dominance structure was different in particular sites. None species was recorded as dominant in all 5 study sites; two species: Cape Canary and Karoo Prinia were dominants in four sites; none in 3 sites, 4 species (Laughing Dove, Cape Bunting, Cinnamon-breasted Bunting and Cape White-eye) in 2 sites, and 8 species in one site only (table 1).

Raptors were represented by eight species, with the Rock Kestrel *Falco rupicolus* Daudin, 1800 and Lanner Falcon *Falco biarmicus* Temminck, 1825 as the most common (44.9 % and 22.4 % of all breeding pairs of raptors). Raptors comprised together only 1.3 % of all pairs of all breeding species. Gallinaceous birds, represented by five species (Common Quail *Coturnix coturnix* Linnaeus, 1758, Helmeted Guineafowl *Numida meleagris* Linnaeus, 1758, Swainson's Spurfowl *Francolinus swainsonii* A. Smith, 1836, Natal Spurfowl *Pternistes natalensis* (A. Smith, 1834) and Grey-winged Francolin *Scleroptila africanus* Stephens, 1819), comprised 1.0 %; while ciconiiform species (Southern Bald Ibis *Geronticus calvus* Boddaert, 1783, Hadedda Ibis *Bostrychia hagedash* Latham, 1790 and Hammerkop *Scopus umbretta* Gmelin, 1789) — 1.4 %.

Proportions among some congeners were as follow:

Steptopelia species. *S. senegalensis* : *S. capicola* : *S. semitorquata* = 0.71 : 0.28 : 0.01 (N = 253 of all breeding pairs of all three species);

Emberiza species. *E. tahapisi* : *E. capensis* : *E. flaviventris* = 0.52 : 0.48 : 0.003 (N = 318);

Serinus/Crithagras species. *S. canicollis* : *C. gularis* : *C. atrogularis* : *C. albogularis* = 0.90 : 0.06 : 0.04 : 0.002 (N = 452);

Passer species: *P. capensis* : *P. diffuses* : *P. domesticus* = 0.47 : 0.42 : 0.11 (N = 126);

Euplectes species: *E. progne* : *E. ardens* : *E. orix* = 0.50 : 0.40 : 0.10 (N = 10);

Cisticola species: *C. fulvicapilla* : *C. lais* : *C. tinniensi* = 0.81 : 0.18 : 0.01 (N = 192);

Corvus species. *C. capensis* : *C. albus* : *C. albicollis* = 0.46 : 0.35 : 0.19 (N = 26).

In overall, granivores were the most numerous feeding guild (31 species; 48.0 % of all pairs), followed by insectivores (27 species; 32.3 %) and frugivores (11 species; 17.4 %). Other guilds comprised together only 2.5 % (11 species). Four granivore species, namely Cape Canary, Laughing Dove, Cinnamon-breasted Bunting and Cape Bunting were among dominants (together 29.9 %). Two insectivores (Karoo Prinia and Neddicky) were also in the group of dominants (together 11.5 %). Other feeding guilds were without dominant species.

Nesting guilds were composed mainly of tree/shrub nesting birds (32 species; 47.2 %). Three other guilds, namely: ground-, rock- and short vegetation-nesting, contributed equally (17.2 %, 16.7 % and 14.0 % represented by 17, 16 and 10 species respectively). The remaining, hole-nesting guild, comprised 5.0 % (5 species).

The results of this survey show that both the sandstone cliffs and the bushy vegetation along these cliffs are characterized by high species diversity and relatively high population densities of some species, which are much less numerous in other habitats (cf. Kopij, 2006 a), e. g. Rock Pipit *Anthus crenatus* Finsch et Hartlaub, 1870; Karoo Scrub-Robin *Cercotricas corypoeus* (Vieillot, 1817), Malachite Sunbird, Bokmakierie, Ground Woodpecker *Geocolaptes olivaceus* Gmelin, 1788, Southern Bal Ibis, Helmeted Guineafowl, serins and raptors.

The bushy vegetation constitutes also an important habitat for several species regarded as very rare in Lesotho, i. e. Swee Waxbill *Coccyzygia melanotis* (Temminck, 1823), Red-billed Firefinch *Lagonosticta senegala* (Linnaeus, 1766), White-throated Canary *Crithagra albogularis* A. Smith, 1833; Natal Spurfowl, Crested Barbet

Table 1. Avian assemblages of the Clarens Formation on the western outskirts of the Maluti/Drakensberg endemic area
 Таблица 1. Сообщества птиц формации Клеренса западных окраин эндемического района Малути/Дракенсберга

Species	Leribe		Berea		Qhomane/Тлоуце		South of Roma		North of Roma		Total	
	N	%D	N	%D	N	%D	N	%D	N	%D	N	%D
<i>Serinus canicollis</i>	14	4.4	123	11.8	100	11.8	66	14.6	100	26.3	405	13.5
<i>Prinia maculosa</i>	21	6.6	45	4.3	36.6	5.8	30	6.6	100	11.5	189	6.3
<i>Streptopelia senegalensis</i>	15	4.7	94	9	76.4	6	51.1	1.8	43.6	3.6	179	5.9
<i>Emberiza taitasi</i>	47	14.7	100	1.4	12.2	71	77.2	17	12.1	15	165	5.5
<i>Cisticola fuscicapilla</i>	9	2.8	46	4.4	37.4	4.4	37	11.5	13.6	3.6	156	5.2
<i>Emberiza capensis</i>	14	4.4	58	5.6	47.2	5.5	46.7	3.1	21.2	5.5	152	5.0
<i>Cossypha caffra</i>	14	4.4	40	3.8	32.5	3	25	7.1	10.9	2.9	121	4.0
<i>Columba guinea</i>	40	12.5	45	4.3	36.6	4.4	37	2.7	18.2	5.7	119	4.0
<i>Hirundo fuligula</i>	9	2.8	47	4.5	38.2	27	29.3	12	21.8	2.4	119	4.0
<i>Zosterops pallidus</i>	22	6.9	20	1.9	16.3	34	37	5.5	37.9	10	111	3.7
<i>Pycnonotus nigricans</i>	13	4.1	30	2.9	24.4	19	20.7	20	30.3	9	91	3.0
<i>Streptopelia capicola</i>	8	2.5	10	1	8.1	34	37	11	16.7	7	70	2.3
<i>Esritida astrild</i>	1	0.3	42	4	34.1	16	17.4	10	2.2	15.2	69	2.3
<i>Apus barbatus</i>	2	0.6	4.3	1.5	13	6.5	55.4	12	18.2	2.2	65	2.2
<i>Telophorus zeylonus</i>	5	1.6	10.6	3.1	25.2	29	31.5	10	15.2	5	65	2.2
<i>Nectarinia famosa</i>	2	0.6	4.3	5.1	43.1	7	7.6	3.5	24.2	10	64	2.1
<i>Passer capensis</i>	16	5	22	2.1	17.9	15	16.3	2	3	4	59	2.0
<i>Onychognathus morio</i>												
<i>Anthus crenatus</i>	3	0.9	30	2.9	24.4	7	7.6	2	0.4	3	57	1.9
<i>Passer diffusus</i>												
<i>Spreo bicolor</i>	1	0.3	17	1.6	13.8	18	19.6	4	0.9	6.1	31.3	1.1
<i>Anthus cinnamomeus</i>	5	1.6	13	1.2	10.6	10	10.9	7	1.5	1.5	53	1.8
<i>Geocolaptes olivaceus</i>	1	0.3	1	0.1	0.8	26	28.3	6	1.3	9.1	34	1.1
<i>Cisticola lais</i>	1	0.3	2.5	2.4	20.3	2	2.2	2	0.4	3	33	1.1
<i>Geronitius calvus</i>	1	0.3	1	0.1	0.8	13	14.1	14	3.1	21.2	29	1.0
<i>Hirundo cucullata</i>	9	2.8	9	0.9	7.3	1	1.1	10	2.2	15.2	29	1.0
<i>Crithagra gularis</i>	4	1.3	7	0.7	5.7	7	7.6	8	1.8	12.1	28	0.9
<i>Colius striatus</i>	7	2.2	14.9	7	5.7	8	8.7	6	1.3	9.1	24	0.8
<i>Sphenocacus afer</i>	2	0.6	4.3	2	17.1	8	8.7	1	0.2	1.5	23	0.8
<i>Cercomela familiaris</i>	2	0.6	4.3	0.4	3.3	5	5.4	2	0.4	3	18	0.6
<i>Riparia paludicola</i>	6	1.9	12.8	0.6	4.9	1	1.1	2	0.4	3	18	0.6
<i>Falco rupicolus</i>												
<i>Lanius collaris</i>												
<i>Motacilla capensis</i>												
<i>Crithagra atrogularis</i>	1	0.3	11	1.2	10.6	1	1.1	1	0.1	0.1	3	0.7
<i>Oenanthe monticola</i>	3	0.9	6.4	0.6	4.9	1	1.1	1	0.1	0.1	16	0.5
<i>Pernistes swainsonii</i>	1	0.3	2.1	0.5	4.1	1	1.1	1	0.2	1.5	8	0.5
<i>Passer domesticus</i>												
<i>Corvus capensis</i>												
<i>Ploceus velatus</i>												
<i>Cercotricas coryphoecus</i>												
<i>Coccopygia melanotos</i>												

Table 1.
окончание табл 1.

Species	Leribe			Berea			Qhomane/Flouze			South of Roma			North of Roma			Total		
	N	%D	Ind.	N	%D	Ind.	N	%D	Ind.	N	%D	Ind.	N	%D	Ind.	N	%D	Ind.
<i>Numida meleagris</i>																		
<i>Parisoma layardi</i>																		
<i>Corvus albus</i>				8	0.8	6.5	2	0.3	2.2	10	2.4	9.1	10	0.3	2.5			
<i>Falco biarmicus</i>	1	0.3	2.1	3	0.3	2.4	1	0.1	1.1	2	0.4	3	3	0.7	2.7	10	0.3	2.5
<i>Calandrella cinerea</i>	2	0.6	4.3	5	0.5	4.1	3	0.4	3.3	5	1.1	7.6	9	0.3	2.2	9	0.3	2.2
<i>Oryzopsis atricollis</i>				1	0.1	0.8	2	0.3	2.2	7	0.2	1.7	7	0.2	1.7	7	0.2	1.7
<i>Tachymarpis melba</i>				2	0.2	1.6	4	0.5	4.3	7	0.2	1.7	7	0.2	1.7	7	0.2	1.7
<i>Bostrychia hagedash</i>				5	0.5	4.1	5	0.6	5.4	5	0.2	1.2	5	0.2	1.2	5	0.2	1.2
<i>Corvus albicollis</i>				2	0.2	1.6	1	0.1	1.1	2	0.5	1.8	5	0.2	1.2	5	0.2	1.2
<i>Euplectes prognus</i>				5	0.5	4.1	1	0.1	1.1	1	0.2	0.9	5	0.2	1.2	5	0.2	1.2
<i>Scopus umbretta</i>				3	0.3	2.4	3	0.4	3.3	1	0.2	1.5	4	0.1	1.0	4	0.1	1.0
<i>Corunx coturnix</i>				3	0.3	2.4	4	0.5	4.3	4	0.1	1.0	4	0.1	1.0	4	0.1	1.0
<i>Euplectes ardens</i>				3	0.3	2.4	1	0.1	1.1	4	0.1	1.0	4	0.1	1.0	4	0.1	1.0
<i>Ploceus capensis</i>	1	0.3	2.1	3	0.3	2.4	1	0.1	1.1	4	0.1	1.0	4	0.1	1.0	4	0.1	1.0
<i>Polyboroides typus</i>	1	0.3	2.1	2	0.2	1.6	1	0.1	1.1	4	0.1	1.0	4	0.1	1.0	4	0.1	1.0
<i>Streptopelia semitorquata</i>	3	0.9	6.4	1	0.1	0.8	1	0.1	1.1	2	0.4	3	3	0.1	0.7	3	0.1	0.7
<i>Accipiter rufiventris</i>	1	0.3	2.1	1	0.1	0.8	1	0.1	1.1	1	0.2	1.5	3	0.1	0.7	3	0.1	0.7
<i>Anas sparsa</i>	1	0.3	2.1	1	0.1	0.8	2	0.3	2.2	1	0.2	1.5	3	0.1	0.7	3	0.1	0.7
<i>Macronyx capensis</i>				1	0.3	2.1	1	0.1	1.1	1	0.2	0.9	3	0.1	0.7	3	0.1	0.7
<i>Monticola rufesstris</i>	1	0.3	2.1	2	0.6	4.3	1	0.1	1.1	1	0.2	0.9	3	0.1	0.7	3	0.1	0.7
<i>Turdus olivaceus</i>	2	0.6	4.3	2	0.2	1.6	1	0.1	1.1	1	0.2	1.5	2	0.1	0.5	2	0.1	0.5
<i>Stenosira scita</i>	1	0.3	2.1	1	0.1	0.8	1	0.1	1.1	1	0.2	1.5	2	0.1	0.5	2	0.1	0.5
<i>Gypaetus barbatus</i>	2	0.6	4.3	1	0.1	0.8	1	0.1	1.1	1	0.2	1.5	2	0.1	0.5	2	0.1	0.5
<i>Buteo rufofuscus</i>	1	0.3	2.1	1	0.1	0.8	1	0.1	1.1	1	0.2	1.5	2	0.1	0.5	2	0.1	0.5
<i>Cisticola tinniens</i>				1	0.1	0.8	1	0.1	1.1	1	0.2	1.5	2	0.1	0.5	2	0.1	0.5
<i>Charadrius tricollaris</i>				2	0.2	1.6	2	0.3	2.2	2	0.5	1.8	2	0.1	0.5	2	0.1	0.5
<i>Scleroptila natalensis</i>				1	0.3	2.1	1	0.3	2.1	2	0.5	1.8	2	0.1	0.5	2	0.1	0.5
<i>Legonosticta senegalensis</i>	1	0.3	2.1	1	0.3	2.1	1	0.1	1.1	2	0.5	1.8	2	0.1	0.5	2	0.1	0.5
<i>Trachyphonus vaillantii</i>	1	0.3	2.1	1	0.3	2.1	1	0.1	1.1	1	0.2	1.5	1	0.0	0.2	1	0.0	0.2
<i>Acridotheres tristis</i>	1	0.3	2.1	1	0.1	0.8	1	0.1	1.1	1	0.2	1.5	1	0.0	0.2	1	0.0	0.2
<i>Emberiza flaviventris</i>				1	0.1	0.8	1	0.1	1.1	1	0.2	1.5	1	0.0	0.2	1	0.0	0.2
<i>Scleroptila africana</i>				1	0.1	0.8	1	0.1	1.1	1	0.2	1.5	1	0.0	0.2	1	0.0	0.2
<i>Euplectes orix</i>	1	0.3	2.1	1	0.1	0.8	1	0.1	1.1	1	0.2	1.5	1	0.0	0.2	1	0.0	0.2
<i>Falco peregrinus</i>				1	0.1	0.8	1	0.1	1.1	1	0.2	1.5	1	0.0	0.2	1	0.0	0.2
<i>Milvus migrans</i>				1	0.1	0.8	1	0.1	1.1	1	0.2	1.5	1	0.0	0.2	1	0.0	0.2
<i>Criihragra albogularis</i>				1	0.1	0.8	1	0.1	1.1	1	0.2	1.5	1	0.0	0.2	1	0.0	0.2
<i>Saxicola torquata</i>	1	0.3	2.1	1042			779			452			418			3011		
Number of pairs	320			57			55			42			38			80		
Number of species	48			57			55			42			38			80		

Note. N — number of resident (breeding pairs); %D — dominance; Ind. — index of relative abundance. In bold case dominant species are indicated.

Trachyphonus vaillantii Ranzani, 1821 (cf. Osborne, Tigar, 1990; Bonde, 1993; Hockey et al., 2005).

The line transect method, like each other method designed for counting birds, produces two kinds of errors: normal variation and bias. In general, the larger is the sample the more precise results are. In this study, the sample size comprising 16 transects, with the total length of 107 km suffice for the outlined purpose. However, a few sources of error could bias the results, for example different daily and seasonal activity and different weather conditions (Kopij, 2006 b). In general, species with high vocal activity could have been overestimated, while elusive species, with low activity rate, could have been underestimated. However, in grasslands, daily and seasonal activity of birds is much more synchronized than in birds breeding for example in temperate forests. Most species are resident in one place throughout the wet season, even throughout the year; while weather conditions are also more stable (sunny and windless days prevail).

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