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Diet of swifts (Apodidae) and swallows (Hirundinidae) during the breeding season in South African grassland

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Abstract. The contents of 30 stomachs of 3 swift species, and 96 stomachs of 9 swallow species were analyzed. Most of the birds were shot during the breeding season in the semi-arid grasslands of South Africa. The swifts fed mainly on termite alates and minute nemathoceran Diptera, while the swallows preyed mainly upon minute Coleoptera. Flying ants were an important food constituent in the diets of both swifts and swallows.

Key words: swifts, Apodidae, swallows, Hirundinidae, diet, grassland, South Africa

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INTRODUCTION

Swifts and swallows are well-represented bird families in the Afrotropical Region (Fry et al. 1988, Keith et al. 1992). They are known to feed mainly on airborne insects (Fry et al. 1988, Keith et al. 1992, Maclean 1993, Snow & Perrins 1998). However, for most Afrotropical species there is a lack of quantitative analysis of their diet. Data based on stomach contents analysis are available for only four of 22 African swift species (Fry et. al. 1988, Keith et al. 1992) — Palm Swift *Cypsiurus parvus* (n = 17), Little Swift *Apus affinis* (n = 17), Horous Swift *A. horus* (n = 12), Black Swift *A. barbatus* (n = 6) and for only two of 42 swallow species — Barn Swallow *Hirundo rustica* (n = 31) and Banded Martin *Riparia cincta*. In this article further quantitative data on the diet of three swift and nine swallow species are presented

MATERIAL AND METHODS

The study was based on stomach contents analysis. A total of 30 stomachs of three swift species and 96 stomachs of nine swallows species were collected (through permission obtained

Table 1. Material (number of stomachs) examined. Shaded figures indicate breeding season (after Maclean 1993). J–J — July to June, m — males, f — females, j — juveniles, ad — adults, T — total.

Species	Months												m	f	juv.	ad.	T
	J	A	S	O	N	D	J	F	M	A	M	J					
Apus caffer	–	1	–	1	1	5	1	1	2	–	–	–	6	4	–	2	12
A. horus	–	–	–	–	–	–	–	–	–	5	–	–	1	1	–	3	5
A. affinis	–	–	2	–	5	3	2	–	1	–	–	–	4	7	2	–	13
Hirundo rustica	–	–	–	–	7	5	4	3	2	–	–	–	4	6	4	10	24
H. albogularis	–	1	–	–	2	2	–	2	–	–	–	–	4	3	–	–	7
H. semirufa	–	–	1	3	5	–	–	–	–	–	–	–	5	4	–	–	9
H. cucullata	–	–	6	2	1	3	–	–	–	–	1	–	6	4	2	2	14
H. spilodera	–	–	3	2	–	4	1	2	4	–	–	–	8	2	6	–	16
H. fuligula	–	–	–	–	2	2	–	–	–	–	–	–	2	2	–	–	4
Delichon urbica	–	–	–	–	–	1	–	–	6	–	–	–	3	3	–	1	7
Riparia paludicola	1	–	4	–	–	–	–	1	–	2	–	–	3	4	–	1	8
R. cincta	–	–	–	–	3	3	1	–	1	–	–	–	7	1	–	–	8
Total	1	2	16	8	26	28	9	9	16	7	1	–	53	41	14	19	127

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from the Department of Nature Conservation at Bloemfontein) mainly in the austral summer (September–March), during the years 1985–1988 (Table 1). All swifts and most swallows were collected in the semi-arid grassland of the Free State and adjoining areas of the Northern Cape and the former Transvaal. The birds were shot for taxonomic study carried out in the National Museum at Bloemfontein.

Stomachs were placed in 70% alcohol and labelled. Stomach contents were sorted in the laboratory, counted and identified to order or family level, using keys in Scholtz & Holm (1986) and Chinery (1993). Frequency of occurrence was calculated as the proportion of stomachs containing given taxon expressed as a percentage of the total number of stomachs analyzed.

RESULTS

Swifts fed almost exclusively on airborne insects, but in one stomach of the Horus Swift five spiders were found (Table 2). Small flies Nematocera (Diptera) were an important component of the diet

Table 2. Food of three swift *Apus* species studied. F — percentage of frequency, N — percentage of the total number of prey items identified, (mm) — mean length.

Prey taxa (mm)	*A. caffer*		*A. horus*		*A. affinis*	
	F	N	F	N	F	N
Aranea (4)	–	–	20	1.7	–	–
Orthoptera (8)	–	–	–	–	8	0.3
Isoptera (15)	25	50	60	58.7	–	–
Heteroptera (5)	17	16.7	60	1.3	8	0.7
Coleoptera 67	40	5.3	40	2.0	5.4	4.0
Carabidae (6)	17	0.7	–	–	8	0.3
Scarabaeidae (4)	17	1.0	–	–	8	0.3
Coccinelidae (4)	8	0.3	–	–	–	–
Unidentified (4)	42	3.3	40	2.0	46	3.4
Diptera	50	26.6	40	9.0	54	34.8
Smal (3–4)	42	26.3	20	6.6	54	33.1
Medium (5–7)	8	0.3	40	3.3	16	1.7
Hymenoptera (5)	8	0.3	40	26.4	23	59.1
Unidentified (5)	17	1.2	–	–	16	1.0
Stomachs analyzed	12		5		13	
Prey items identified		300		303		295

Table 3. Diet of nine swallow species (*Hirundo, Delichon, Riparia*) studied. For symbols F, N and (mm) — see Table 2.

Prey taxa (mm)	*H. rustica*		*H. albogul.*		*H. semirufa*		*H. cucullata*		*H. spilodera*		*H. fuligula*		*D. urbica*		*R. paludicola*		*R. cincta*	
	F	N	F	N	F	N	F	N	F	N	F	N	F	N	F	N	F	N
Isoptera (15)	4	7.6	–	–	11	4.5	–	–	–	–	–	–	–	–	–	–	–	–
Heteroptera (7)	17	2.4	–	–	–	–	21	23.1	63	3.9	–	–	–	–	–	–	–	–
Coleoptera	75	56.9	43	91.0	56	61.4	43	20.5	63	30.3	75	30.0	71	97.0	75	35.7	75	62.1
Staphylinidae (5)	4	0.5	–	–	–	–	–	–	6	4.9	–	–	–	–	–	–	–	–
Scarabaeidae (6)	20	4.3	43	27.3	11	4.5	7	2.6	12	7.8	–	–	–	–	–	–	38	16.2
Chrysomelidae (5)	8	1.0	–	–	22	23.8	–	–	–	–	–	–	–	–	–	–	–	–
Coccinellidae (4)	–	–	14	18.2	11	4.5	–	–	–	–	–	–	14	3.0	–	–	–	–
Curculionidae (5)	17	1.9	14	9.1	–	–	–	–	–	–	–	–	14	13.4	–	–	13	8.1
Other families (4)	8	1.0	–	–	–	–	–	–	–	–	–	–	71	37.3	–	–	–	–
Unidentified (4)	63	48.2	29	35.4	56	28.6	43	17.9	56	17.6	75	30.0	71	43.3	75	35.7	63	37.8
Diptera	25	3.4	–	–	–	–	43	23.5	12	12.8	20	60.0	14	1.5	–	–	38	32.4
Calliphoridae (7)	4	0.5	–	–	–	–	7	2.6	–	–	–	–	–	–	–	–	13	8.1
Unidentified — small (2–4)	4	1.0	–	–	11	4.5	21	10.6	6	9.8	50	60.0	14	1.5	–	–	13	10.8
Unidentified — medium (5–6)	13	1.4	–	–	11	25.1	14	7.7	12	2.0	–	–	–	–	–	–	13	13.5
Unidentified — large (> 6)	4	0.5	–	–	–	–	7	2.6	6	1.0	–	–	–	–	–	–	–	–
Hymenoptera (5)	8	12.5	–	–	–	–	14	28.2	12	49.0	50	10.0	–	–	26	17.9	–	–
Other orders	4	0.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Larvae	–	–	–	–	–	–	–	–	–	–	–	–	–	–	13	44.6	13	2.7
Unidentified — small (2–4)	4	15 .4	–	–	–	–	–	–	12	3.9	–	–	14	1.5	–	–	–	–
Unidentified — medium (5–6)	8	1.4	14	9.1	11	4.5	14	4.7	–	–	–	–	–	–	13	1.8	13	2.7
Stomachs analysed	24		7		9		14		16		4		7		8		8	
Prey items identified		209		11		21		39		102		20		67		56		57

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of the White-rumped Swift *Apus caffer* and Little Swift. Termite alates Isoptera composed more than half of all items identified in the diet of the Little Swift and Horus Swift, while ant alates Formicidae (Hymenoptera) were fairly common prey of the Horus Swift. In terms of numbers, the former was the most important prey of the Little Swift.

The diet of all swallow species investigated was also composed entirely of insects (Table 3). Unexpectedly, small beetles Coleoptera were most often encountered and most numerous prey in the diet of most swallow species. Scarabaeidae were the most numerous beetle family in the diet of the Barn Swallow, White-throated Swallow *Hirundo albogularis*, Greater Striped Swallow *H. cucullata*, South African Cliff Swallow *H. spilodera* and Banded Martin. Chrysomelidae were most numerous in the diet of the Red-breasted Swallow *H. semirufa*, while Curculionidae were the most important beetle family in the diet of the House Martin *Delichon urbica.*

Flies were frequent prey of the Red-breasted Swallow, Greater Striped Swallow, Rock Martin *Hirundo fuligula* and Banded Martin. However, the Palearctic summer migrants, namely the Barn Swallow and House Martin, preyed upon flies only occasionally, whereas in the diet of the White-breasted Swallow and Brown-throated Martin flies were not recorded at all.

The Red-breasted Swallow fed mainly medium-sized flies, South African Cliff Swallow preyed chiefly upon small flies, while the Greater Striped and Barn Swallows ate both large and small flies (Table 3). Hemiptera were found to be frequent prey items in the diet of the Greater Striped and South African Cliff Swallows; these insects were mainly medium-sized.

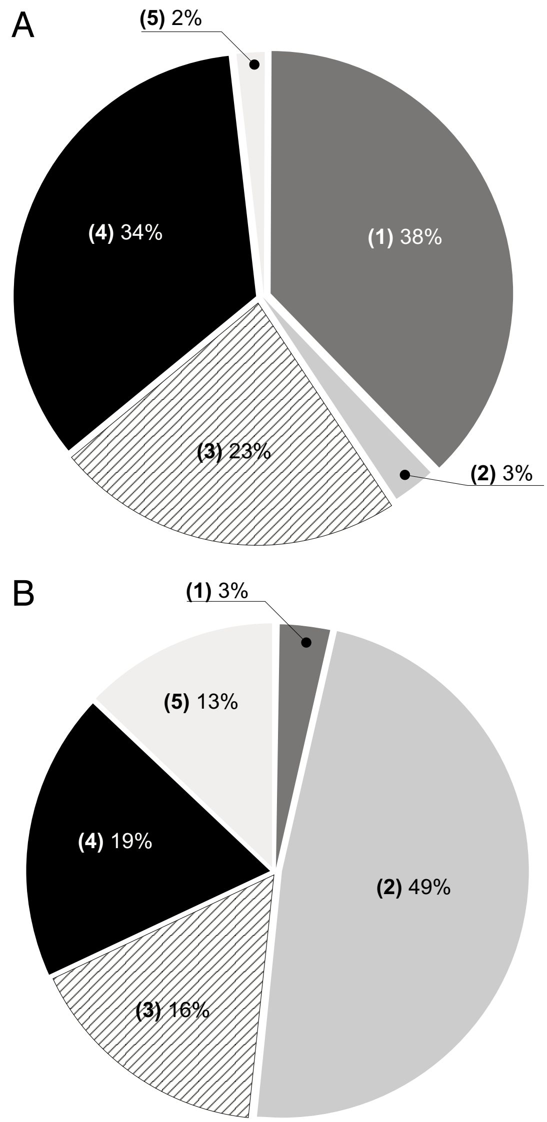

Fig. 1. Proportion of main prey groups in the diet of three swift (A) and nine swallow (B) species studied. 1 — Isoptera, 2 — Coleoptera, 3 — Hymenoptera, 4 — Diptera, 5 — remaining taxa.

DISCUSSION

The analysis of the stomach contents has confirmed general information that in southern Africa airborne insects constitute the bulk of the diet of both swift and swallow species (Maclean 1993). However, the proportion of the particular insect groups recorded in this study was rather not expected. In the diet of swallows, minute beetles comprised half of the total number of prey items identified, while in the diet of swifts these constituted only 3.8% of the total number (Fig. 1). Both swifts and swallows often preyed upon flying ants and minute flies, but flying termites in large proportions were only recorded in the diet of swifts (Fig. 1).

Small beetles, flying termites and flying ants were recorded as an important prey of the Barn Swallow in its winter quarters in Africa (Turner 1994). However, these insect groups were known only as occasional prey in the diet of other swallow species, both in Europe (Snow & Perrins 1998) and in Africa (Fry et al. 1988, Keith et al. 1992). Ant alates were regarded as occasional prey of African swifts (Fry et al. 1988, Keith et al. 1992).

Data in Fig. 1 suggest the existence of food niche segregation between the South African swifts and swallows. This may be due to differences in feeding habitats. Swifts tend to feed close

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to their breeding colonies (where flying ants may be abundant, as they often occupy human settlements) or over water, when weather conditions are not favourable for the emergence of terrestrial insects (nemathoceran flies are often abundant there — own observ.). Swallows are more likely to feed over river valleys, cultivated fields and rural areas, where beetles may occur in large quantities.

Termite alates are known to be very caloric and rich in amino-acids, essential for the synthesis of the protein (Redford & Dorea 1984, Crouch 1997). Kok & Hewitt (1990) have listed 65 bird species feeding on termites in the semi-arid grassland of South Africa. Although Kok & Hewitt (1990) recorded flying termites only in the diet of the South African Cliff Swallow, it is likely that in early summer (October/November), termite alates constitute an important food for most swift and swallow species in African grassland and savanna. For example, van Ee (1988) recorded a flock of Barn Swallows feeding exclusively on the flying termites.

Similarly, flying ants may only be available as food over a short period of the year. This may explain why they were recorded in large proportion in some and were not recorded at all in other species (Tables 2 and 3).

In Europe, aphids Aphidae (Homoptera) constituted an important component of the diet of swallows (Snow & Perrins 1998). This group of insects was not recorded in the present study. However, these insects, as well as other minute, soft-bodied arthropods, could pass undetected in stomach contents, because they may be entirely digested in a short period of time (Hartley 1948, van Koesveld 1951).

Although swifts prey entirely by aerial pursuit, spiders Araneae (Arachnida) are not their unusual prey, as these may represent airborne species. Certain families of spiders disperse by ballooning, so they are available as aerial prey for swifts, swallows and other birds that feed in flight (Coyle et al. 1985, Greenstone 1990).

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STRESZCZENIE

[Pokarm jerzyków i jaskółek na obszarach trawiastych w Afryce Południowej]

Przeanalizowano zawartość 30 żołądków 3 gatunków jerzyków i 96 żołądków 9 gatunków jaskółek (Tab. 1), odstrzelonych w kilku miejscach trawiastych obszarów RPA. Jerzyki odżywiały się głównie uskrzydlonymi formami termitów i drobnymi muchówkami (Tab. 2), podczas gdy jaskółki polowały przede wszystkim na drobne chrząszcze (Tab. 3, Fig. 1). Zarówno w diecie jerzyków, jak i jaskółek, stwierdzono duże ilości uskrzydlonych mrówek (Tab. 2 i 3, Fig. 1).

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