Aquila (2012), Vol. **119**, p. 79–90

Field observations of a Saker Falcon *(Falco cherrug)* holding a satellite transmitter on its wintering ground in Niger

Housseini Issaka[1,2] *& Joost Brouwer*[2]

[1]Sahara Conservation Fund, Niamey, Niger; [2]Brouwer Environmental & Agricultural Consultancy

ABSTRACT—Late October 2009 a female satellite-tracked Saker Falcon, "*Dorottya*" arrived in Niger from Hungary. She spent most of the following four months 25–50 km NNE of Zinder (roughly 14.00 9.00E). The areas where she stayed were mostly quite flat coversands with a local rainfall of 300-400 mm/year and with millet as main crop. From 7–16 February, 2010 field work was carried out to investigate the behaviour of the tagged falcon and to collect data on the ecology of the area. The falcon was observed twice during the survey. One regurgitation pellet and remains of one plucking were also found. The pellet contained beetle and bird remains, no mammal hair was found. Twenty km of the power line crossing the area and 25 prey-and-vegetation transects of about 2 km each were walked. The local vegetation structure proved to be very open, with less than 20 trees/ha. The area where *Dorottya* stayed the first two months around Dania, still contained some more or less natural habitat. The area around Toumnia where she stayed in the following two months had been converted to millet fields. A third area, 70 km further southwest, where she stayed only one night, had higher density of trees (70 trees/ha) but was also mostly covered by millet fields. Local bird biomass observed varied from 1 to 2.5 kg per km of transect. Grasshopper and reptile presence was low, signs for the presence of burrowing mammals was not very frequent, either. The main danger to Saker appears to come from local boys with slingshots and from local hunters. On the other hand birds of prey like the Saker are considered to bring good luck, and to be useful for millet crops pest control by feeding on songbirds such as Red-billed Quelea *(Quelea quelea)* and rodents. These aspects may be entry points for a future conservation campaign for Saker and other raptors in the region.

Key words: *Falco cherrug*, overwintering, satellite telemetry, Niger.

Correspondence: *Housseini Issaka*, Sahara Conservation Fund, BP 981, Niamey, Niger; E-mail: housseissaka@yahoo.fr

Introduction

In the Sahel, the Saker is a rare visitor from Europe during the dry season. It has been recorded only three times during a six-year-long intensive raptor survey in West Africa (Mauritania–Nigeria) in the late 1960s, early 1970s *(Thiollay, 1977; 1978)*, and on two occasions during similar surveys in 2002 and 2003 (*J. Thiollay*, pers. comm.). Yet, the species has been very rarely observed in northern Cameroon *(Vielliard, 1971; Thiollay, 1978)* and has not been recorded at all by *Scholte et al. (1999).*

Saker Falcon *(Falco cherrug)* is a threatened species throughout its breeding range, including Hungary and Slovakia. To better know what threats it faces during migration and overwintering, a number of Saker Falcons in Hungary and Slovakia were fitted with satellite-tracking devices in the context of an EU LIFE project. Recently, we had evidence of the overwintering of two tagged Saker Falcons in southern Nigeria. One female, tagged in

Area	No. of transects	Distance covered	Habitat type	Degradation	Grass cover %	Grass height (m)	No. of shrubs/ha	No of trees	No of trees/ha
Toumnia	16	15.2 km	FT	0,06	96,56	0,46	1,44	9,50	17,94
Dania	7	26.3 km	FT, GB, GT	0,39	90,95	0,40	1,31	6,96	12,94
Doungou Haoussa	2	4.5 km	FT	0,52	85,02	0,36	1,28	6,99	19,93

Table 1. Average of main habitat features in the overwintering area of the Saker Falcon (FT = combination of farmland and trees; GB = grassland and shrubs; GT = combination of grassland and trees)

Slovakia spent much of the winter of 2008/2009 in southern Niger, near Madaoua (14ºN 6ºE) and Birni N'Konni (14ºN 5ºE). Another female, called *Dorottya* and tagged in Hungary stayed in 2009/2010 also in southern Niger, but further east and largely in an area some 150 km north of Zinder, at approximately 14ºN 9º E. Due to the rarity of the species in this part of Africa and to the importance of data collection about its wintering ecology in the Sahel, a small project was developed in February 2010 in the region where *Dorottya* was wintering.

The main goals of our research were to: (1) observe the behaviour of the tagged falcon; (2) describe the overwintering habitats; (3) estimate the potential prey abundance in the area; (4) evaluate potential threats to, and promote conservation of, raptors in general and Saker Falcon in particular.

Methods

The field work took place from 7 to 16 February 2010, in the form of daytrips by motorbike from Zinder. On the basis of coordinates provided by the satellite tracking, potential roost sites were visited early in the day, in order to have the best chance of observing the tagged bird. During visits later in the day the presumed roost sites were searched for regurgitation pellets and prey remains. Photographic documentation of the area, habitats and roost sites was made by a digital photo camera. For an evaluation of land use and cover and for quantitative estimation of the presence of potential prey species for Saker Falcons, a number of linear transects of approximately one hour duration each was walked. We adapted the method described by *Trierweiler et al. (2007)* for surveys of Montagu's Harrier *(Circus pygargus)* in Niger. Date, locality and weather were noted, as well as the GPS coordinates of the starting and finishing points. Times of starting and finishing were also recorded. Transect length was calculated from the coordinates using Google Earth maps.

The following habitat characteristics were recorded: land use, land cover or habitat type; degree of degradation (from 0 = no degradation visible, to 5 = complete destruction); grass cover percentage (from 0 = bare spots to 100% full coverage); height of grass, shrubs and trees (in metres); presence of tree species (1= rare, 2 = frequent, 3 = dominant); number of trees per hectare (Table 2). Potential prey items for Sakers include birds, grasshoppers, small mammals and reptiles. Out of these mammals are the most difficult to estimate, but the presence of holes dug by burrowing mammals can be considered a good proxy *(Trierweiler et al., 2007).*

	Location	Start N	Start E	End N	End E	Dist. (Km)	Weather	Habitat	Degradation	Cover %	Grass height (M)	Shrubs	Trees	Tree/Ha
Toumnia														
7 Feb (10:14–11:12)	Babban Toudou	13.98884	8.96804	13.99040	8.97373	0.63	C	FT	1	100	0.50	1.5	12	19
7 Feb (13:49–14:45)	Babban Toudou	14.00528	9.04011	14.00888	9.03897	0.42	C	FT	0	100	0.30	1.0	12	20
8 Feb (17:15–18:11)	Garin Elhadji	14.00744	9.04056	14.01880	9.03967	1.25	C	FT	0	100	0.40	2.0	7	10
9 Feb (8:40–9:33)	Zongo Samia	14.00580	9.04596	14.01218	9.06144	1.81	C	FT	0	80	0.50	1.0	7	19
9 Feb (9:50–10:52)	Zongo Samia	13.98978	9.02493	13.96987	9.02515	2.20	C	FT	0	100	0.50	1.0	10	15
9 Feb (12:00–13:02)	Zongo Samia	13.98982	9.02499	13.98820	9.00439	2.22	C	FT	0	100	0.40	1.0	10	15
9 Feb (14:39–15:32)	Zongo Samia	14.00252	8.97314	13.98670	8.97280	1.75	C	FT	0	100	0.40	2.0	7	16
9 Feb (17:00–18:00)	Zongo Samia	14.00628	9.02400	14.00573	9.01126	1.37	C	FT	0	70	0.50	2.0	12	27
10 Feb (10:50–11:55)	Garin Chouri	14.00781	9.03726	14.00938	9.03779	0.18	C	FT	0	100	0.50	1.5	7	12
11 Feb (9:30–10:33)	Garin Chouri	14.00281	9.03699	14.00281	9.01949	1.89	C	FT	0	95	0.50	1.5	13	18
11 Feb (13:20–14:22)	Garin Chouri	14.03602	9.03798	14.04984	9.04125	1.57	C	FT	0	100	0.50	1.5	7	6
11 Feb (15:40–16:39)	Katourjé	14.03459	8.98885	14.05289	8.98592	2.04	C	FT	0	100	0.50	1.0	7	18
12 Feb (8:20–9:15)	Katourjé	14.03457	8.98875	14.02725	8.96737	2.46	C	FT	0	100	0.50	1.5	7	16
12 Feb (10:40–11:41)	Mairouwa	14.03284	8.99610	14.02853	9.01854	2.44	C	FT	0	100	0.50	1.5	12	13
12 Feb (14:30–15:25)	Babban Toudou	14.00235	8.97093	14.00324	8.98911	1.95	O	FT	0	100	0.40	1.5	7	35
12 Feb (16:10–17:06)	Aroungouza	14.00250	8.97009	14.02129	8.96842	2.08	O	FT	0	100	0.50	1.5	15	28
Dania														
13 Feb (9:40–10:30)	Sabon Rouwa	14.12439	9.12357	14.10602	9.12274	2.03	O	GT	3	95	0.30	1.0	4	7
13 Feb (11:00–12:04)	Sabon Rouwa	14.12409	9.12550	14.13435	9.15504	3.37	O	GT	0	60	0.15	0.7	4	11
13 Feb (13:00–13:58)	Sabon Rouwa	14.13218	9.11816	14.14306	9.10618	1.77	O	FT	0	100	0.50	1.0	6	21
13 Feb (14:40–15:43)	Sabon Rouwa	14.12300	9.11257	14.12831	9.09731	1.75	O	FT	0	100	0.50	1.5	13	5
16 Feb (9:00–9:57)	Dania	14.19131	9.10971	14.19975	9.12615	2.00	C	FT	0	100	0.40	1.5	4	4
16 Feb (11:00–12:05)	Dania	14.19172	9.10839	14.20372	9.09345	2.08	C	GB	0	100	0.50	2.0	0	0
16 Feb (13:15–14:05)	Dania	14.18839	9.10883	14.16959	9.11524	2.19	C	GB	0	100	0.15	1.5	0	0
Doungou Haoussa														
15 Feb (11:00–12:02)	Taramni bougajé	13.45571	8.69590	13.43420	8.70001	2.43	O	FT	0	100	0.40	1.5	15	82
15 Feb (12:55–13:52)	Taramni bougajé	13.45607	8.69411	13.46668	8.67852	2.04	O	FT	0	100	0.50	2.0	13	58

Table 2. Basic information of transects walked to assess land use and prey availability of a satellite-tagged Saker Falcon wintering in the area

During transects all potential preys were recorded on both sides up to 1 m lateral distance. All reptiles and birds seen were counted, grasshoppers were recorded according to categories (small < 3 cm, medium 3–7cm, large green and large red > 7 cm), similarly to the active mammal holes (small < 3 cm and large > 3 cm).

In order to evaluate the knowledge on raptors and their threats and to raise public awareness we made interviews starting with specific questions in order to elicit discussions with local people encountered during the transects or in villages. All discussions were held in a positive, non-judgmental setting. To raise awareness of bird conservation and raptors and falcons in particular, discussions were held with villagers in subgroups and with some local teachers in villages.

Eventually, to evaluate specific threats in the Saker Falcon wintering areas, an approximately 10-km-long section of power line along the Zinder–Tanout road on the western edge of the Toumnia region was checked for potential bird victims of electrocution or wire collision.

	Presence % (n times recorded in transect/total transects)				Occurrence[1]		
	Toumnia	**Dania**	**Doungou Haoussa**	**Total area**	**Toumnia**	**Dania**	**Doungou Haoussa**
Faidherbia albida	1	0.43	1	0.84	1	2	1
Guiera senegalensis	0.87	0.86	0	0.80	1	1	a
Sclerocarya birrea	0.812	0.57	0	0.68	2	2.5	a
Boscia senegalensis	0.56	1	0	0.64	1	1	a
Piliostigma reticulatum	0.56	0.71	0.5	0.60	2	3	1
Euphorbia balsamifera	0.56	0.14	0	0.40	3	3	a
Leptodenia pyrotechnica	0.5	0	0	0.32	2	a	a
Ziziphus mauritiana	0.12	0.43	0.5	0.24	3	3	3
Acacia nilotica	0	0.57	1	0.24	a	2	3
Acacia senegal	0	0.57	0	0.16	a	2	a
Combretum glutinosum	0.12	0	0.5	0.12	2.5	a	3
Hyphaene thebaica	0	0	1	0.08	a	a	1
Comiphora africana	0	0.29	0	0.08	a	2	a

Table 3. Presence and occurrence of woody species in the vegetation ([1] codes for occurrence: a = absent; 1 = rare; 2 = frequent; 3 = dominant)

Results

Field search for Dorottya

One of the authors *(HI)* visually recorded *Dorottya* in two occasions, on the 7th and 10th February. All roosting sites in the Toumnia area were not very far from villages. *Dorottya* used to roost at night in *Sclerocarya birrea* (n = 2) and *Acacia* sp. (n = 1) trees. We have limited evidence of *Dorottya*'s diet by a few pellets containing bird and beetle remains.

Description of the landscape, land use and habitats

From Google Earth maps, provided by the LIFE Saker project, and from the relevant 1 : 200.000 IGN map sheets (Zinder, Tanout, Miria and Gamou), it looked like *Dorottya* spent most of her time in January–February 2010 on quite flat terrain at about 470–490 m a.s.l. When the maps, which date from the 1960s, and Google Earth images were compared, tree cover in both the Toumnia and Dania areas appear to have decreased considerably over the past 50 years, while the number of millet (and sorghum) fields, and the population, have increased significantly.

People living in the Dania and Toumnia areas are mostly Hausa farmers and Fulani pastoralists who move with their livestock. Average rainfall is 300-400 mm/year, falling between June or July and September. Going north from Sabon Rouwa (Toumnia area, transects 3–6), this is a flat or very gently undulating cover sands area. Only few isolated hills rise to 50 m above the ground in more than 100 km^2.

A total of 25 transects were walked to assess land cover and prey availability: 7 in the Dania area (total length 15.2 km), 16 in the Toumnia area (26.3 km), and 2 in the Doungou Haoussa area (4.5 km) (Tables 1 and 2). Of the 7 transects in the Dania region, 3 were in farmland with trees, two in grassland with trees and two in grassland with shrubs (Table 1).

In the Dania region cover percentage was almost always 100%, except for transects 5 and 6 (60 and 95%, respectively). These latter were also the only two transects with moderate erosion/degradation (Category 3). Grass height was only 0.15 m on two transects, and varied from 0.3–0.5 m on the others. Shrub height varied from 0.7–2.0 (average 1.3) m, and tree height from 4–13 (average 6.2) m. Tree density varied from 0–21, on average 7 trees/ha.

All 16 transects in the Toumnia region were across farmland with trees: there is virtually no uncultivated land left there. Cover percentage was almost always 100% and there was almost no degradation. Grass height varied from 0.3–0.5 m, shrub height from 1.0–2.0 (average 1.5) m, and tree height from 7–13 (average 9.5) m. Tree density varied from (6) 10–28 (35), averaging 18 trees/ha.

At Doungou Haoussa 2 transects were walked, starting out from the *Dorottya*'s roosting site. Cover was 100%, grass height 0.4 and 0.5 m, shrub height 1.5 and 2.0 m, tree height 15 and 13 m, respectively. Tree density was 82 and 58 trees/ha, respectively. Woody plant species recorded in the areas are listed in Table 3.

		No. of transects where present/all transects				**Individuals/km transect**			
	Weight (g)	**Toumnia**	**Dania**	**Doungou Haoussa**	**Total area**	**Toumnia**	**Dania**	**Doungou Haoussa**	**Total area**
Bubulcus ibis	345	0.44	0	0	0.28	1.37	0	0	0.78
Small *Falco* sp.	200	0.13	0	0	0.08	0.11	0	0	0.07
Vanellus spinosus	150	0.19	0.29	0	0.2	0.57	0.33	0	0.44
Streptopelia senegalensis	100	0.69	0.57	0.50	0.64	1.82	1.25	0.89	1.55
Streptopelia sp.	100	0.50	0	1.00	0.4	1.06	0	0.89	0.70
Oena capensis	35	0.38	0.57	0.50	0.44	0.57	0.59	0.67	0.59
Centropus senegalensis	170	0.13	0.43	0	0.2	0.08	0.20	0	0.11
Caprimulgus eximius	80	0.06	0	0	0.04	0.08	0	0	0.04
Coracias abyssinicus	120	0.88	0.71	0	0.76	1.14	0.53	0	0.83
Upupa epops	55	0.50	0.43	0	0.44	0.30	0.39	0	0.30
Phoeniculus purpureus	70	0.13	0.14	0	0.12	0.19	0.07	0	0.13
Tockus nasutus	210	0.38	0	0.50	0.28	0.80	0	0.45	0.50
Tockus erythrorhynchus	150	0.13	0	0	0.08	0.19	0	0	0.11
Lanius meridionalis	50	0.88	0.71	1.00	0.84	1.86	0.66	0.67	1.35
Corvus albus	500	0.38	0.57	1.00	0.48	0.42	0.26	0.45	0.37
Alaudidae sp.	20	0.38	0.71	0	0.44	0.68	1.45	0	0.87
Lamprotornis pulcher	65	0.75	0.86	0.50	0.76	3.72	2.24	2.46	3.11
Lamprotornis sp.	90	0.19	0	0	0.12	0.46	0	0	0.26
Cercotrichas podobe	25	0.06	0	0	0.04	0.04	0	0	0.02
Oenanthe sp.	25	0.56	1.00	0.50	0.68	0.61	0.59	1.12	0.65
Bubalornis albirostris	70	0.75	0.57	0.50	0.68	2.92	0.79	0.89	2.03
Amadina fasciata	18	0.06	0	0	0.04	0.42	0	0	0.24
Motacilla flava	18	0.31	0.14	0.50	0.28	0.30	0.07	0	0.20
Small passerine sp.	30	1.00	0.71	1.00	0.92	12.10	2.63	3.80	8.19

Table 4. Presence and densitiy of birds as potential Saker prey items along the transects in the three different survey areas

	Toumnia	Dania	Doungou Haoussa	Total area
All birds	838	273	118	1229
Total bird biomass (g)	64 932	17 843	8 020	90 790
Individuals of birds/km	31.91	17.97	26.40	26.76
Bird biomass (g/km)	2 470	1 170	1 630	1 980

Table 5. Total amount, calculated total biomass, bird and biomass density of birds as potential Saker prey items along the transects in the three different survey area

Estimation of the potential prey presence in the area

Birds

The birds recorded along the prey availability transects are shown in Table 4. In total 1305 birds were observed along 45.9 km of prey transect (61 unidentified birds, as well as 9 raptor sightings, all considered to be unlikely prey for Saker: Lanner—*Falco biarmicus*, Saker?, two Short-toed Eagles—*Circaetus gallicus*, two Dark Chanting Goshawks—*Melierax metabates* and one unidentified raptor)—were not included in Table 4). Average number of birds per km was 26.7 overall: 18 in the Dania area (ranging from 5 to 46), 31.9 in the Toumnia area (ranging between 15–86; 167 for the extremely short transect 8), and 26 in the Doungou Haoussa area (ranging between 16–38). The number of birds per km of transect was thus highest in the Toumnia area. For a raptor that also preys on birds, bird biomass availability is even more important than the number of individual birds. Biomass availability in g per species per km of transect is given in Table 5. Most relevant bird species available to Saker, in terms of their number and total biomass per kilometer, as well as their ranking as potential food source for Sakers are shown in Table 6.

Birds like Pied Crow *(Corvus albus)*, Cattle Egret *(Bubulcus ibis)*, Grey Hornbill *(Tockus nasutus)* and Spur-winged Plover *(Vanellus spinosus)* are important because of their considerable weight. Small passerines in general, Chestnut-bellied Starling *(Lamprotornis pulcher)* and White-billed Buffalo Weaver *(Bubalornis albirostris)* in particular, and also Laughing Dove *(Streptopelia senegalensis)* and other turtle dove species, are important because of their high density. Grey Hornbills were not present in the north (Dania), Chestnut-bellied Starlings decreased in density while Buffalo Weavers increased in density towards south.

Total bird biomass per km of transect was lowest at Dania (1 175 g/km, range 308–2 8923), and roughly equal at Toumnia and Doungou Haoussa: 2 473 (range 723–6 190) and 2 361 (range 1 044–3 929) g/km, respectively. The outstanding value of 8 222 g/km at Toumnia was again in the extremely short transect 8. In the Toumnia area, *HI* noted bird nests in almost every tree.

Grasshoppers, mammal holes and reptiles

The presence of grasshoppers, mammal holes and reptiles is shown in Table 7. The density of small grasshoppers (<3 cm) was by far the greatest in the Toumnia area, but still rather low (14.8/km), against 4.2 in the Dania area and 0.9 in the Doungou area. Hardly any medium-sized (3–7 cm) grasshoppers were found, and even less large ones (>7 cm).

Small mammal hole density (<3 cm diameter) was similar in the Dania and Toumnia ar-

	Weight	All reas			Dania			Toumnia			Doungou		
	(g)	g/km	rank	i/km	g/km	rank	i/km	g/km	rank	i/km	g/km	rank	i/km
Bubulcus ibis	270	270	**3**	0.78	0	–	0	473	**1**	1.37	0	–	0
Vanellus spinosus	150	65	**11**	0.44	49	**7**	0.33	86	**11**	0.57	0	–	0
Streptop. senegalensis	100	155	**6**	1.55	125	**4**	1.25	183	**6**	1.83	89	**6**	0.89
Streptopelia sp.	100	70	**10**	0.70	0	–	0	107	**9**	1.07	89	**7**	0.89
Coracias abyssinicus	120	99	**8**	0.83	99	**5**	0.53	137	**8**	1.14	0	–	0
Tockus nasutus	210	105	**7**	0.50	0	–	0	168	**7**	0.80	94	**5**	0.45
Lanius meridionalis	50	73	**9**	1.46	43	**8**	0.86	93	**10**	1.87	56	**8**	1.12
Corvus albus	500	327	**1**	0.65	263	**1**	0.53	209	**4**	0.42	1230	**1**	2.46
Lamprotornis pulcher	65	228	**4**	3.51	227	**2**	3.49	243	**3**	3.73	145	**4**	2.24
Bubalornis albirostris	70	171	**5**	2.44	92	**6**	1.32	205	**5**	2.93	235	**3**	3.36
Passerine sp. (small)	30	298	**2**	9.93	170	**3**	5.66	364	**2**	12.15	342	**2**	11.41

Table 6. Availability of bird species as prey for Saker Falcon in the different areas given in weight (g/km) and number (i/km=individual/km) per kilometre with their ranking of importance as potential food source

eas (24 and 27.6 per km), and slightly less in the Doungou area (18.6 per km). Larger mammal hole density (>3 cm diameter), however, was approximately six times greater in the Toumnia area (2.9 holes per km) than in the Dania and Doungou area (0.5 and 0.4 holes per km).

Reptile density was quite similar and low at the three sites: 0.5 reptiles per km at Dania, 0.7 at Toumnia and 0.4 at Doungou Haoussa, mostly Common Agamas *(Agama agama).*

Threat evaluation and awareness raising

Local population

Interviews were held with two village chiefs, three farmers, one group of villagers and the Forest Service in Zinder. Overall conclusions are as follows. The interviews have brought to light that very few villagers know the Saker. Overall villagers do not eat Saker but they know that children (youngsters) may kill them with slingshots. There were even villagers accusing their neighbours in the north of killing everything they find on their way when they go to hunt for they possess traditional firearms (villages of Dania, Sabon Rouwa). The majority wishes this kind of bird to be protected because it brings good luck according to them. The presence of this kind of falcon reduces the damage caused by certain crop pests like *Quelea quelea* e.g. They have no problems with them and even want them to be protected becasue where they are there is always the blessing of God. It is a species that does no harm at all to the farmers and its existence in the area would even be beneficial for them because it hunts the birds and kills the rats that threaten their crops.

Dorottya's fate

The words by local villagers about youngsters with slingshots were almost prophetic. From 7 March *Dorottya*'s signal remained stationary, at 13.90583 N 9.30183 E, between Kirchia and Zemrou. On 20 March *Halimatou Amadou* went to investigate. *Halimatou* found that *Dorottya* was killed by a young Fulani herder with a slingshot. In the last week of April 2010 the PTT that used to be carried by *Dorottya* was recovered by *Issaka Houdou* of the Antilopes Sahélo-Sahariennes project who went to the village for this purpose.

Location		Toumnia	Dania	Doungou Haoussa	Total area
No of transects		16	7	2	25
Km total		26.26	15.19	4.47	45.92
		Total number recorded			
Grasshoppers	**<3 cm**	389	64	4	457
	>3 cm	8	2	0	10
Mammal holes	**<3 cm**	725	364	83	1172
	>3 cm	77	8	2	87
Reptiles		18	7	2	27
		Number/km			
Grasshoppers	**<3 cm**	14.81	4.21	0.89	9.94
	>3 cm	0.30	0.13	0.00	0.22
Mammal holes	**<3 cm**	27.61	23.96	18.57	25.50
	>3 cm	2.93	0.53	0.45	1.89
Reptiles		0.69	0.46	0.45	0.59

Table 7. Presence of potential Saker prey items along the transects: grasshoppers, mammal holes (as a proxy for small mammals) and reptiles

Power lines

Approximately 20 km of power line was surveyed along the Zinder–Tanout road, on the western edge of the Toumnia region (Kania-Babban Toudou). No dead birds were found on the ground or on the lines, either. Local people said they had never seen a bird that had been victim of the power lines and that they saw birds perching on the lines all the time.

Awareness raising

It has proven that raptors on the whole, and the Saker Falcon in particular, are not considered harmful. The Saker has value in several ways, economical (protection of crops and thus indirect increase of income and reduction of hunger) and cultural (with the myths that people subscribe to in relation to the Saker when they see it during a trip, and the luck that it brings to a person). On the whole, Villagers think it would be important to protect the Saker. An awareness campaign could be started on the basis of these findings in order to make the local inhabitants accept and protect them.

Discussion and conclusions

Dorottya arrived in southern Niger late October 2009, spending most of November and December in the Dania area, and most of January and February 2010 in the Toumnia area, some 25 km further south-west. During these months she made several short trips outside her regular 'territory', among others to Doungou Haoussa (approx. 13.46 N 8.70 E), where she spent the night of 12–13 February. Of interest is why she stayed in this particular area and why she did not stay in the areas she visited only briefly, and what threats she faced. Of interest is also how she behaved, and what she consumed.

Observation of the tagged falcon

During our study *Dorottya* was observed twice. The trees she was seen in and other trees she roosted in were often leafless or partly leafless marula trees *(Sclerocarya birrea)*, arguably so she could see better what was around her. Note that when *Dorottya* first arrived late October, not long after the end of the rains, marula trees would have more leaves but other suitable perches would still have been available.

During one of the encounters *Dorottya* was watched for fourteen minutes until a pedestrian made her take off. No exact estimate was on her fleeing distance but as she was killed with a slingshot later, probably she could not have been disturbed too easily by people. Local people also explained that this kind of bird was generally not hunted, and many roosting trees were not far from villages.

A regurgitation pellet, approximately 50-55 mm in length, was found under the tree where *Dorottya* perched 11–12 February. It contained an elytron (wing cover) of a beetle, an upper mandible of a bird, feathers and bones. No hairs of rodents or other mammals were present. It looks like *Dorottya* was at least in part an opportunistic feeder, or stretched to find prey, unless the beetle remains came from a beetle very recently eaten by a bird subsequently eaten by *Dorottya*. Plucking remains found under another roosting or perching tree may have been from a domestic chicken.

The main areas where *Dorottya* stayed, around Dania and around Toumnia, are at just under 500 m a.s.l., on rather flat cover sands deposited by the wind. The population consists mostly of Haussa farmers and Fulani pastoralists who move with their livestock. Local rainfall averages 300-400 mm/year, enough to grow a decent millet crop in some years but not in others. Over the past fifty years tree cover appears to have decreased considerably, while the number of millet fields has greatly increased. The latter has been caused by a significant population increase and also, it is said, by a reduction in yield per field. The yield reduction is most likely related to reduction in useful rainfall and/or depletion of the nutrients stored in the soil. Over the period 1960–2010 the population of Niger as a whole more than quadrupled, from 3.9 to 15.9 million. At present the population of Niger as a whole is estimated to grow by 3.8% per year. This implies a population would duplicate in 18-19 years. Migration can locally increase or reduce population growth. If man-caused changes in land cover and land use affect Saker on their wintering grounds in the Sahel, than clearly those effects will increase during the coming years and decades.

Description of the landscape, land use categories and habitats

The vegetation surveys carried out in February showed that at the three sites visited by *Dorottya* non-farmland habitat existed only in the north (Dania). From north to south (Dania–Toumnia–Doungou Haoussa), average shrub height increased slightly (1.3–1.4–1.75 m), while average tree height (6.2–9.5–14.0 m) and tree density (7–18–70 per ha) increased considerably. This coincides with an increase in average rainfall from north to south, but may also be influenced by geology and soils.

In the two areas most frequented by *Dorottya*, Dania and Toumnia, vegetation was thus quite open, averaging only 7 (range 0–21) and 18 trees (range 6–35) per ha, respectively. Trees were also not very tall, averaging 6 (Dania) and 9.5 (Toumnia) m. Where there were

more trees, in the Doungou Haoussa area (70 per ha), *Dorottya* only stayed one night. It would be interesting to investigate further what influence vegetation structure may have on the presence of Saker in the Sahel.

Woody species composition at Dania and Toumnia was in part quite similar, in part different. Individual woody species are unlikely to be important to the presence of Saker in the Sahel, unless they greatly influence vegetation structure, or unless the individual woody species influences the presence of the basic needs of Saker (food and roosting site), and/or access to those basic needs (via good sentinel posts, a good field of view, and not too much disturbance). Data were insufficient to draw any conclusions on that.

Estimation of the potential prey presence in the area

As mentioned, analysis of the pellet produced by *Dorottya*, and of prey remains below one of her perching trees, showed only bird and beetle remains. Total bird biomass observed per km of transect was lowest at Dania in the north: 1 175 g/km (range 308–28 923), and roughly equal in Toumnia and Doungou Haoussa: 2 473 (range 723–6 190) and 2 361 (range 1 044–3 929) g/km, respectively. Birds like Pied Crow *(Corvus albus)*, Cattle Egret *(Bubulcus ibis)*, Grey Hornbill *(Ocyceros birostris)* and Spur-winged Plover *(Vanellus spinosus)* were important because of their considerable weight. Small passerines in general, Chestnut-bellied Starling *(Lamprotornis pulcher)* and White-billed Buffalo Weaver *(Bubalornis albirostris)* in particular, and also Laughing Dove *(Streptopelia senegalensis)* and other turtle dove species, were important because of their high density. None of the top ten birds available in terms of biomass were Palearctic migrants and only very few birds observed were Palearctic migrants in general: only 16 wheaters (*Oenanthe* spp.), 7 Yellow Wagtails *(Motacilla flava)* and 2 kestrels (*Falco* spp.), a maximum of 25 birds out of 1229 individuals.

In February 2010, bird biomass density at Dania was much lower than at Toumnia. It therefore makes sense that *Dorottya* preferred the Toumnia area to the Dania area at that time of year. In November–December 2009 bird biomass density at Dania may have been higher. Not long after the end of the rainy season more shrubs and trees, and perhaps even some annual grasses and herbs, would still have been green at Dania, and there would have been more grass and other seeds left on the ground. There would have been therefore more insects and insect- and seed-eating birds, making the area around Dania more attractive to a raptor like *Dorottya*. Drying out of the vegetation progresses from north to south as the dry season develops. Montagu's Harriers *(Circus pygargus)*, too, have been shown to move further south in Niger and Nigeria gradually during the dry season (cf. Dutch Montagu's Harrier Foundation, *www.grauwekiekendief.nl*).

Moving of Montagu's Harriers to south during the dry season appears to be related to the availability of the large grasshoppers as prey: later in the dry season fewer green bushes are available that these grasshoppers feed on. No grasshopper remains were found in *Dorottya*'s pellet, and grasshopper availability at the three sites was very low: no large grasshoppers, hardly any medium-sized ones, and an average of only 14.8 small grasshoppers (<3 cm) per km at Toumnia, 4.2 at Dania and 0.9 in the Doungou area was detected. If *Dorottya* ate beetles she probably would have eaten also grasshoppers if they crossed her path, but it is unlikely they were a major food item for her in February 2010.

Mammals are a major food item for Sakers in Europe. Because of the high daytime temperatures even during the dry season (many days with maximum temperatures over 30°C), most mammals in the Sahel are diurnal or at best crepuscular. The behaviour may make them less attractive to Sakers. The density of small holes (<3 cm diameter) of mammals (mostly small rodents) in the study areas was not very high: 24 and 27.6 per km (approximately 120 and 140 per ha) in the Dania and Toumnia areas, and slightly less in the Doungou area (18.6 per km or 93 per ha). Larger mammal hole density (>3 cm diameter), of e.g. larger rodents, squirrels and mustelids, was approximately six times greater in the Toumnia area (2.9 holes per km or 15 per ha) than in the Dania and Doungou area (0.5 and 0.4 holes per km or 2-3 per ha). In addition no mammal hairs were found in the pellet of *Dorottya*. In conclusion, there is no indication that mammals play a significant role in the diet of Sakers in the Sahel. The same applies to reptiles, with reptile density equally low at the three sites: 0.5 reptiles per km at Dania, 0.7 at Toumnia and 0.4 at Doungou Haoussa.

Threat evaluation and awareness raising

Dorottya often roosted only 500–1000 m from a village or hamlet, yet very few villagers knew the species. While local power lines do not appear to be a problem the main dangers to Sakers appear to be young boys with slingshots and local hunters. *Dorottya*'s death early March 2010, caused by a young herder with a slingshot, about 35 km ESE of the Toumnia area, further testifies to that. On the other hand a number of people in the area believe that birds like Sakers reduce damage to on crops by rats and by millet-eating birds such as Quelea *(Quelea quelea),* locally known as "mange-mils" in French (millet-eaters) and Sudan Golden Sparrows *(Passer luteus)*. It is also believed that birds like Sakers bring good luck. Based on these facts a successful awareness campaign could be completed. We know that WWF Niger would be interested in such a project.

Acknowledgements

It is a pleasure to acknowledge the enthusiastic support for this project by *Mátyás Prommer* MME (BirdLife Hungary) and *József Fidlóczky* of Bükk National Park Directorate (Hungary). Financial support was provided under the EU LIFE project *'Conservation of Saker* (Falco cherrug) *in the Carpathian Basin'* LIFE06 NAT/HU/000096.

In Niger logistical support was provided by the Projet Antilopes Sahélo-Sahariennes, which is managed by the Sahara Conservation Fund and the Ministry of Environment. We would like to thank in particular *Thomas Rabeil* (SCF-Niamey and Zinder, general support), *Issaka Houdou* (SCF-Zinder, recovery of PTT transmitter), *Abdoulaye Harouna* (WWF Niger), the late *Ms. Halimatou Amadou* (student at the Université Abdou Moumouni), and *Sama Gagaré* (Centre Agrhymet, Niamey) for identification of prey remains from a regurgitation pellet.

We would also like to thank *Ralph Buij* (Institute for Environmental Sciences, University of Leiden, based in Maroua, Cameroon) and *Wim Mullié* (ecotoxicological and ornithological consulant based in Dakar, Senegal) for their contributions.

It is with great sadness that we report the death of *Ms. Halimatou Amadou*, only a few

weeks after her involvement in the Saker Falcon project in Niger. *Halimatou* was a student at the Université Abdou Moumouni in Niamey. To help locate the Saker Falcon *Dorottya* and her tracking device, *Halimatou* took time off from her thesis research on bats at Tessaoua, not far from Zinder. A few weeks after having found *Dorottya* she became ill as one of the victims of an encephalitis epidemic in the region where she worked. She passed away in hospital twelve days later. Our thoughts are with her parents and other family, who have lost such a promising young daughter, sister and relative.

References

Scholte, P, de Kort, S. & van Weerd, M. (1999): The birds of the Waza-Logone area, Far North Province, Cameroon. *Malimbus* **21,** p. 16–50.

Thiollay, J. M. (1977): Distribution saisonnière des rapaces diurnes en Afrique occidentale. *L'Oiseau et la Revue française d'Ornithologie* **47,** p. 253–294.

Thiollay, J. M. (1978): Les plains du nord Cameroun. Centre d'hivernage de rapaces palearctiques. *Alauda* **46,** p. 314–326.

Trierweiler, C., Koks, B. Harouna, A., Issaka H. & Brouwer, J. (2006): Montagu's Harrier research in the Sahel 200–2007. Aims, findings, methods used and plans for the future. Dutch Montagu's Harrier Foundation, Scheemda, The Netherlands, 14 p.

Trierweiler, C., Brouwer, J. Koks, B. Smits, L., Harouna A. & Moussa, K. (2007): Montagu's Harrier expedition to Niger, Benin and Burkina Faso, 9 January–7 February 2007. Report to Vogelbescherming Nederland. Dutch Montagu's Harrier Foundation, Scheemda, The Netherlands, 47 p. + appendix.