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Bats (Chiroptera) of Burkina Faso: preliminary list with fifteen first record species

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ABSTRACT

Based on a fine review of bat literature in Burkina Faso, we identified the south-western and south-eastern parts of the country as gap regions where a study that aims to fill gap in bat diversity estimation could be conducted. In total, 72 sampling sites distributed in 32 localities were surveyed between April 2008 and September 2009. 407 mist nets-nights of 12 and 6 m were used for a total effort of 2937.3 net-hours. 1639 specimens were capture in total distributed in 45 species, 22 genera and 9 families. 15 species including 2 frugivorous and 13 insectivorous were recorded for the first time in Burkina Faso. These new species recorded increased the bats diversity of Burkina Faso from 36 to 51.

Keywords: Bats, capture, first records, species richness, Burkina Faso.

INTRODUCTION

The first publication referring to bats of Burkina Faso was made by Kock (1969) in his work of Sudan bats. A second study was conducted in 1978 specifically on the bats of Burkina Faso (Koopman et al., 1978); 27 bats species were listed including 18 new records. Another major study occurred between 1980 and 1981 in Burkina Faso (Koch-Weser, 1984). This study published 24 species including six first records of bats for Burkina Faso. By 1984, 34 species of bats had already been identified in Burkina Faso. Many publications have subsequently mentioned bats from Burkina Faso but since the late 1980s, no new record was reported. meanwhile, many other species have been reported in neighbouring countries: Gambia (Kock et al., 2002); Benin (Djossa, 2007); Ghana (Weber and Fahr, 2007); Ivory Coast (Fahr, 2008). Due to the importance of bats as bio-indicators, their roles in plant pollination and seed dispersal on which depend many tropical plants and their role in the control of pests insects, we judged relevant to continue documenting bats diversity in Burkina Faso for pertinent decision making for biodiversity conservation. With this study, we found the

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south-western and the south-eastern regions as the only ones that lack protected area in Burkina Faso, although the environmental heterogeneity, the habitat complexity and resources availability. We therefore, concentrated our prospecting effort on these regions with 72 sampling sites distributed over 32 localities.

MATERIALS AND METHODS

Study sites

Burkina Faso is a landlocked country covering 274 200 km^2. About 75% of the country is supported by a Precambrian crystalline basement, which results in a generally flat landscape. The average altitude is 400 m while the extreme altitudes are 125 m (Southeastern region of Pama) and 749 m (Tenakourou Peak in the Southwest). Although characterized by low altitude and relatively low rainfall, Burkina Faso has a fairly important river system, especially in its southern part. Rivers are connected to three major basins: the Volta, Comoé and Niger basins.

Burkina Faso is characterized by a Sudano-Sahelian tropical climate with a dry season from October - November to April and a wet season from May to September - October, depending on climatic zones. Most of the country is located in the Sudanian zone, particularly the centre and the south, while the far south and the southwest belong to the Sudano-Guinean zone. The northern part of the country is under the Sahelian influence. The country subdivision made by Guinko (1984) and Fontès and Guinko (1995) allow distinguishing two great phytogeographical domains on the basis of climate and vegetation data. These are the Sahelian and Sudanian domains, each one being subdivided in two sectors, according to the national monograph on the biological diversity of Burkina Faso (MEE, 1999). The vegetation of the Sahelian zone consists of grassy, bush-like, shrubby and arborous steppe, usually pretty inappropriate. Woody plants can gather more or less locally to form aired vegetation. The vegetation of the Sudanian zone is formed in the south of the third parallel. Sudanian savannas are gradually replacing steppe formations. While the herbaceous cover fills out, the density of woody plants increases denser and higher. From North to South line where we have improvement in water conditions, the savanna may gradually become grassy, shrubby, arborous and woody and then gradually tend towards an open forest in the far Southwest.

Sampling design

Samples were collected within the BIOTA project (Biodiversity Monitoring Transect Analysis) from 2008 to 2009. All prospected sites are located in the Sudanian domain (Figure 1). The Table 1 gives information about the sampling sites and the Table 2 gives sites coordinates. In total, 72 sampling sites were selected in 32 chosen localities.

In the sampling localities, foresters or local guides were approached to locate potential sampling sites, e.g. caves or waterholes. Based on information obtained prospecting in the surrounding environment, nets were placed inside and outside the forest, most often around water sources, perpendicular to water flows in gallery forests and in front of cave entrances or any place likely to serve as pass way for bats. Large caves were also visited to find colonies and recognize the bat species living in.

Bats were caught with 12 m and 6 m-mist nets (Vohwinkel, Germany, height: 2.8 m, 5 shelves, mesh: 16 mm, denier 70 / 2, both nylon and polyester netting). Geographic coordinates of sampling sites were taken with a Garmin GPS 12. Mist nets were usually opened from 18:00 to 0:00 sometimes opened again from 4:00 to 6:00, and in some cases from 18:00 to 6:00 hours, depending on local activity patterns of bats. The nets were

checked regularly to remove the captured bats. Each bat was placed individually in a cotton bag, and then weighed with a Pesola spring balance (accuracy of 0.25 g for capacity 30 g; precision 1 g for capacity 100 g and 2 g for capacity 300 g). Common measurements like forearm length, were taken with callipers (Mahr 16U, accuracy of 0.1 mm). Captured specimens were also sexed, aged and reproductive status were reported according to Antony (1988) and Racey (1988). Based on these measurements and characterizations, bats were identified in the field using Rosevear (1965), Hayman and Hill (1971) and Bergmans (2002) identification keys. While most bats were subsequently released at their capture site, some specimens (difficult to identify or new records) were sacrificed with ether and preserved in ethanol of 96% for about one week and transferred into alcohol of 70% for further study and long term conservation. These specimens are kept to start to build the first bat reference collection of Burkina Faso housed at University of Ouagadougou.

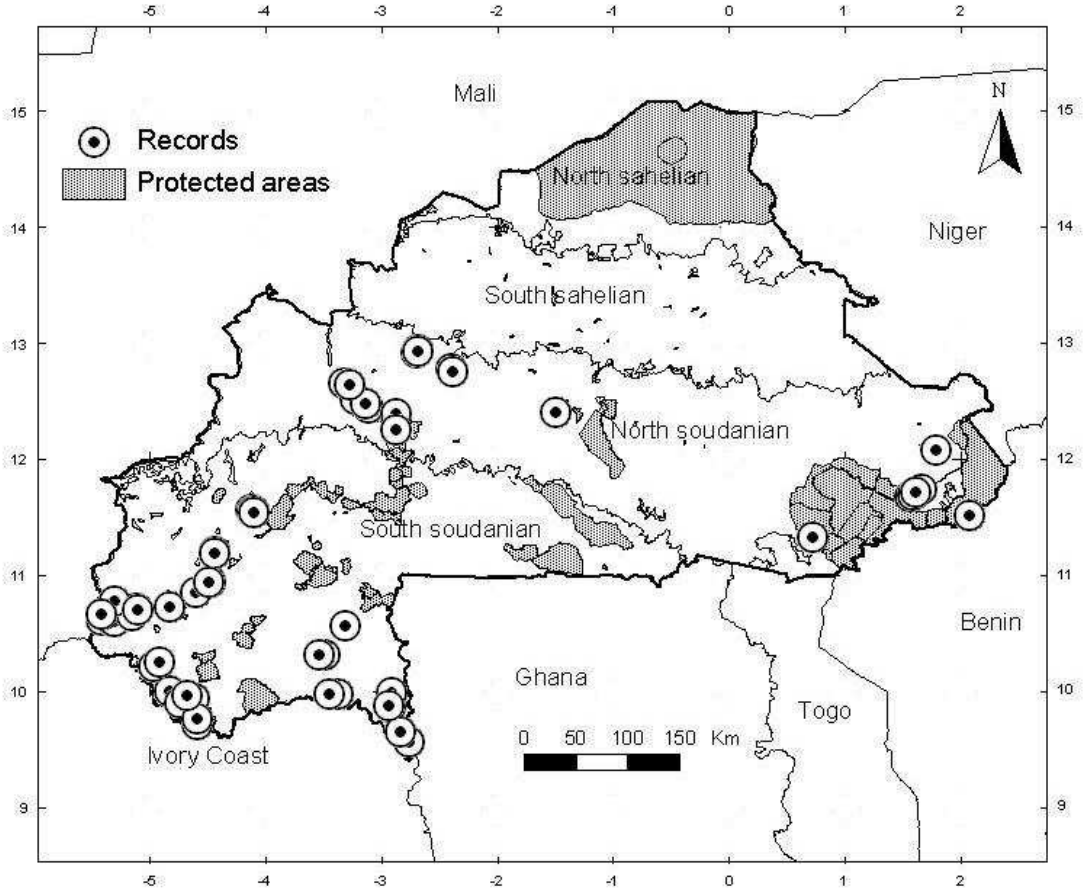

Figure 1: Map of Burkina Faso showing the sampling sites.

Table 1: Sampling sites description and sampling characteristics.

Locality	Site	Description	Date	# of nets	Capture effort
P.F. & P.W.R. Comoé-Léraba	Site 1	Folonzo village	21.4.2008	6	30
	Site 2	near Comoé river	22.4.2008	4	48
	Site 3	near termite mound	23.4.2008	5	60
	Site 4	near water way	24.4.2008	5	48
	Site 5	near dense forest at *Guibourtia copalifera*	25.4.2008	4	48
	Site 6	near Confluent Comoé-Leraba	26.4.2008	4	96
P.F. Niangoloko	Site 1	near road	28.4.2008	6	72
	Site 2	in front of cave	29.4.2008	4	32
U.P. Bangr-Weoogo	Site 1	near *Khaya senegalensis*	17.6.2008	4	32
	Site 2	near pond	18.6.2008	4	30
	Site 3	near pond	19.6.2008	2	24
P.F. Péni	Site 1	near road	7.8.2008	2	12.5
	Site 2	shrubby savanna	8.8.2008	4	20
	Site 3	woodland	9.8.2008	5	55
Hippopotamus biosphere reserve	Site 1	shrubby savanna	11 – 12.8.2008	12	132
	Site 2	woodland (near forest)	13.8.2008	6	66
	Site 3	shrubby savanna (near forest)	14.8.2008	6	66
	Site 4	dense forest	15.8.2008	6	66
P.F. Kou	Site 1	woodland (near forest)	16 – 17.8.2008	8	72
	Site 2	shrubby savanna (near forest)	18.8.2008	4	44
P.F. Niouma	Site 1	shrubby savanna	30.10.2008	4	22
	Site 2	clear forest	31.10.2008	6	45
	Site 3	near pond	1.11.2008	6	54
P.F. Toessé	Site 1	near pond	2.11.2008	5	40
	Site 2	near stream	3.11.2008	6	46.5
	Site 3	near pond	4.11.2008	4	31
P.F. Sa	Site 1	shrubby savanna	24.11.2008	4	39.3
	Site 2	gallery forest (except forest)	25.11.2008	6	52
	Site 3	woodland (near river)	26.11.2008	6	45
P.F. Toroba		gallery forest (near river)	28 – 29.11.2008	13	152.8
P.F. Kari	Site 1	shrubby savanna	30.11.2008	4	36
	Site 2	gallery forest (near river)	1 – 2.12.2008	15	180
P.F. Tissé		gallery forest (near river)	3.12.2008	7	82.3
P.F. Oualou		gallery forest	5.12.2008	8	46
Karfiguéla (Banfora cliffs)	Site 1	cave, hill, river	17 – 18.2.2009	14	47.5
	Site 2	cave, hill, river	19.2.2009	7	10.5
Sindou peaks		herbaceous steppe with some woody	21.2.2009	7	21.9
Néguéni		hill (along stream)	23.2.2009	4	3.5
	Cave 1	hill, cave	23.2.2009	DR	
	Cave 2	hill, cave	23.2.2009	DR	

Toussiana	Site 1	gallery forest (along stream)	25.2.2009	5	15.5
	Site 2	gallery forest, hill, stream	26.2.2009	4	9
	Site 3	dense forest	27.2.2009	6	20
Galgouli	Site 1	herbaceous steppe (along stream)	28.4.2009	7	29.8
	Site 2	gallery forest (along stream)	29.4.2009	6	12.4
Loropéni	Site 1	gallery	30.4.2009	4	20
	Site 2	woodland (along dam)	1.5.2009	6	31.5
Batié	Site 1	woodland (along dam)	2.5.2009	5	23.8
	Site 2	woodland (rupicolous bar)	3.5.2009	4	18
Mouhoun River		gallery forest (along river)	4.5.2009	5	25
P.F.Koulbi		gallery forest (along river)	5.5.2009	6	25.5
Bambassou		gallery forest (along river)	6.5.2009	6	31.5
Tikitianao			7.5.2009	DR	
W National park	Site 1	gallery forest	11.8.2009	5	11.3
	Site 2	gallery forest	12.8.2009	6	53.3
Gobnangou range	Saboarkori 1	shrubby savanna (along mountain chain)	14.8.2009	7	38.5
	Saboarkori 2	woodland (along mountain chain)	15.8.2009	5	56.3
	Yirini	shrubby savanna (along mountain chain)	16.8.2009	6	33
	Yirini, cave	cave	17.8.2009	DR	
	Tindangou	cave	17.8.2009	DR	
Diapaga			18.8.2009	DR	
Pama		woodland (near pond)	19.8.2009	4	22.5
Outourou	Site 1	gallery (between hill)	18.9.2009	9	35
P.F. Lera	Site 1	gallery forest	19.9.2009	4	27.5
	Site 2	gallery forest	20.9.2009	8	24
	Site 3	gallery forest	21.9.2009	8	22
Kankalaba	Site 1	gallery forest	22.9.2009	8	40
	Site 2	gallery forest	23.9.2009	9	42.5
	Site 3	gallery forest	24.9.2009	8	39
Niofila	Site 1	shrubby savanna (between dam and mountain)	27.9.2009	8	96
	Site 2	woodland (near mountain)	28.9.2009	4	18
	Site 3	forest	29.9.2009	9	108
32	**72**		**74**	**399**	**2937.3**

P.F.: Protected forest; P.W.R.: Partial wildlife reserve; U.P.: Urban park; B.R.: Biosphere reserve; DR: day roost. # of nets = number of nets. Capture effort = number of hours during which a net of 12 m is open overnight (i.e. this number is divided by two for a 6 m-net).

Table 2: Sites coordinates.

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Locality	Site	Coordinates	Latitude	Longitude
Bambassou		09°59"N, 02°54'W	9.9837	-2.9059
Batié	Site 1	09°51'N, 02°55'W	9.8630	-2.9171
Batié	Site 2	09°52'N, 02°56'W	9.8771	-2.9336
Gobnangou range	Saboarkori 1	11°40'N, 01°33'E	11.6720	1.5617
Gobnangou range	Saboarkori 2	11°41'N, 01°35'E	11.6919	1.5842
Gobnangou range	Tindangou	11°44'N, 01°39'E	11.7354	1.6616
Gobnangou range	Yirini	11°42'N, 01°36'E	11.7105	1.6055
Gobnangou range	Yirini, grotte	11°41'N, 01°35'E	11.6922	1.5842
Diapaga			12.0765	1.7871
P.F. & P.W.R. Comoé-Léraba	Site 1	9°57'N, 04°40'W	9.9560	-4.6768
P.F. & P.W.R. Comoé-Léraba	Site 2	9°55'N, 04°36'W	9.9323	-4.6085
P.F. & P.W.R. Comoé-Léraba	Site 3	9°59'N, 04°49'W	9.9958	-4.8217
P.F. & P.W.R. Comoé-Léraba	Site 4	9°53'N, 04°44'W	9.8935	-4.7411
P.F. & P.W.R. Comoé-Léraba	Site 5	9°45'N, 04°35'W	9.7613	-4.5908
P.F. & P.W.R. Comoé-Léraba	Site 6	9°42'N, 04°35'W	9.7043	-4.5866
P.F. Kari	Site 1	12°26'N, 03°06'W	12.4341	-3.1122
P.F. Kari	Site 2	12°28'N, 03°08'W	12.4772	-3.1366
P.F. Kou	Site 1	11°10'N, 04°26'W	11.1828	-4.4427
P.F. Kou	Site 2	11°11'N, 04°26'W	11.1956	-4.4418
P.F. Koulbi		09°39"N, 02°50'W	9.6522	-2.8376
P.F. Lera	Site 1	10°36"N, 05°18"W	10.6086	-5.3094
P.F. Lera	Site 2	10°35'N, 05°18'W	10.5973	-5.3130
P.F. Lera	Site 3	10°35"N, 05°18'W	10.5976	-5.3049
P.F. Niangoloko	Site 1	10°12"N, 04°57'W	10.2149	-4.9644
P.F. Niangoloko	Site 2	10°14"N, 04°54'W	10.2427	-4.9118
P.F. Niouma	Site 1	12°55"N, 02°40'W	12.9228	-2.6798
P.F. Niouma	Site 2	12°56"N, 02°41"W	12.9363	-2.6880
P.F. Niouma	Site 3	12°55"N, 02°41'W	12.9198	-2.6986
P.F. Oualou		12°23"N, 02°52'W	12.3922	-2.8672
P.F. Péni	Site 1	10°56"N, 04°28'W	10.9437	-4.4776
P.F. Péni	Site 2	10°55"N, 04°28'W	10.9315	-4.4779
P.F. Péni	Site 3	10°55'N, 04°29'W	10.9301	-4.4912
P.F. Sa	Site 1	12°39'N, 03°19'W	12.6537	-3.3201
P.F. Sa	Site 2	12°37'N, 03°16'W	12.6329	-3.2664
P.F. Sa	Site 3	12°39'N, 03°19'W	12.6570	-3.3186
P.F. Tissé		12°14'N, 02°52'W	12.2487	-2.8692
P.F. Toessé	Site 1	12°45'N, 02°22'W	12.7528	-2.3830
P.F. Toessé	Site 2	12°46"N, 02°23'"W	12.7825	-2.3977
P.F. Toessé	Site 3	12°45"N, 02°22'W	12.7534	-2.3829
P.F. Toroba		12°30'N, 03°13'W	12.5120	-3.2236
Galgouli	Site 1	09°58"N, 03°26'W	9.9678	-3.4438
Galgouli	Site 2	09°58'N, 03°22'W	9.9689	-3.3735
Kankalaba	Site 1	10°45'N, 05°16'W	10.7532	-5.2834
Kankalaba	Site 2	10°45'5, 05°18'W	10.7660	-5.3056
Kankalaba	Site 3	10°46'N, 05°18'W	10.7685	-5.3055
Karfiguéla	Site 1	10°43'N, 04°49'W	10.7232	-4.8222

Karfiguéla	Site 2	10°43'N, 04°49"W	10.7215	-4.8211
Loropéni	Site 1	10°18'N, 03°28'W	10.3040	-3.4832
Loropéni	Site 2	10°18'N, 03°31'W	10.3120	-3.5323
Mouhoun River		09°33'N, 02°45'W	9.5535	-2.7601
Néguéni	Grotte 1	10°39"N, 05°23'W	10.6542	-5.3894
Néguéni	Grotte 2	10°39'N, 05°23'W	10.6545	-5.3890
Néguéni		10°39'N, 05°24'W	10.6656	-5.4075
Niofila	Site 1	10°41"N, 05°05'W	10.6917	-5.0991
Niofila	Site 2	10°42'N, 05°06'W	10.7095	-5.1162
Niofila	Site 3	10°41"N, 05°07'W	10.6859	-5.1270
Outourou		10°36"N, 05°24'W	10.6145	-5.4100
U.P. Bangr-Weoogo	Site 1	12°23'N, 01°29"W	12.3975	-1.4891
U.P. Bangr-Weoogo	Site 2	12°23'N, 01°29"W	12.3963	-1.4927
U.P. Bangr-Weoogo	Site 3	12°23"N, 01°29'W	12.3967	-1.4890
Pama		11°19'N, 00°43'E	11.3207	0.7241
W park	Site 1	11°30'N, 02°04'E	11.5160	2.0701
W park	Site 2	11°30'N, 02°04"E	11.5117	2.0723
Sindou peaks		10°39'N, 05°09'W	10.6535	-5.1536
Hippopotamus biosphere reserve	Site 1	11°33"N, 04°7'W	11.5624	-4.1222
Hippopotamus biosphere reserve	Site 2	11°32'N, 04°06'W	11.5435	-4.1053
Hippopotamus biosphere reserve	Site 3	11°32'N, 04°06'W	11.5393	-4.1042
Hippopotamus biosphere reserve	Site 4	11°32'N, 04°06'W	11.5460	-4.1041
Tikitianao			10.5570	-3.3130
Toussiana	Site 1	10°50'N, 04°35"W	10.8466	-4.5978
Toussiana	Site 2	10°50'N, 04°35'W	10.8442	-4.5978
Toussiana	Site 3	10°50'N, 04°35'W	10.8446	-4.5987

P.F.: Protected forest; P.W.R.: Partial wildlife reserve; P.U.: Urban park; B.R.: Biosphere reserve

RESULTS

During this study, 45 species were identified: 6 frugivorous and 39 insectivorous (Table 3). These species are regrouped in 9 families and 22 genera. Among these 45 species, 15 are recorded for the first time in Burkina Faso. In the following lines we give the number of examined specimens, the forearm length (for adults only), and the spatial distribution of each species as well as the extension of its range in Africa.

Frugivorous (Pteropodidae)

***Nanonycteris veldkampii* (Jentink, 1888)**

Number of examined specimens: 132 (73 males, 59 females).

Nanonycteris veldkampii is small specie. The forearm length is 43.6 – 48.8 mm for 42 males and 50.8 – 53.2 mm for 26 females. This species was caught at Batié (4), Gobnangou range (4), Protected forest (P.F.) of Kou (13), P.F. Lera (4), P.F. Niouma (2), P.F. Péni (29), P.F. Sa (1), river of Mouhoun (2), Galgouli (13), Kankalaba (7), Niofila (24), Outourou (1), Pama (4), W park (2) and Hippopotamus biosphere reserve (22). All our captures were made during the wet season in protected forests, gallery forests along the Gobnangou range, and close to water bodies. *Nanonycteris veldkampii* migrates during the wet season from the forest zone to the northern Sudanian zone (Thomas, 1983).

Nanonycteris veldkampii is widely distributed in West Africa and western parts of Central Africa. It ranges from Guinea and Sierra Leone in the west, through each country in West Africa to Cameroon, with a single record from the southern region of Central African Republic (African Chiroptera Report, 2011).

***Rousettus aegyptiacus* (E. Geoffroy St.-Hilaire, 1810)**

Number of examined specimens: 39 (32 males, 6 females).

Rousettus aegyptiacus resembles to *Lissonycteris angolensis* but it is bigger than the last. Her forearm length is 91.7 – 102.6 mm for 30 males and 91.0 – 100.9 mm for 6 females. It was recorded from the western and eastern part of the South-Sudanian zone. In the Sudanian zone, *Rousettus aegyptiacus* has been captured in rocky formations that provide a wide variety of day roosts. We captured many individuals in the Banfora cliffs (37) and discovered a large rock cleft, which contained about 500 to 2000 individuals. Two additional specimens have been captured along the Gobnangou range.

Rousettus aegyptiacus ranges from Senegal and Egypt south to South Africa; Cyprus, Turkey, Jordan, Lebanon, Israel, South Syria, Yemen, Saudi Arabia, South Iraq, South Iran, Pakistan, NorthWest India; islands in the Gulf of Guinea (São Tomé and Príncipe); adjacent small islands (Simmons, 2005).

Insectivorous (Emballonuridae)

***Coleura afra* (Peters, 1852)**

Number of examined specimens: 19 (16 males, 3 females).

Coleura afra is the smallest of Emballonuridae present in Burkina Faso. The forearm length is 49.8 - 51.9 mm for 16 males and 51.1 - 53.7 mm for 3 females. Rarely seen in West Africa, it is located in the southwest in the South-Sudanian zone. This cave-dwelling species has been captured only in this part of the country to Néguéni (19). Thousands of individuals have indeed been observed in this cave located on a hill at Néguéni.

Coleura afra is present in West, East and South central Africa (Dunlop, 1997). It is found in much of east and eastern-central Africa, with an isolated record from central Mozambique. It is also found in West Africa, with records from Guinea and Guinea Bissau, northern Ivory Coast, Ghana, Togo, Benin, and western Nigeria. There is also a small distribution in western Angola. This species was recently discovered in Madagascar and is known only from the Ankarana Special Reserve in the north of the island and the Namoroka National Park in the west (African Chiroptera Report, 2011).

Hipposideridae

***Hipposideros cyclops* (Temminck, 1853)**

Number of examined specimens: 3 (1 male, 2 females).

Hipposideros cyclops differs with other Hipposideridae by its blackish brown color. The forearm length is 70.0 mm for one examined male and 69.8 and 70.3 mm for 2 examined females. It is located in the extreme Southwest in the South-Sudanian zone. All three specimens have been captured in the protected forest and partial wildlife reserve of Comoé-Léraba, next to a dense forest with *Guibourtia copalifera* and not far from the Comoé-Léraba confluence.

According to Decher and Fahr, 2005, *H. cyclops* occurs in West, Central, and East Africa. In West Africa, it occurs from southern Senegal through Gambia, Guinea Bissau, Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Benin to Nigeria. In Central Africa, *H. cyclops* occurs in Cameroon, Equatorial Guinea (Rio Muni and Bioko), Gabon, Central African Republic, Congo (Brazzaville), Congo (Kinshasa), and the southern tip of Sudan. In East Africa, it occurs in Uganda, Kenya, and in the coastal forests and the Eastern Arc Mountains of Tanzania.

Molossidae

***Chaerephon nigeriae* Thomas, 1913**

Number of examined specimens: 5 (3 males, 2 females).

Chaerephon nigeriae differs with other *Chaerephon* by her large size. The forearm length for 2 males is 47.8 and 49.7 mm and for one female 47.2 mm. It is located in South-central and extreme Southwestern part in Sudanian zone. The five specimens have been captured in a gallery forest along a

stream at Galgouli (1) and in an open forest and shrubby savanna in the protected forest of Niouma (4).

Chaerephon nigeriae is present in Guinea, Sierra Leone, Mali, Ivory Coast, Ghana, Togo, and Nigeria, Saudi Arabia and Yemen, Ethiopia south to Namibia, Botswana, Uganda, Malawi, and Zimbabwe (Simmons, 2005).

***Mops condylurus* (A. Smith, 1833)**

Number of examined specimens: 6 (2 males, 4 females).

Mops condylurus is the second largest *Mops* in Burkina Faso. The forearm length is 47.1 mm for one male and 45.2 mm for 1 female. It is located in the Sudanian zone. The specimens have been captured in a shrubby savanna on the edge of a forest, in a shrubby savanna near a mountain assembly line, and next to a pond. The localities are: Gobnangou range (1), P.F. Niouma (2), P.F.Toessé (1), and Hippopotamus biosphere reserve (2).

Mops condylurus is widely distributed over much of sub-Saharan Africa. It ranges from Senegal, Gambia and Mali in the west, to Sudan, Ethiopia and Somalia in the east; from here it ranges southwards through much of eastern and southern Africa, as far south as eastern South Africa and Swaziland. The species appears to be largely absent from the Congo Basin (African Chiroptera Report, 2011).

Nycteridae

***Nycteris grandis* (Peters, 1865)**

Number of examined specimens: 2 (1 male, 1 female).

Nycteris grandis is easily distinguished from other Nycteridae by its large size. The forearm length is 55.7 mm for the male and 57.4 mm for the female. It is located in the extreme Southwest in the South-Sudanian zone. Unlike Adam and Hubert (1976), who stated that it cannot be found outside the Guinean zone, or Van Cakenberghe and De Vree (1993) who said that *Nycteris grandis* is restricted to rainforests, our capture in the protected forest of Lera (2) in a gallery forest, confirms the statement of Rosevear (1965) according to which *N. grandis* can also be present outside the rainforest, in dense and moist gallery forest.

Nycteris grandis is restricted to Africa (Hickey and Dunlop, 2000). It ranges from Senegal, through West and Central Africa, to southern Sudan, southeastern Kenya and eastern Tanzania, with scattered records as far south as Zambia, Zimbabwe and Mozambique (African Chiroptera Report, 2011). It is also found on the islands of Zanzibar and Pemba (Simmons, 2005).

Rhinolophidae

***Rhinolophus alcyone* Temminck, 1853**

Number of examined specimens: 8 (4 males, 4 females).

All captured specimens were gray and resembled in colouration to *Rhinolophus fumigatus*. *Rhinolophus alcyone* forearm length is 50.0 - 50.3 mm for 3 males and 48.4 – 50.6 mm for 4 females. It was captured in the extreme southwest of the South-Sudanian zone. We encountered this species only in the protected forest of Lera (7) and in gallery forest at Kankalaba (1). In Burkina Faso, this forest species probably depends on gallery forests that provide similar conditions to rainforests further south.

Rhinolophus alcyone ranges through much of West and Central Africa. It has been recorded from Senegal in the west through to Togo, and then from Nigeria to southern Sudan and western Uganda, with patchy records from the Congo basin (although it likely occurs throughout the Congo). It ranges as far south as central Democratic Republic of the Congo (African Chiroptera Report, 2011).

Vespertilionidae

***Glauconycteris variegata* (Tomes, 1861)**

Number of examined specimens: 1 female.

This wing and tail membranes reticulated specie forearm length is 43.3 mm for one sub-adult female. It is located in West Central area in the North-Sudanian zone. *Glauconycteris variegata* specimen has been captured near a pond in the protected forest of Toessé (1).

It ranges from Senegal to Somalia, south to South Africa (Simmons, 2005).

***Neoromicia capensis* (A. Smith, 1829)**

Number of examined specimens: 1 male.

Neoromicia capensis forearm length is 32.1 mm for one male. It is located at the extreme southwestern area in South-Sudanian zone. The specimen has been captured in a gallery forest along a stream between hills at Toussiana (1).

Neoromicia capensis is widespread over much of sub-Saharan Africa. It has been recorded from Guinea Bissau in the west, to Somalia, southern Sudan and Eritrea in the east, ranging south to most of South Africa (African Chiroptera Report, 2011).

***Neoromicia rendalli* (Thomas, 1889)**

Number of examined specimens: 1 female.

Neoromica rendalli is easily distinguishable from other *Neoromicia* in Burkina Faso, by the white colour of its wings and its forearm (35.2 mm for one sub-adult female) which is longer than that of others. It is located in the South-east in the South-Sudanian zone. The specimen has been captured in a woody savanna near a managed water point at Pama (1).

Neoromicia rendalli ranges from Senegal, Mali, and Gambia to Somalia, south to Botswana, Malawi, Mozambique, South Africa (Simmons, 2005).

***Pipistrellus inexspectatus* Aellen, 1959**

Number of examined specimens: 2 females.

Pipistrellus inexspectatus is located in the southwest in the South-Sudanian zone. The forearm length is 32.6 and 32.7 mm for 2 females. The specimens have been captured in a wooded savanna along a rupicolous bar at Batié (1) and in a gallery forest at Koulbi protected forest (1).

Pipistrellus inexspectatus has been recorded from a few localities in West and Central Africa. It has been reported from Sierra Leone, Ghana, Benin, Uganda, Nigeria and Cameroon (Simmons, 2005; African Chiroptera Report, 2011).

***Scotoecus albofuscus* (Thomas, 1890)**

Number of examined specimens: 7 (2 males, 5 females).

The white wings of *Scotoecus albofuscus* contribute to distinguish it with *Scotoecus hirundo*. The forearm length is 31.7 and 34.0 mm for 2 males and 30.6 – 31.3 mm for 3 females. It is located in the extreme Southwest in the South-Sudanian zone. All specimens have been captured near rocky formations and in the presence of water in the cliffs of Banfora (2), next to a water point near hills at Néguéni (4), and in shrubby savanna between a mountain and a dam at Niofila (1). Their presence seems to be linked to the topography and the presence of water.

Scotoecus albofuscus has been widely, but patchily recorded over much of West Africa and East Africa, with some records from Central Africa. It ranges from The Gambia and Senegal in the west, through West Africa to eastern Nigeria; it is then distributed from northern Uganda and southern Kenya, through Tanzania, southeastern Democratic Republic of the Congo, southern Malawi, Mozambique and southeastern South Africa. The range is poorly known and the species might be more widespread (African Chiroptera Report, 2011).

***Scotoecus hirundo* (de Winton, 1899)**

Number of examined specimens: 6 (2 males, 4 females).

Scotoecus hirundo forearm length is 32.8 and 33.1 mm for 2 males and 30.3 – 33.0 mm for 4 females. It is located in the extreme Southwest in the South-Sudanian zone. The specimens have been captured in a gallery forest located along a stream at Galgouli (4) and in a woody savanna in the protected forest of Peni (2).

Scotoecus hirundo occurs in Benin, Cameroon, Ivory Coast, Ethiopia, Ghana, Guinea-Bissau, Senegal, Tanzania, Uganda (African Chiroptera Report, 2011).

***Scotophilus dinganii* (A. Smith, 1833)**

Number of examined specimens: 2 females.

Scotophilus dinganii is the largest *Scotophilus* found in Burkina Faso. The forearm length is 55.3 and 55.9 mm for 2 females. Both specimens have been captured in the extreme Southwest in the South-Sudanian zone. One specimen has been captured in the protected forest and partial wildlife reserve of Comoé-Léraba and another at Galgouli.

Scotophilus dinganii occurs in Senegal, Guinea-Bissau, and Sierra Leone east to Somalia, Djibouti, and south Yemen, and south to South Africa and Namibia (Simmons, 2005).

Table 3: Family, genus and captured species.

Family	Genus	Species
PTEROPODIDAE	*Eidolon*	*Eidolon helvum* (Kerr, 1792)
	Epomophorus	*Epomophorus gambianus* (Ogilby, 1835)
	Lissonycteris	*Lissonycteris angolensis* (Bocage, 1898)
	Micropteropus	*Micropteropus pusillus* (Peters, 1868)
	Nanonycteris	*Nanonycteris veldkampii* (Jentink, 1888)
	Rousettus	*Rousettus aegyptiacus* (E. Geoffroy St.-Hilaire, 1810)
EMBALLONURIDAE	*Coleura*	*Coleura afra* (Peters, 1852)
	Taphozous	*Taphozous nudiventris* Cretzschmar, 1830
		Taphozous perforatus E. Geoffroy St.-Hilaire, 1818
HIPPOSIDERIDAE	*Hipposideros*	*Hipposideros abae* J.A. Allen, 1917
		Hipposideros caffer/tephrus
		Hipposideros cyclops (Temminck, 1853)
		Hipposideros jonesi Hayman, 1947
		Hipposideros ruber (Noack, 1893)
		Hipposideros vittatus Peters, 1852
MEGADERMATIDAE	*Lavia*	*Lavia frons* (E. Geoffroy St.-Hilaire, 1810)
MOLOSSIDAE	*Chaerephon*	*Chaerephon major* (Trouessart, 1897)
		Chaerephon nigeriae Thomas, 1913
		Chaerephon pumilus (Cretzschmar, 1826)
	Mops	*Mops condylurus* (A. Smith, 1833)
		Mops demonstrator (Thomas, 1903)
NYCTERIDAE	*Nycteris*	*Nycteris gambiensis* (K. Andersen, 1912)
		Nycteris grandis Peters, 1865
		Nycteris hispida (Schreber, 1774)
		Nycteris macrotis Dobson, 1876
		Nycteris thebaica E. Geoffroy St.-Hilaire, 1818
RHINOLOPHIDAE	*Rhinolophus*	*Rhinolophus alcyone* Temminck, 1853
		Rhinolophus fumigatus Rüppell, 1842
		Rhinolophus landeri Martin, 1838
RHINOPOMATIDAE	*Rhinopoma*	*Rhinopoma hardwickii* Gray, 1831
VESPERTILIONIDAE	*Glauconycteris*	*Glauconycteris variegata* (Tomes, 1861)
	Myotis	*Myotis bocagii* (Peters, 1870)
	Neoromicia	*Neoromicia capensis* (A. Smith, 1829)
		Neoromicia nana (Peters, 1852)
		Neoromicia guineensis (Bocage, 1889)

		Neoromicia rendalli (Thomas, 1889)
		Neoromicia somalica (Thomas, 1901)
	Nycticeinops	*Nycticeinops schlieffenii* (Peters, 1859)
	Pipistrellus	*Pipistrellus inexspectatus* Aellen, 1959
		Pipistrellus rusticus (Tomes, 1861)
	Scotoecus	*Scotoecus albofuscus* (Thomas, 1890)
		Scotoecus hirundo (de Winton, 1899)
	Scotophilus	*Scotophilus dinganii* (A. Smith, 1833)
		Scotophilus leucogaster (Cretzschmar, 1826)
		Scotophilus viridis (Peters, 1852)

DISCUSSION

The results showed the important contribution of this study to improve the knowledge of bat and their diversity in Burkina Faso. From the 1639 specimens examined 45 species was identified. Among these 45 species, 15 species described above were first records for Burkina Faso.

Among the 36 species already reported from Burkina Faso, 34 were reported since 1980s (Kock, 1969; Poché, 1975; Adam and Hubert, 1976; Koopman et al., 1978; Green, 1983; Koch-Weser, 1984), and two species conserved at USNM since 1965 and 1968 were recently cited in African Chiroptera Report (2011). Of these 36 species, six were not captured during this study (*Asellia tridens*, *Hysignathus monstrosus*, *Mops midas*, *Pipistrellus deserti*, *Pipistrellus nanulus*, and *Rhinopoma microphyllum*).

Hipposideros cyclops, *N. grandis* and *R. alcyone* are forest species. They were capture in the extreme southwestern of Burkina Faso, where exist forest habitats; they therefore cannot be expected in the areas surveyed for the present study. *Nanonycteris veldkampii* is migratory species that is found in Burkina Faso during rainy seasons only. *Rousettus aegyptiacus* and *C. afra* are cave-dwelling species. They were both found in the South, in rocky formations that constitute their day roosts. *Chaerephon nigeriae*, and *M. condylurus* although synanthropic species often found in homes, have only been captured in the South. *Neoromicia capensis*, *N. rendalli*, *P. inexspectatus*, *S. albofuscus*, *S. hirundo* and *S. dinganii* are species of moist savannas. They were all captured in the southwestern, South-Sudanian zone except *N. rendalli* which was captured in the Southeast. *Glauconycteris variegata*, a species known to be restricted to humid savannas, was captured in the North-Sudanian zone.

Following this study, the total number of bats species found in Burkina Faso was 51. Compared with other countries, the diversity of bats in Burkina Faso is still low and could mean that some bat species will be discovered with increasing prospecting effort. However, it is not sure to expect much more. In countries like Ivory Coast, 87 species were reported (Fahr, 2008) and 86 from Ghana (Weber and Fahr, 2007). Indeed, these countries host large forest habitats; moreover, they count different types of forest-savanna mosaic habitats known to attract diverse bats communities (Fahr and Kalko, 2010). Country size also contributes to increasing the number of species. And this is shown in countries like the Gambia which has 31 species of bats (Kock et al., 2002) and Benin where 53 species are found (Djossa, 2007). Although present in the Guinean zone, these countries have poor species diversity. And this poor diversity could be explained by their small size that leads to less diversity of habitats.

Conclusion

This study showed that 15 new species of bats could be encountered in Burkina Faso. In addition, according to Kalko and Handley (2001), insectivorous bats are difficult to

capture and combination of several methods, including acoustic methods can contribute to a better sampling of these species. We can therefore say that combining multiple capture techniques gives more chance to capture bats and it is possible to increase the bats diversity data actually reported for Burkina Faso.

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