4th Quarterly Report

West African giraffe (*Giraffa camelopardalis peralta*)

Republic of Niger

May-July 2020

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This report describes the activities referring to giraffe conservation in Republic of Niger and the preliminary home range estimate for the period from 1 February 2020 to 30 April 2020.

Introduction

The last population of West African giraffe (*Giraffa camelopardalis peralta)* – recently shown to be a subspecies of the northern giraffe (Fennessy et al. 2016; Winter et al. 2018) – is only found in the Republic of Niger. Giraffe distribution is predominantly in the Kouré and North Dallol Bosso central region, about 60 km south east of the capital, Niamey, and extends to Doutchi, Loga, Gaya, Fandou and Ouallam areas. Together this area is locally referred to as the "Giraffe Zone" and forms part of the Parc W Biosphere Reserve covering more than 1,700 km^2. A new satellite population of giraffe was established in Gadabedji Biosphere Reserve at the end of 2018 with the support of Giraffe Conservation

Foundation (GCF) and Sahara Conservation Fund (SCF). The next closest known population of giraffe is in northern Cameroon and southern Chad and are Kordofan giraffe (*G. c. antiquorum*) (Fennessy et al. 2016; Winter et al. 2018).

In November 2018 and August 2019, GCF with support from SCF and the Government of Niger, fitted 19 West African giraffe with solar powered GPS satellite units (ossi-units) to help assess their habitat use and spatial ecology over time. This Quarterly Report (Feb-Apr 2020) describes the home range (HR) size and movement patterns of the GPS tagged giraffe during this period.

During the quarter, data (hourly coordinate fixes) from 11 giraffe (females) were transmitted; however, one unit (3037) failed to work after the few days in May 2020. Only one ossi-unit transmitted the GPS positions daily, whilst the remainder worked irregularly with several day-long gaps. For the detailed information see Table 1 below.

Table 1. An overview of GPS satellite tagged giraffe from 1 May to 31 July 31 including ID of unit and giraffe, sex of animal, number of transmitted positions, number of days data transmitted and the ID code of giraffe.

Unit ID	Sex	Unit fitted	Nº GPS records	Nº days	Last date of transmitted position	Giraffe ID
3037	F	November 2018	225	11	13.5.2020	117/08
3038	F	November 2018	265	25	31.7.2020	279/15
3224	F	August 2019	1,829	84	31.7. 2020	114/16
3236	F	August 2019	1,396	62	31.7. 2020	112/08
3238	F	August 2019	1,675	85	31.7.2020	106/08
3241	F	August 2019	2,418	62	29.7.2020	116/08
3243	F	August 2019	265	18	17.7. 2002	235/14
3244	F	August 2019	1,350	58	26.7. 2020	218/13
3245	F	August 2019	263	13	2.7. 2020	42/05
3248	F	August 2019	1,600	67	6.7.2020	389/18
3249	F	August 2019	2,206	92	31.7.2020	107/08

Home range

Home range (HR) of an animal is described as an area used during its normal activities of foraging, mating and caring for young. Any animal can make an "unusual" movement outside the HR resulting in outlier points which are not considered as part of its normal activity area unless observed regularly (Burt 1943). Animal tracking technology has increased the capacity of collecting data, and the methods to analyse them have evolved consequently (e.g. analytical tools for addressing autocorrelation) (Noonan 2018). The major estimator tools – Kernel Density Estimator (KDE; Worton 1989) and Minimum Convex Polygon (MCP; Hayne 1949) – are routinely used because they are relatively simple to understand, implement

and comparable, but assume that the data are independent. However, they underestimate the HR size (Fleming et al. 2015, Fleming and Calabrese 2017). As the position data are collected with short intervals (daily, hourly), they become dependent and highly autocorrelated (Noonan 2018).

Methods

For assessing the preliminary West African giraffe´s HR size in Niger, the R package continuous-time movement modelling (ctmm) version 0.5.7 was used (Calabrese and Fleming 2016). The ctmm package is based on Autocorrelated KDE (AKDE). After running 95% and 50% AKDE in R studio the resulting shapefile was opened in QGIS 2.18.12 and the area calculated using the $area function. The mean, range and standard deviation of 95% AKDE and 50% AKDE was calculated by in Microsoft Excel (Microsoft Office 365 ProPlus). The quarterly HR was estimated for the 11 giraffe for the period May to July 2020. Additionally, giraffes (3037 F, 3038F, 3241 F,3243 F, 3245 F) were not included into mean and standard deviation calculation because of either a very unusual movement pattern or very low dataset. According to the movement pattern, female 3241 is considered to be non-resident during the quarter. The long-distance movement connected with several gaps in data collection resulted in disproportionally large 95% HR exceeding 115,000 km^2. The model does not handle this type of data well thus for this female HR was calculated by KDE.The analysis done for female 3241 resulted in 1, 999.1 km^2 - 95% KDE and 73.7 km^2 - 50% KDE. See Table 2 which highlights the results of 95% and 50% AKDE for first quarter, second, third and fourth quarter. The very low number of transmitted positions of females 3037, 3038, 3243, 3245 biased the result, thus they were excluded from the calculations.

Results

The average quarterly HR size for giraffe was 2,238.7 km^2 ± 2,010.6, ranging from 132.3- 5,762.1km^2 (n=10). The mean size of their core area was 571.8 km^2 ± 502.9 ranging from 32.1-1,437.5km^2 (n=10).

*Table 2 The preliminary Home Range (HR) size for first quarter (Aug-Oct 2019), second (Nov-Dec 2019, Jan 2020) third quarter (Feb-Apr 2020) and fourth (May-July 2020) of GPS satellite tagged West African giraffe in Niger. Marked values * are not included in the mean and standard deviation calculations as they are not considered as 'normal' HR.*

	First quarter (August-October 2019)			Second quarter (Nov-Dec 2019-January 2020)			Third quarter (February -April 2020)			Fourth quarter (May-July 2020)		
ID/sex	Nº of records	50% AKDE (km^2)	95% AKDE (km^2)	Nº of records	50% AKDE (km^2)	95% AKDE (km^2)	Nº of records	50% AKDE (km^2)	95% AKDE (km^2)	Nº of records	50% AKDE (km^2)	95% AKDE (km^2)
3037 F	1,386	185.3	837.1	1,340	91.5	420.5	1,303	61.4	259.2	225	550.2*	532.7*
3038 F	54			579	15.9	97.8	295	277.3	1057.0	265	502.6*	2,131.2*
3224 F	2,023	1,762.2	9,225.2	2,114	194.8	641.5	1,950	24.6	88.6	1,829	761.2	2,876.4
3226 F	2,023	713.8	3,518.9	1,958	1,119.6	6,223.6	1,969	5,284.7*	20,282.2*			
3236 F	2,023	506.2	1,955.4	2,115	523.1	1,937.5	2,069	80.8	398.9	1,396	420.7	1,673.7
3237 F	530	55.3	335.9	485	775.8	3,028.3	108					
3238 F	2,023	39.1	175.6	2,114	1,111.2	4,998.8	2,069	113.6	437.2	1,675	612.4	2,367.1
3241 F	2,023	13,649.97*	56,438.63*	2,114	20,233.5*	80,549.3*	2,068	535.6	2,897.1	2,418	26,148.9*	115,403.9*
3243 F	2,021	641.5	2,507.1	2,182	915.4	4,031.4	1,862	160.3	638.8	265	0.0*	0.09*
3244 F	2,023	181.8	851.8	9,142	514.2	2,126.9	2,158	46.6	200,8	1,350	32.1	132.3
3245 F	2,023	27.2	125.9	2,187	162.5	826.3	1,996	111.5	558.6	263	0.0*	0.01*
3246 M	1,389	424.9	1,648.8	80								
3247 F	2,020	162.8	717.6	2,209	148.5	680.9	998	376.7	1,507.6			
3248 F	2,023	831.2	3,188.4	2,187	153.8	858.8	2,158	151.1	845.4	1,600	1,437.5	5,762.1
3249 F	2,023	621.5	2,570.0	2,187	652.3	2,937.1	2,158	48.2	184.8	2,206	167.1	620.5
3250 F	2,023	334.5	1,333.6	2,084	589.2	2,244.1						
MEAN		**463.4**	**2,070.8**		**497.7**	**2,218.1**		**165.6**	**806.7**		**571.8**	**2,238.7**
STANDARD DEVIATION		**442.8**	**2,250.9**		**367.4**	**1,786.6**		**148.8**	**769.9**		**502.9**	**2,010.6**

The HR difference between third and fourth quarters may be influenced by local climate, with the rainy season from June to October. During May, the majority of giraffe moved back to the core area (Kouré) from the Dallol Bosso. Whilst the landscape dried up during the dry season there were a few water points remaining, therefore the giraffe sought out these areas. However, as the giraffe are not water dependent (Leeuw et al. 2001, Fennessy 2009), the main driver of this seasonal migration is probably composition of forage quality, digestibility and availability.

Giraffe HR size vary across the Africa. Undoubtedly, the HR size are influenced by numerous environmental and anthropogenic factors with smaller HR on average observed in populations with higher rainfall resulting in greater productivity and access to critical resources (Fennessy 2009, Knüsel 2019). Giraffe living in arid ecosystems have larger HR on average as the productivity is lower and giraffe have to roam further to reach resources and find mates (Le Pendu and Ciofolo 1999, Fennessy 2009). The large variation of our HR estimates may be attributed to the local conditions at the site where giraffe occurred during this quarter, as well as the wide variation in the transmitted data. The smallest HR sizes were observed for two females (3243, 3245) who´s units only transmitted data on 18 and 13 days respectively, during the quarter. The largest HR size was 3241 who roamed north-west from Niamey a number of times during the quarter and it did not create a "normal" home range, in connection with gaps in data transmission the HR size was overestimated to 115,403.9 km^2.

Movement patterns

The West African giraffe movement patterns are very much influenced by season; during the dry season the giraffe´s core area mostly covers Dallol Bosso and Harikanassou Regions, whilst in the rainy season they are more in the Kouré Region of the 'Giraffe Zone'. Being an ancient riverbed with valleys, ponds and marshes, the soil in the Dallol Bosso is more fertile with a higher abundance of trees around wetlands than in Kouré, where the habitat is more Sahelian. Moreover, the browse composition and availability differs with seasonally higher amount of fats and carbohydrates in the Dallol Bosso than in Kouré (Caister et al. 2003).

Giraffe's use of their habitat was visually different to the last quarter. The majority of individuals shifted their range back to the Kouré or in close proximity. The most significant movement was by a female (unit 3241) who at the beginning of May was north from Niamey, and during the second half of the month she moved south close to Kodo and Kouré. At the beginning of June she then walked north-east of Niamey where until the second half of the month and moved back to Kodo and Kouré. In July, she walked similar to the month before and by the end of July she was in close proximity of Hamdallaye (see gif. 1). This unusual movement resulted in larger HR size than the HR of other giraffe during this quarter.

Two giraffe (units 3244 and 3249) remained around Hamdallaye and Dantchandou, likely because of the *Faidherbia albida* abundance – preferred forage at this time of the year. For a detailed movement pattern of each individual during the quarter see Appendix I. More information about the unit functionality see in Appendix II. The graphs include data from the beginning until May 2020.

May, June, July 2020

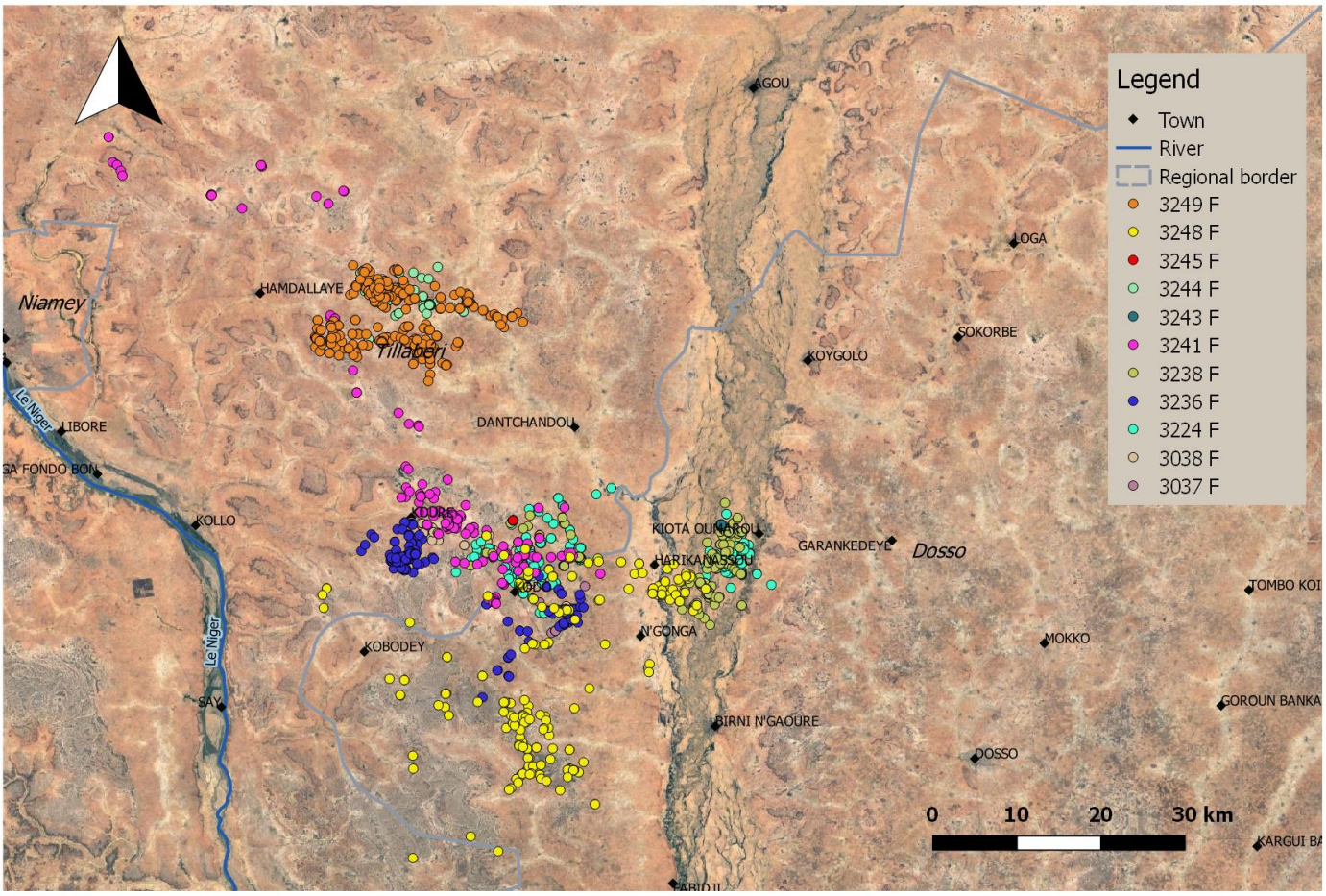

Figure 1 Giraffe habitat distribution of the GPS satellite tagged West African giraffe in Niger during May, June, July 2020.

Human Dimension study

From 1 June to 6 July 2020, we undertook a targeted Human Dimension surveys mission in the 'Giraffe Zone' in Niger. Eight communes were visited: Kouré, Falmey, N'Gonga, Kiota, Harikanassou, Koygolo, Dantchandou and Fakara, to collect individual interview data in the framework of a study on West African giraffe conservation. Prior to the survey, a targeted method was developed in collaboration with local and international partners so as to ensure best approach, respect of the interviewees and where possible, comparable with surveys to be undertaken in the Gadabedji Biosphere Reserve and Africa-wide.

The objective of this survey is to study the knowledge and attitudes of local people towards the West African giraffe in Niger. Additionally, we are seeking to learn about people's habits and practices, and how they use the landscape.

A pilot study was carried out in the 'Giraffe Zone' to assess the feasibility of the questionnaire and survey methods. The pilot was undertaken in Kanaré where ten people were interviewed. The team was first introduced to the traditional and administrative chiefs and the purpose of the survey was presented. Following this, those interviewed were selected randomly and voluntarily within the village. In total, 25 people (70.8% men and 29.2% women) were interviewed for the pilot study. Important to note, all people involved in the pilot phase were Zarma speaking – the second most spoken language after Hausa in Niger. The following main survey was also conducted in Zarma.

Following the pilot study, the interviews and process were reviewed and refined which was then applied back in the field. To date, a total of 340 people (245 males and 96 females; old and new questionnaire) were interviewed, including during the pilot phase, and across eight areas in the 'Giraffe Zone': Kiota, N'Gonga, Harikanassou, Koygolo, Fakara, Kouré, Dantchandou and de Falmey.

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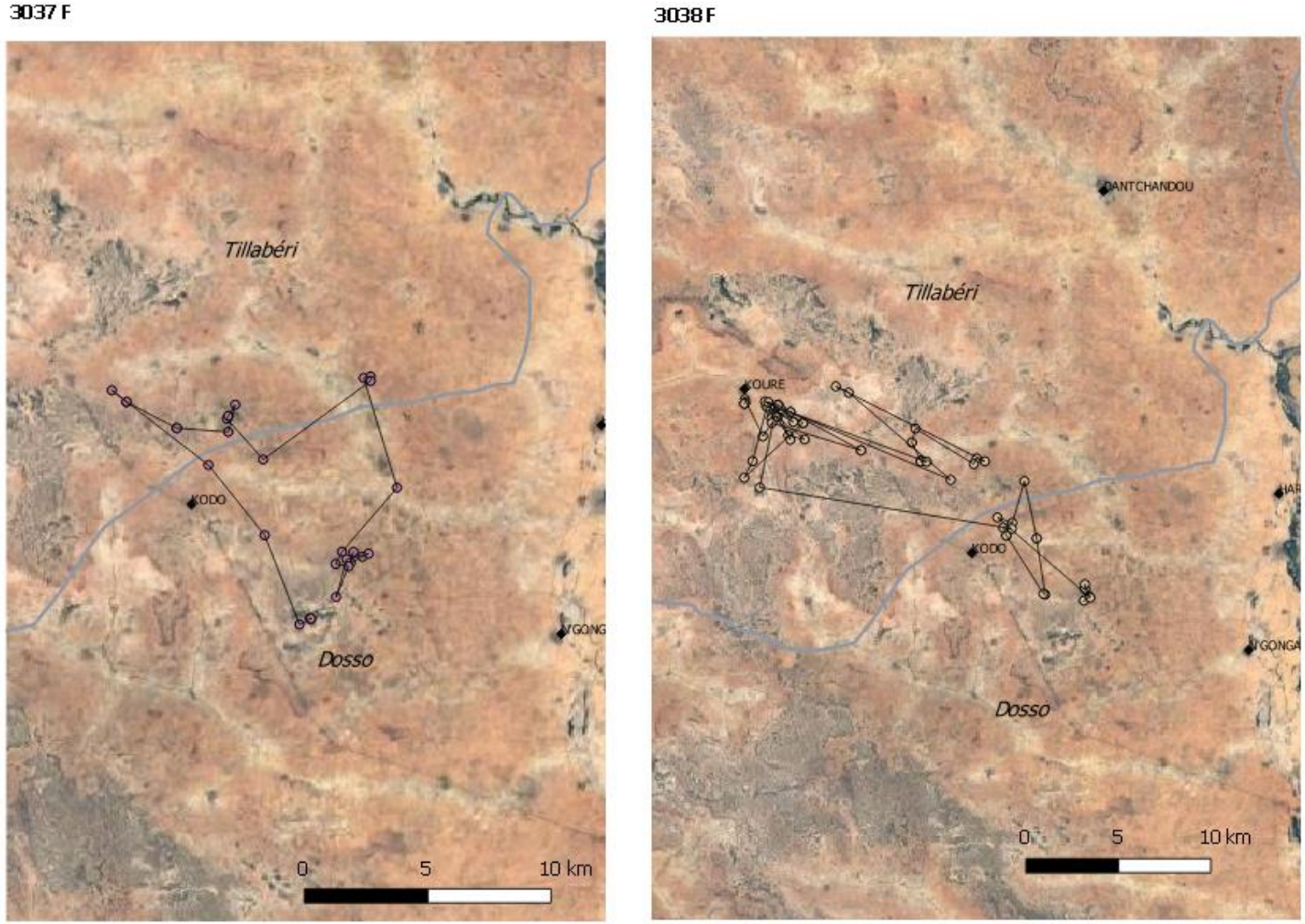
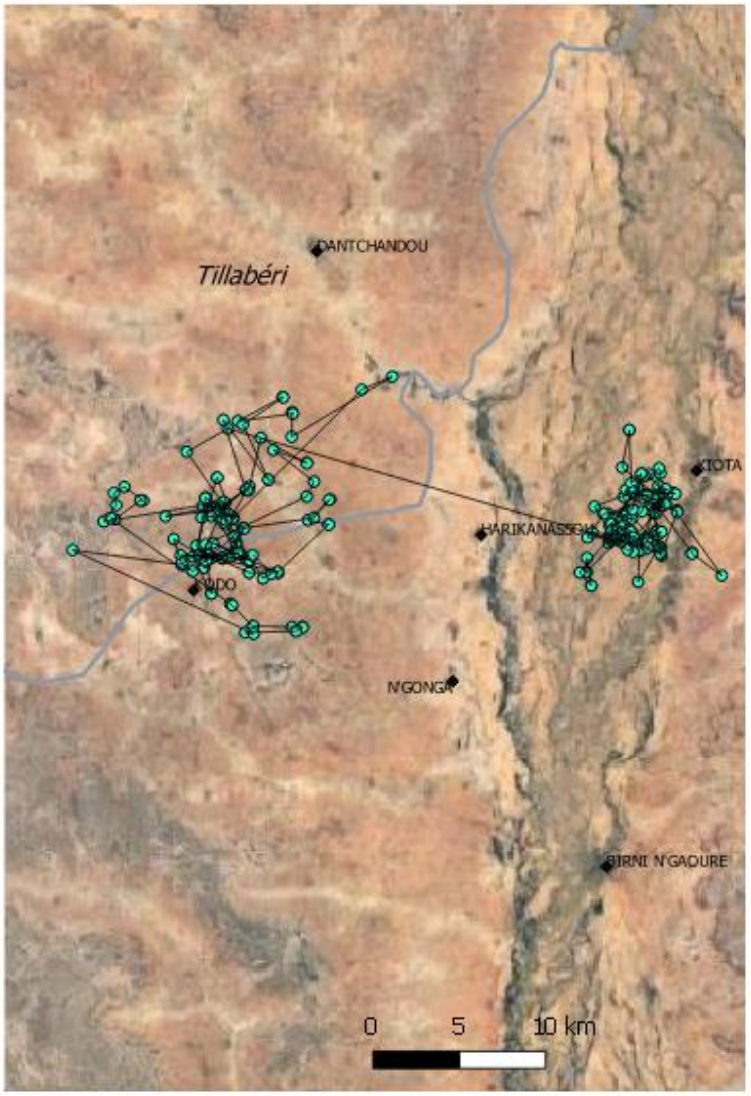
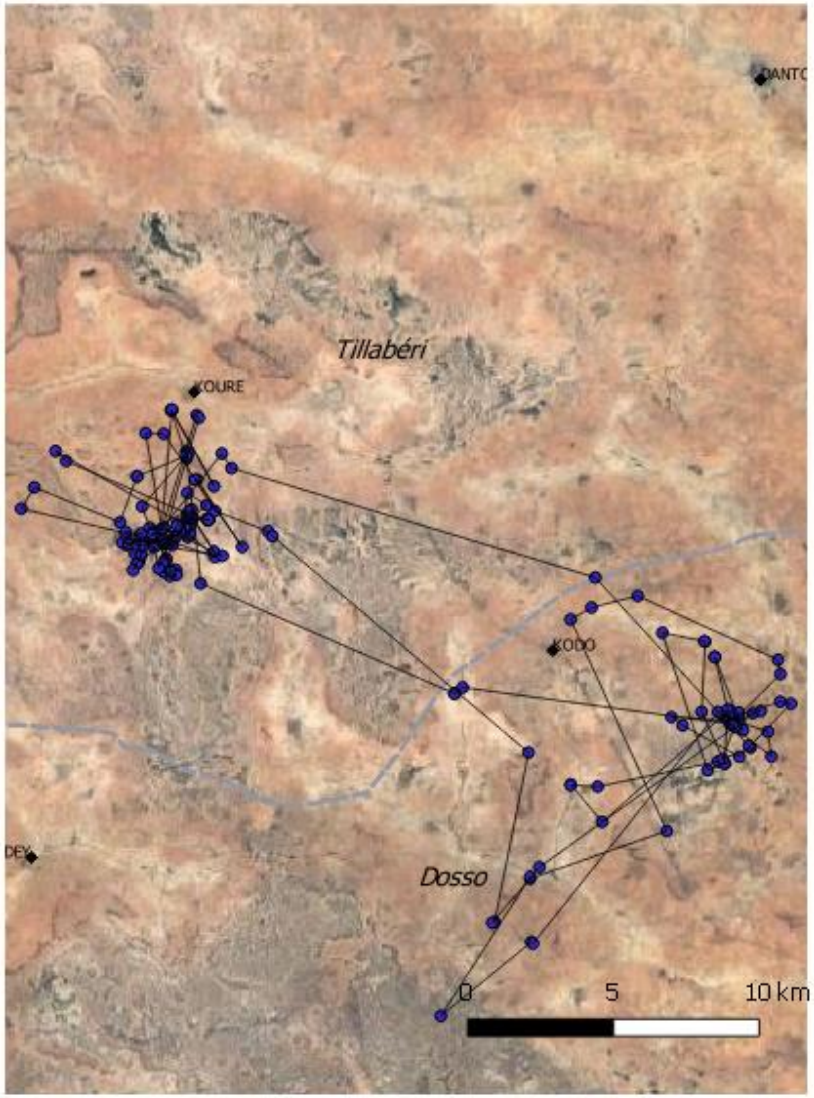
Appendix I.- Giraffe movement pattern



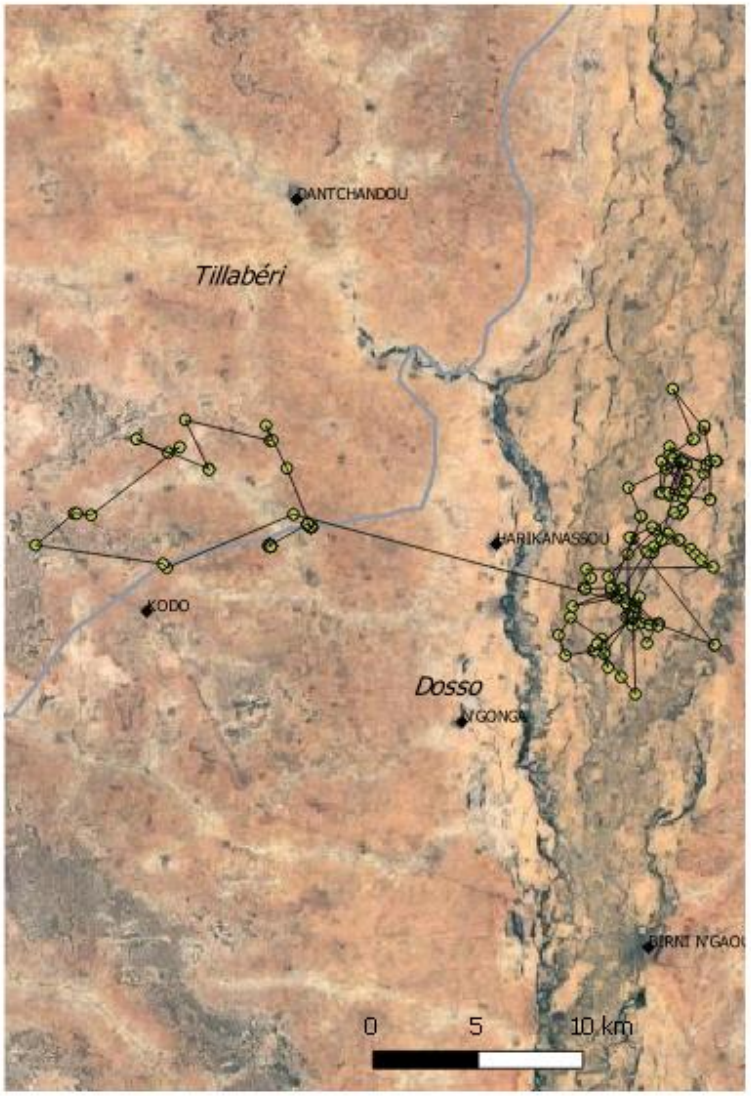
3224 F


DANTCHANDOU
Tillabéri
TOTA
HARIKANASSOU
KODO
N'GONGA
BIRNI N'GADURE
0
5
10 km

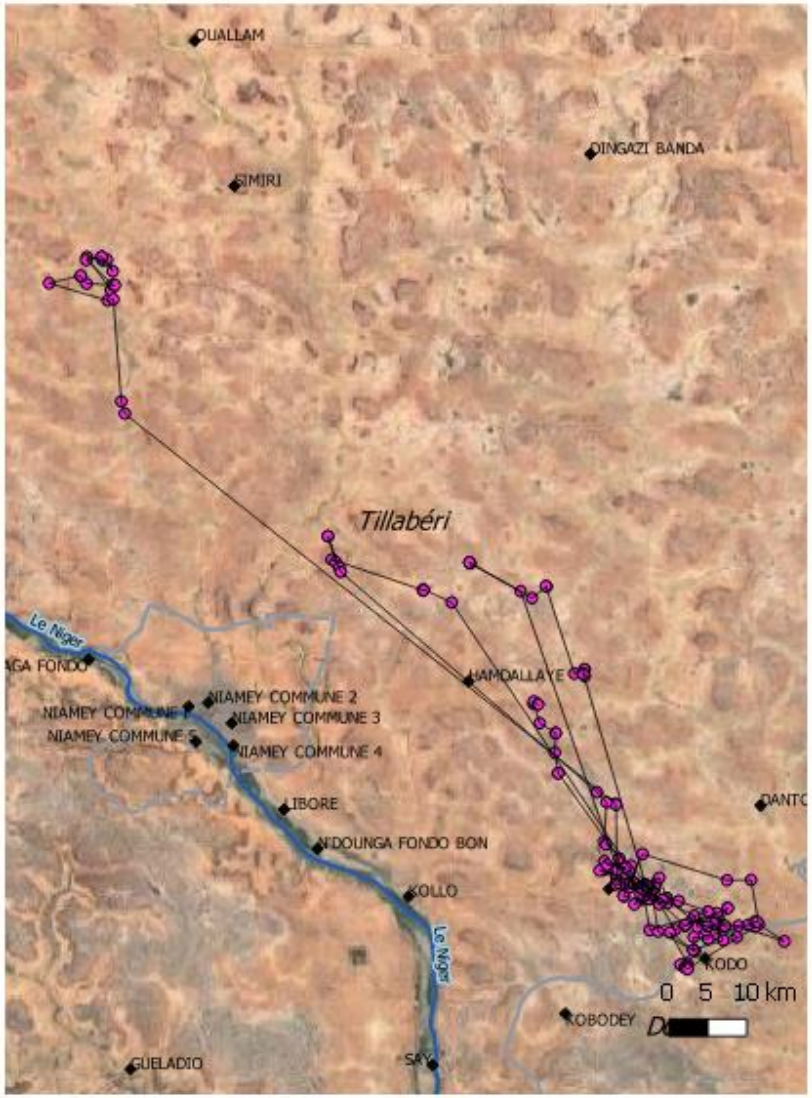
3236 F


Tillabéri
KOURE
KODO
Dosso
0
5
10 km

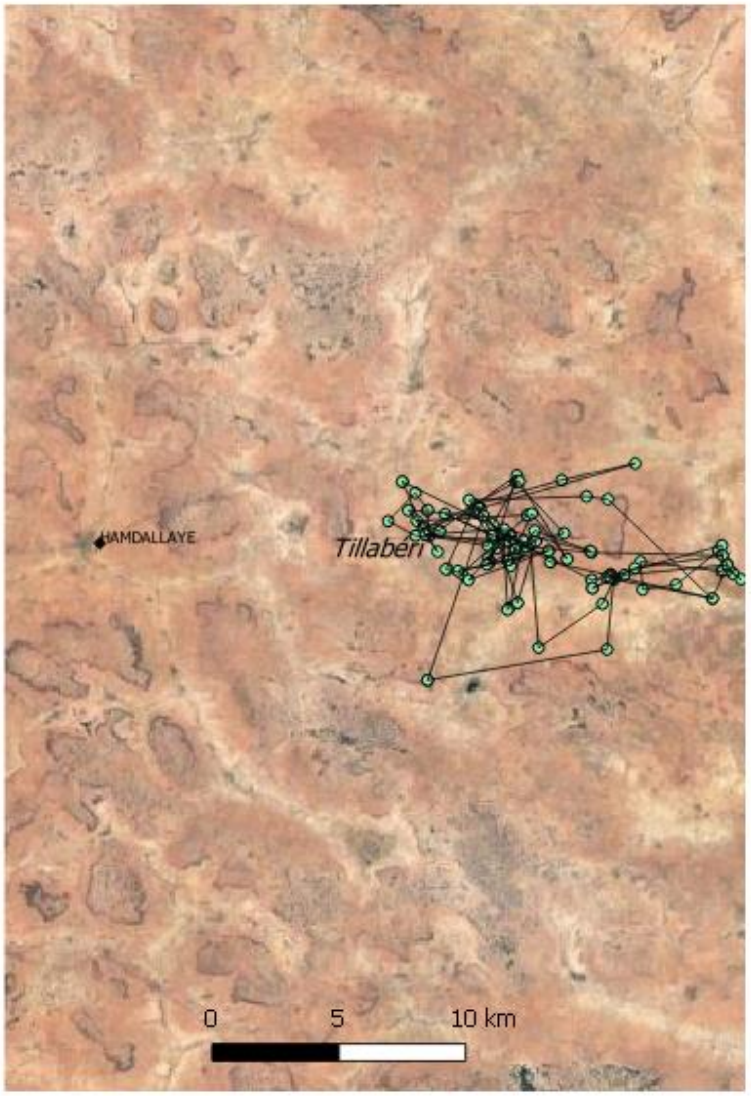
3238 F


DANTCHANDOU
Tillabéri
HARIKANASSOU
KODO
Dosso
0 5 10 km

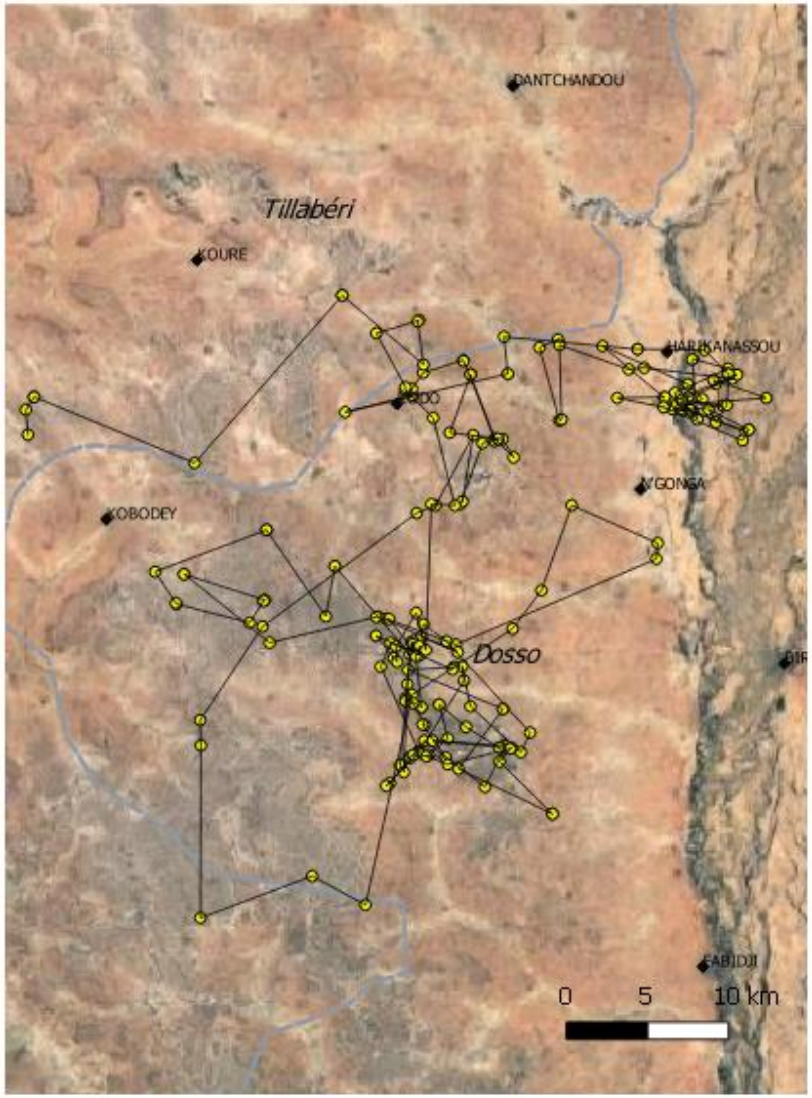
3241 F


OUALLAM
DINGAZI BANDA
SIMIRI
Tillabéri
Le Niger
HAMDALLAYE
NIAMEY COMMUNE 2
NIAMEY COMMUNE 3
NIAMEY COMMUNE 4
NIAMEY COMMUNE 5
IBORE
KOLLO
KODO
0 5 10 km
GUELADIO
SAY

3244 F


HAMDALLAYE
Tillabéri
0
5
10 km

3248 F


DANTCHANDOU
Tillabéri
KOURE
KOBODEY
GONGA
Dosso
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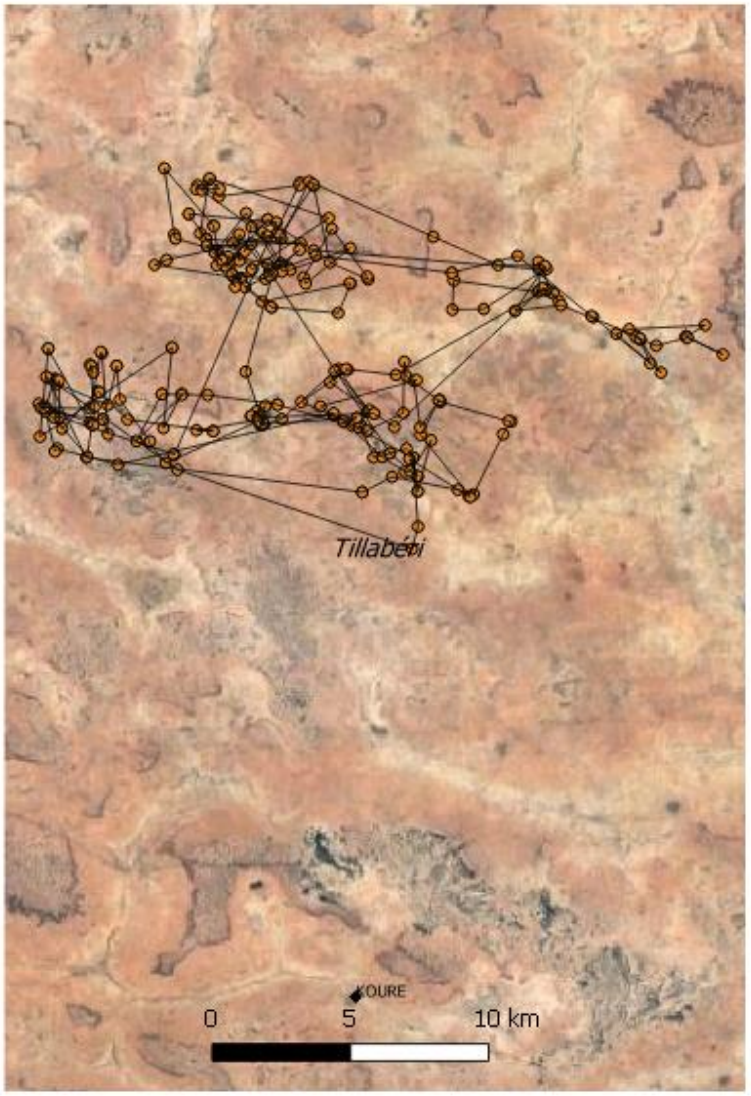
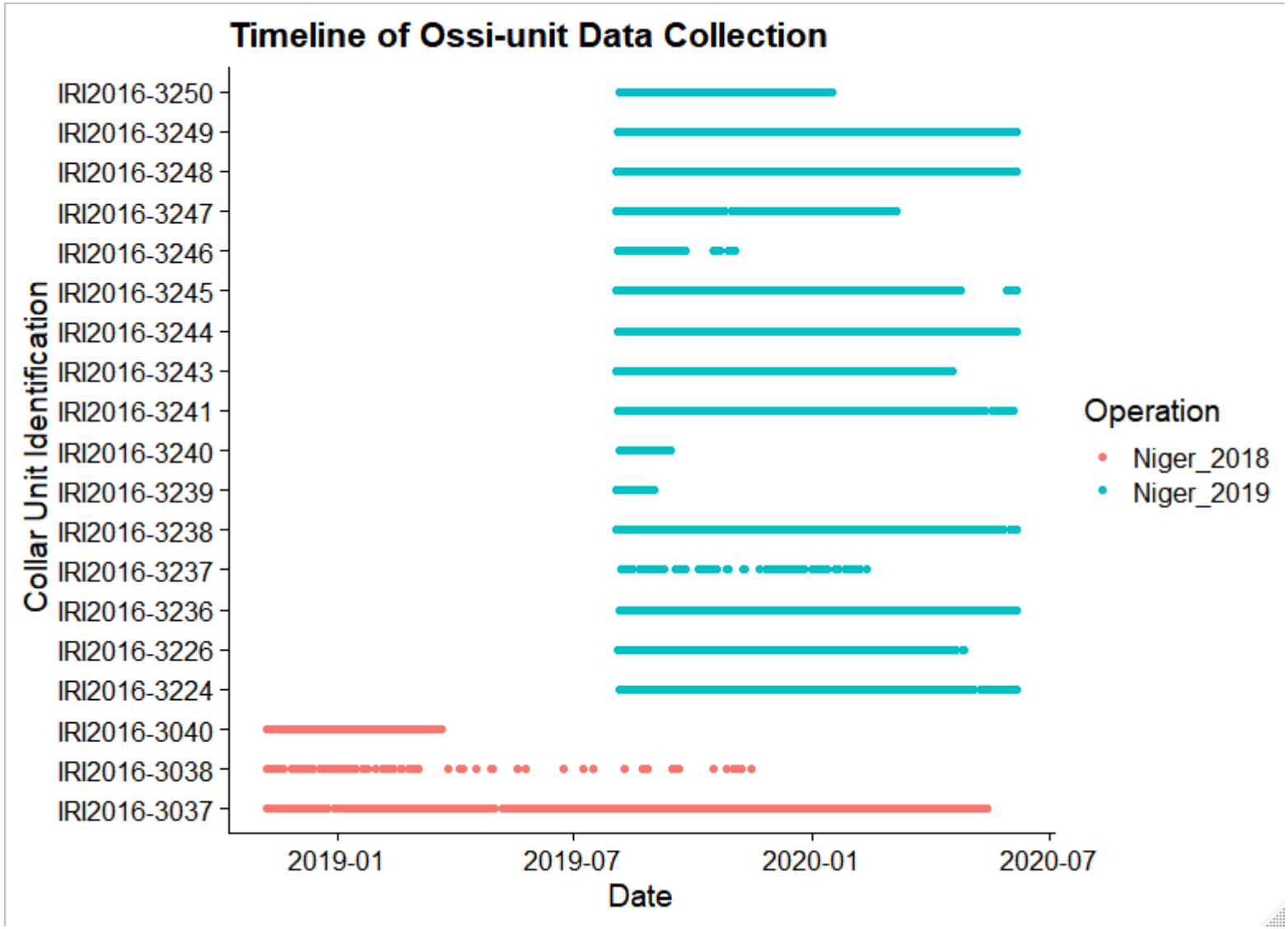
5
10 km

3249 F



Appendix II.- Unit functionality



Appendix III.- Type of failure