2nd Annual Report

West African giraffe (*Giraffa camelopardalis peralta*)

Republic of Niger

November 2019 – November 2020

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This second annual report summarises some of our conservation activities and preliminary results which contributed to West African giraffe conservation between November 2019 – November 2020.

Introduction

The last population of West African giraffe (*Giraffa camelopardalis peralta*) – a subspecies of the northern giraffe (*G. camelopardalis*) (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 60km 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 by the Giraffe Conservation Foundation (GCF) for the Government of Niger with the support of the Sahara Conservation Fund (SCF). The next closest known population of giraffe is in northern Cameroon and southern Chad and are identified as Kordofan giraffe (*G. c. antiquorum*) (Fennessy et al. 2016; Winter et al. 2018).

Niger's giraffe coexist with the local population resulting at times in conflict over space and resources. This IUCN Red Listed 'Vulnerable' West African giraffe subspecies, most recently down listed from 'Endangered' yet still few in numbers, is threatened by various factors including agricultural encroachment and development, climate change and variability, human population growth and natural resource overexploitation. These phenomena have reduced forage, contributing to the disappearance of the West African giraffe that was once represented across several West African countries including Burkina Faso, Senegal, Mauritania, Mali and Nigeria.

In 1996 it was estimated that only 49 West African giraffe remained in the wild, limited to an area of 840 km^2 of arid Sahelian scrubland north of the Niger River in the "Giraffe Zone" (Suraud et al. 2009). The efforts of the Government of Niger in collaboration with local and international partners have strongly contributed to the growth in their numbers since. According to the most recent census in 2019, the population was estimated at more than 600 individuals (Ministry of the Environment 2019).

GPS satellite units and HR estimates

Giraffe Conservation Foundation (GCF), Sahara Conservation Fund (SCF) and the Government of Niger fitted nineteen West African giraffe (*Giraffa camelopardalis peralta*) with solar powered GPS satellite units (ossi-units) to help assess their habitat use and spatial ecology over time. During the firs mission in November 2018 three giraffe were tagged (1 male, 2 females). During the second one in August 2019, sixteen giraffe were tagged (3 males, 13 females). Unfortunately, no units fitted to males now work, all likely due to damage incurred during necking behaviour. By the end of October 2020 only five units transmitted data with three of them being stationary.

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 Microsoft Excel (Microsoft Office 365 ProPlus). For statistical analyses, Statistica (TIBCO Software Inc 2018) was used. For comparison, the 50% AKDE and 95% AKDE between dry and rainy season the Mann-Whitney U test was run. The dry season HR was estimated for the 14 giraffe for the period from December 2019 to April 2020. Unit 3241 was excluded because of a very unusual movement pattern and as such considered to be non-resident during the whole year. The female giraffe did not create a 'normal' HR and AKDE applied on this movement pattern resulted in 95% HR exceeding 62,000 km^2 during the dry season and 35,000 km^2 during the rainy season. In the rainy season (June-October) HR was estimated for 5 giraffe. The dataset was divided into two parts which cover the rainy season period, the first from June to July 2020 and the second from August to October 2019. N.B. only two units worked well between August to October 2020 and the dataset was not sufficient. The values of each individual from both parts of the rainy season were averaged and a new column in Table 1 was created. The averaged values were used for statistical comparison between dry and rainy seasons. See Table 1 which highlights the results of 95% and 50% AKDE for the dry season, for the rainy season from June to July 2020, for the rainy season from August to October 2019, and the average size of the rainy season HR. November and May were not included as they were transition months (Le Pendu and Ciofolo 1999).

*Table 1. represent the HR estimates for dry season, rainy season for June and July, rainy season from August to October and averaged values for rainy season. Values and unit marked by * are not included into any analysis. Giraffe 3241 did not created "normal" HR and the other values are from stationary units.*

	Dry season Dec 2019 – Apr 2020			Rainy season Jun-Jul 2020			Rainy season Aug-Oct 2019			Rainy season (mean)	
ID	Number of records	50% AKDE (km^2)	95% AKDE (km^2)	Number of records	50% AKDE (km^2)	95% AKDE (km^2)	Number of records	50% AKDE (km^2)	95% AKDE (km^2)	50% AKDE (km^2)	95% AKDE (km^2)
3037	2,217	70.4	315.9								
3038	801	204.7	973.6	190	113.7	522.7	54	167.6	668.1	140.7	595.4
3224	3,376	62.9	312.6	1,283	515.4	2,195.2	2,022	1,762.7	9,228.7	1,139.1	5,711.9
3226	3.238	317.2	12,902.9								
3236	3495	371	1,610.4	682	*3.5	*16.1	2,023	*506	*1,955.4		
3237	501	1,518.8	6,020.4								
3238	3,493	69.2	270.5	1,057	286.7	1,356.4	2,023	38.9	175.6	162.8	766
3241*	3,493	14,195.4	62,534.6	2,006	*3,652.7	*15,339.1	2,023	*13,650.1	*56,439.2		
3243	3,349	93.5	359.3	264	*0.02	*0.09	2,021	*641.5	*2,507.1		
3244	9,809	242.6	1,063.3	605	*25.6	*136.2	2,023	*181.8	*851.8		
3245	3,484	274.1	1183	202	*0	*0.01	2,023	*27	*125.9		
3247	2,486	318.9	1,349.3								
3248	3,646	92.2	567.3	855	808.1	3,802.1	2,023	831.2	3,188.4	819.7	3,495.3
3249	3,646	289.7	1,260.1	1,462	120.2	424.5	2,023	621.5	2570	370.9	1,497.3
3250	1,384	1,051.8	4,034.5								
Mean		**355.5**	**2,301.7**		**368.8**	**1,736.1**		**684.4**	**3,166.2**	**526.6**	**2,413.2**
Standard deviation		**403.1**	**3,327.8**		**291.4**	**1,296.4**		**614.0**	**3,267.1**	**391.5**	**1,944.7**

Results

The **average** dry season HR was 2,301.7 km^2 ± 3,327.8 ranging from 312.6 to 12,902.9 (n=14). The dry season core area was 355.5 km^2 ± 403.1 ranging from 62.9 to 1,518.8 (n= 14). The average rainy season HR was 2,413.2 km^2 ± 1,944.7 ranging from 766 to 5,711.9 (n=5). The rainy season core area was 526.6 km^2 ± 391.5 ranging from 140.7 to 1,139.1 (n=5). The difference between the dry and rainy season HR is not significant (p>0.05, U=27), nor the core areas used (p>0.05, U=24).

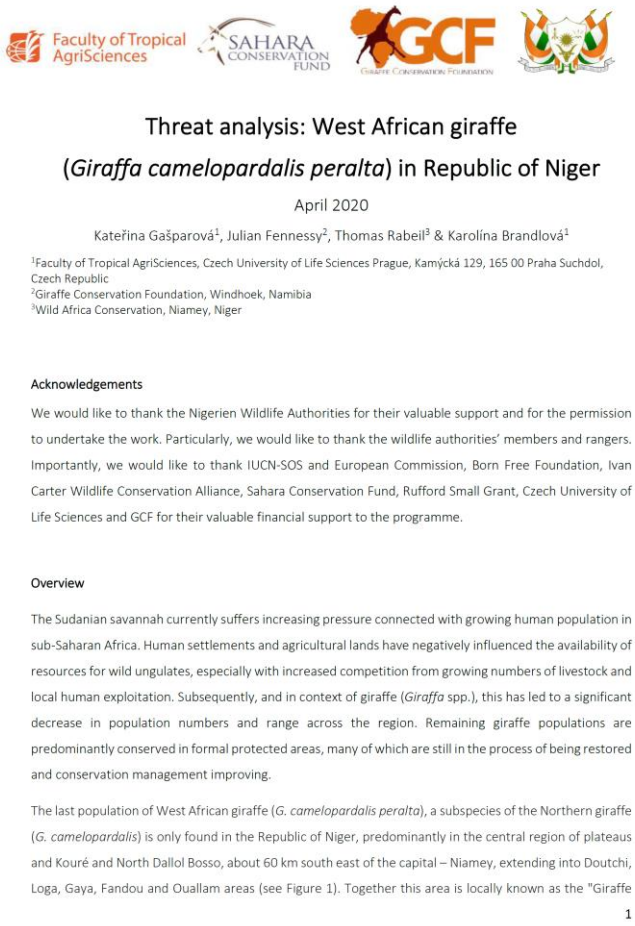
The average quarterly HR size, irrespective of sex, was 1,383.0 km^2 ± 1,038.6, ranging from 125.9 to 3,243.9 km^2 (n=16). The mean size of their core area was 346.3 km^2 ± 277.2 ranging from 27.2 to 841.7 km^2 (n=16). There was no significant difference (p>0.05; U=16) in the 95% HR size between males (n= 3; 1,596.7 km^2 ± 992.1) and females (n=13; 1,333.7 km^2 ± 1081.8). Nor was there any significant difference (p>0.05; U=15) in the 50% AKDE between males and females. The average core area of males (n=3) was 408.7 km^2 ± 261.6 km^2, and for females (n=13) 331.2 km^2 ± 288.9 km^2.

In comparison with other studies published on giraffe´s HR, the preliminary results of the West African giraffe HR size this quarter are relatively large. This result can be attributed to several factors. Firstly, the methods used traditionally for HR estimating are KDE and MCP, both proven to underestimate results (Fleming et al. 2015, Fleming and Calabrese 2017). Our preliminary findings were calculated using AKDE and KDE, as per similar methods for giraffe recently published (D´haen et al. 2019). As an example, in this quarter the average HR size of six giraffe calculated by 95% AKDE was 934.3 km^2, compared to the HR size calculated in the same study by 95% KDE (268.8 km^2). 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 they roam further for resources and finding mates (Le Pendu and Ciofolo 1999, Fennessy 2009). Knüsel (2019) indicated significant differences in HR size between Masai (*G. tippelschirki*) giraffe in Tanzania living in close proximity of towns and those living further from human settlements. The farther from developed human areas, the smaller the giraffe HR size was observed (Knüsel 2019). As the West African giraffe live in the human dominated, fragmented and agricultural landscape of the Sahelian zone with an annual rainfall of ~400 mm, it is more likely that aridity and fragmentation is a main driver of their increased HR rather than proximity to people.

Threat analysis

In April 2020 we developed a threat analysis on the West African giraffe in Niger (Figure 1) and published it on the GCF website https://giraffeconservation.org/wp-content/uploads/2020/05/Threat-analysis-

West-African-giraffe-in-Niger_April-2020.pdf. The threat analysis was created to better understand the current conservation status of the West African giraffe, and to provide a baseline to the planned future review of the National Giraffe Conservation Strategy and Action Plan in Niger, with a focus on the original population in "Giraffe Zone". The threat analysis sought to: (1) describe threats (historic and current) to facilitate conservation planning decisions; (2) provide tools that will allow conservation managers to prioritise actions; and, (3) provide data to support comprehensive review of threats.



Faculty of Tropical AgriSciences · SAHARA CONSERVATION FUND · GCF Giraffe Conservation Foundation

Threat analysis: West African giraffe

(*Giraffa camelopardalis peralta*) in Republic of Niger

April 2020

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Overview

The Sudanian savannah currently suffers increasing pressure connected with growing human population in sub-Saharan Africa. Human settlements and agricultural lands have negatively influenced the availability of resources for wild ungulates, especially with increased competition from growing numbers of livestock and local human exploitation. Subsequently, and in context of giraffe (*Giraffa* spp.), this has led to a significant decrease in population numbers and range across the region. Remaining giraffe populations are predominantly conserved in formal protected areas, many of which are still in the process of being restored and conservation management improving.

The last population of West African giraffe (*G. camelopardalis peralta*), a subspecies of the Northern giraffe (*G. camelopardalis*) is only found in the Republic of Niger, predominantly in the central region of plateaus and Kouré and North Dallol Bosso, about 60 km south east of the capital – Niamey, extending into Doutchi, Loga, Gaya, Fandou and Ouallam areas (see Figure 1). Together this area is locally known as the "Giraffe

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Figure 1. GCF West African giraffe threat analysis

The habitat loss was assesed as the most serious threat, similar for the majority of Sahelian spaecies. With the increasing human population in Niger, space for wildlife is greatly reduced. Much of the original 'tiger bush' habitat on the plateaus has been converted to fields or pastures. Deforested, overgrazed and degraded land continues to occur throughout the "Giraffe Zone" and the current conservation agriculture projects are unable to turn the tide.

An increasing threat is that of infrastructural development programmes including roads and railway, and associated traffic. These threats may not affect the entire population, however, the impacts can be irreversible. An ongoing threat to the West African giraffe population, especially with their expanding range, is that of illegal hunting. If the country continues to face unpredictable natural catastrophes (drought, disease etc.) or political unrest (civil war, terrorism etc.), illegal hunting may increase as demand for alternative source of food and/or income results. With the current international coronavirus (COVID-19) pandemic, social, economic and political instability may fuel local civil unrest and terrorism activities, potentially leading to increased illegal activities involving wildlife. As always, climate change coupled with all the other threats will continue to have an impact on giraffe and their habitat – this is something that may not be able to managed but monitored and appropriate actions undertaken.

Human dimension study

The objective of this survey was to investigate local people´s knowledge and attitude towards giraffe in Niger. We also sought to found out people´s cultural domain habits and practices of how they use the landscape. A key part of the project was to compare the two areas where giraffe now occur in Niger; "Giraffe Zone" and Gadabedji Biosphere Reserve (BR). Both sites are unique, and in many ways very different in how long and level of cohabitation of giraffe with people.

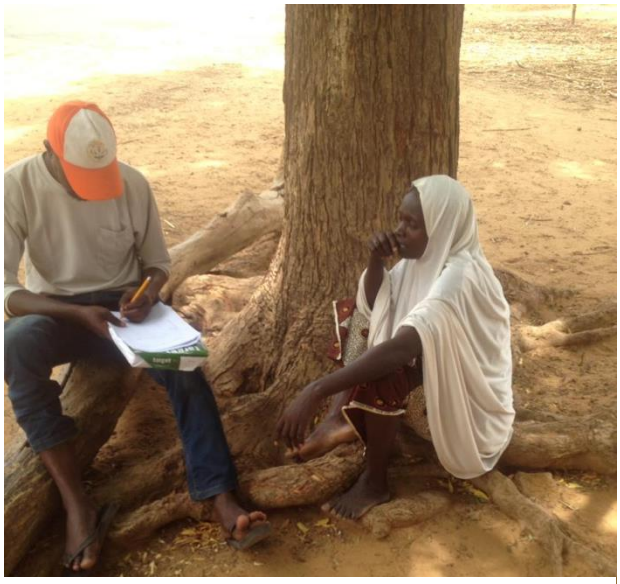

Figure 2. Questionnaire survey in Gadabedji Biosphere Reserve

Methods

The survey was conducted independently in both the "Giraffe Zone" (Figure 2) and Gadabedji BR (Figure 3). The structure and principle of the questionnaires was the same with some modification for the specific site. The survey was coordinated by local interpreter to limit any external influence or bias. An initial pilot study was undertaken to assess the preliminary results and subsequently the questionnaire and/or method adapted if necessary.

Figure 3. Questionnaire survey in "Giraffe Zone"

The survey in the "Giraffe Zone" was conducted amongst various villages (Kouré, Falmey, N'Gonga, Kiota, Harikanassou, Koygolo, Dantchandou and Fakara). In the case of Gadabedji BR, the study was conducted in the villages around its boundaries (starting on the eastern side of in Zangon Bakoba, and then travelled around the reserve finishing on the western side in Zangon Gomki). The sampling was random and both genders were interviewed.

The structure of the questionnaire was divided into two parts. The first involved a "free-listing" method and the second focused on human-giraffe interaction, habitat utilisation and threat analysis. At the end of each questionnaire there was a personal part with questions about age, ethnicity, education, etc.

Results

The survey in "Giraffe Zone" was divided into two missions. The first mission took place from 20 to 27 June 2020. During the fieldwork 102 people (male (82.35%) and female (17.65%)) were interviewed. The main ethnicity was Zarma (88.24%), followed by Touareg (8.82%) and Peulh (2.94%). The second mission was conducted from 2 to 6 July 2020 when 111 people (male (62.16%) and female (37.84%) were interviewed: Zarma (95.5%) and Touareg (4.5%).

In Gadabedji BR 111 people (94 men (84.7%) and 17 women (15.3%)) were interviewed in and around the reserve. Among those interviewed, the ethnicity of the individuals was: Peulhs (50.45%), Touareg (47.75%) and Hausa (1.8%).

The data will be processed in collaboration with the Czech University of Life Sciences, University of Anger and Instituto de Estudion Sociales Avanzados. The next step is to process the data and undertake statistical analysis before writing up the findings.

Giraffe-livestock/human interaction

At the beginning of 2020, targeted fieldwork and data collection was undertaken by GCF supported Czech University of Life Sciences PhD student Kateřina Gašparová as part of her ecological research on the West African giraffe (Figure 4).

Figure 4. Field observations and data collection of West African giraffe in Niger

Methods

To assess giraffe-livestock interactions and the activity budget of the West African giraffe, we opportunistically monitored the population over two months (Feb-Mar 2020). The scan sampling method was used combined with focal sampling. When giraffe were observed, their numbers, IDs, record of their activities, presence and distance from livestock were entered into CyberTracker® together with supplementary information connected with the observation (date, time, GPS position). If more than one giraffe was encountered, the scan sampling started with the most left individual and moved right one after the other so as not to repeat the same giraffe observed. During the scan sampling, the distance and absolute angle was measured from the focal giraffe to another giraffe or to livestock or people. People were divided into local adults and children, and tourist. At the beginning, the men and women were recorded separately, but because of lack of data there were aggregated together. Interestingly, no scan included tourist. Then for the same individual the focal sampling was conducted with all activities recorded during a 20m period. Activities were divided into following categories: (1) feeding – including browsing and when giraffe was walking around a tree or from one to another for the purpose of browsing; (2) ruminating – any activities when the animal was standing, lying or walking while ruminating; (3) movement – including walking and running; (4) social behaviour – necking, maternal behaviour, sniffing each other, etc.; (5) lying; (6) resting – considered to be when giraffe stood and was neither ruminating nor showing vigilance; and, (7) vigilant – recorded when giraffe kept careful watch for possible danger. Additionally, all interaction (watching, walking away, no reaction or livestock walk away) with livestock or people were recorded.

Discussion

The most common livestock observed were 'shoats' (sheep and goats) followed by cattle, corresponding with recent local data collected (FAO 2020). The habitat used by giraffe and livestock is almost identical, however their dietary preferences differ markedly. The only livestock that possibly directly compete for high-level browse with giraffe are camels. However, during the survey no camel were observed close to giraffe. Giraffe appeared to be less relaxed in the presence of cows when compared to shoats, with the later sometimes observed browsing together. Our AVEN partners proposed that one of the reasons why giraffe avoid cattle is the that the cattle herd increase dust.

Based on previous giraffe work across the continent, giraffe feeding behaviour consumes the largest proportion of their diurnal activities. The West African giraffe activities recorded during a total 44 hours of focal sampling consisted of 26h (59.7%) feeding behaviour, 5h (11.6%) ruminating, 4h (9%) movement, 6h (13.8%) resting, 1.5h (2.8%) vigilance, 1h (2.3%) lying and 40min (0.9%) social behaviour. The percentage spent by giraffe browsing varies across different species throughout Africa: in the Masai

Mara National Reserve female Masai giraffe spent 36% of daytime foraging with males spending slightly higher (39%) (Adolfsson 2009). Pellew (1984) observed even higher feeding percentage by Masai giraffe females (65%) compared to males (48%) in the Serengeti National Park, Tanzania. In the Namib desert the Angolan giraffe (*Giraffa camelopardalis angolensis*) spent 50.1% (males) and 64.5% (females) of their daily activity foraging in cold dry season and 53.2% (males)and 55.8% (females) in hot dry season (Fennessy 2004).

Previous diurnal feeding assessments of the West African giraffe showed a significant difference in foraging between the dry and rainy season, 46% and 22.8% respectively (Ciofolo 2002). The low rainy season foraging behaviour observed is unusual compared to other populations in Africa, and as such there is a need to better understand the seasonal activity budgets of the West African giraffe.

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