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Giraffa: Tall tales from the wild and captive world!

Welcome to our second Issue of *Giraffa*. There is much going on in the worlds of giraffe research and conservation. The International Giraffe Working Group (IGWG) is about to start a new census and assessment of the conservation status of giraffe populations across Africa. We need to establish a network of collaborators across the continent to develop baseline knowledge of where giraffe populations are and how they are doing. We discuss how we are proposing to do this in our first article, and welcome the input of all interested parties as we embark on this major project.

Also in this Issue we have a research note from Mr. Phil Berry on his observations of foraging behavior in the endemic Thornicroft giraffes in the Luangwa Valley of Zambia. We welcome these and other research notes from *in-situ* or captive giraffe studies for future issues of *Giraffa*. We also welcome abstracts from any giraffe-related research studies published in other publications. Our goal is to share information on the latest developments in giraffe science and medicine with as wide an audience as possible that might not otherwise be aware of developments in specialized areas of research.

We have an update in this Issue on the ongoing research and conservation project on the last known population of giraffes in West Africa. We will present updates on the status of this project and other giraffe research and conservation projects across Africa in future editions of *Giraffa*.

We hope you enjoyed the first Issue and welcome your feedback and advice on that and this new Issue, all in the name of gaining a better knowledge of giraffe conservation and management. I look forward to hearing from you soon—and most importantly, enjoy!

David Brown (co-editor)

IGWG Mission Statement

Preserving the evolutionary potential of all giraffe populations utilising:

- *Morphometric and molecular genetic analysis*
- *Behavioral ecology*
- *Population dynamics*
- *Landscape conservation*
- *Zoo and wild management strategies*
- *Awareness and education*
- *Scientific and popular communications*

Inside this issue:

GiD: development of the Giraffe Database and species status report

Julian Fennessy, PhD
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BACKGROUND

Giraffes are taxonomically classified as one species (*Giraffa camelopardalis*) with somewhere between six and nine morphologically variable subspecies. Hybridization of taxonomic subspecies in captivity has lead to the assumption that the phenotypic characters defining these groups (e.g., pelage pattern and coloration, ossicone number) are not diagnostic of reproductive isolation in the wild. From a conservation perspective, the current biological assumption is that giraffe subspecies across Africa have been connected by continuous gene flow and hybridization. The morphological variation within *Giraffa* is thus thought to be evolutionarily shallow (i.e., prone to disappearance over a relatively short evolutionary time span due to continuous hybridization between giraffe subspecies).

Recent morphological and genetic studies suggest that the assumption that giraffe subspecies across Africa have been connected by continuous gene flow and hybridization is likely wrong. The patterns of genetic differentiation between giraffe subspecies suggest that some of the key giraffe groups are reproductively isolated from each other. The reproductive isolation between them suggests that there is some evolutionary process (or processes) that are preventing interbreeding between these groups. These processes seem to have been operating from deep in the evolutionary history of *Giraffa* (assuming an early Pleistocene origin of modern giraffes).

The current taxonomic classification of *Giraffa* as one species obscures the threats to the evolutionary potential of the lineage. The single species of giraffe currently recognized is classified as "Lower Risk" on the IUCN Red List (East 1998). The results of the recent genetic studies suggest that each of the non-exchangeable groups found need individual conservation assessments and management plans so that the dynamic evolutionary potential of *Giraffa* may be perpetuated into the future. Much of the evolutionary potential within *Giraffa* is severely endangered as many giraffe populations within the non-exchangeable giraffe groups have gone extinct in recent decades. The *reticulata* giraffe group was estimated to be stable until the 1990s (27,000 individuals cited in East 1998). Severe poaching and armed conflict across its range in Somalia, Ethiopia, and Kenya has reduced it to perhaps fewer than 3000 individuals, one-tenth of its former population size (N. Georgiadis, pers. comm.). Within the *peralta* group of West-Central African there are only about 150 giraffes remaining in all of West Africa west of Cameroon where until the mid-20th century there were perhaps thousands.

The *rothschildi* giraffe group was steadily eliminated in numbers and geographic range over the past century. Populations of the *rothschildi* giraffe group have been extirpated from their native range in Western Kenya and now exist only in a few parks where a few hundred individuals have been translocated. The last known unmanaged population of the *rothschildi* giraffe group is in Murchison National Park in Uganda where they may be 500 individuals.

The destruction of the evolutionary potential within *Giraffa* by extinction of populations may be best illustrated by the case of Sudan. There may have been up to four taxonomic giraffe subspecies existing parapatrically within an 800 km square region of southern Sudan into the late 20th century. The fate of this rich zone of giraffe evolutionary potential is unknown, but has likely been destroyed by war and civil strife within Sudan.

GiD: development of the Giraffe Database and species status report *cont.*

PROJECT

The International Giraffe Working Group (IGWG) is beginning to compile the first known spatially explicit and integrated distribution and abundance assessment of giraffe throughout their range – the Giraffe Database (aka GiD). The best available data to date depicts broad giraffe range and numbers, stemming from Rod East's work published in the IUCN African Antelope Database in 1998. No further assessment or review of the species has been undertaken since this work, yet population numbers and range of giraffe have been markedly altered, as described above. One of the key objectives of the GiD is to assess the accuracy of previously published data based on direct observation, survey reports, expert knowledge, extrapolations and/or guesstimates, to build on and report appropriately on the status of giraffe since the mid to late 1990s.

The data is easiest obtained through a variety of sources, including survey reports, observational data and expert knowledge, some of which may be prompted by a focussed questionnaire. The questionnaire will be accompanied by a map of the specific country or region which can be drawn on or GIS layer data added to build up the information data set. Coupled with the survey reports and observational data or inferences, the questionnaires provide an invaluable resource.

One of the key outputs of the project, aside from the GiD, will be the production of Giraffe Status Reports (GiSR), published approximately every five years and made freely available on the IGWG website. The GiSR will enable the IGWG to provide the IUCN Antelope Specialist Group a regular assessment of the species which will more accurately provide an understanding of their conservation status, areas which are poorly researched and priority areas of conservation.

The GiD and GiSR are using the IUCN/SSC African Elephant Specialist Group (AfESG) model to maximise efficiency and standardisation. For examples of the intended GiD and GiSR production, please see http://iucn.org/afesg/aed/ for example editions of the African Elephant Status Report.

Information provided/obtained will be processed and entered into the GiD. Extracts of the GiD may be released to researchers, governmental or non-governmental organizations subject to the conditions of the GiD Data Access and Release Policy, as the intention of the information is for it to be available to all interested parties where possible. Every contributor to the GiSR will be duly acknowledged and receive a digital copy of the publication.

The four key broad levels of reporting on giraffe in the GiD are:

- **Known Range**: areas where giraffe are currently known to occur
- **Possible Range**: areas within the historical range of the giraffe, but for which there is no recent information (<10 years) either confirming or ruling out their current presence
- **Doubtful Range**: areas that have not been formally surveyed, but where there are reasons to believe that giraffe may no longer be present
- **Non-range**: areas where giraffe are known to be absent throughout the year

N.B: Where known, please provide details of any introduced populations and/or individuals, etc. and from where they originally came.

The GiD is also intending to distinguish between subspecies distribution across the continent e.g. *G.c. angolensis, G.c. reticulate, G.c. peralta*, etc. Genetic sampling has been undertaken for numerous populations across the continent, and further

GiD: development of the Giraffe Database and species status report *cont.*

sampling and analysis is still required, enabling a more accurate picture of the species. An important aspect of the assessment is to gain an understanding of individuals/ organisations/countries understanding of which subspecie/s they are conserving, and in turn the range of each. Furthermore, where are assumed or known areas of hybridisation, and what evidence supports this.

The amount of data collated from across the continent is possibly significant, considering some will be hard copies of surveys/reports, and others may be in digital format e.g. PDF, word or excel files which may be provided by email or on diskette or CD-ROM. Where possible, to assist with the spatial assessment and analysis of data, actual GPS or GIS data will be requested to facilitate integration into the GiD spatial system.

We are also interested in collating known data and additional information on issues that may, directly or indirectly, affect giraffe populations and their conservation, such as poaching, human-giraffe conflict, political conflict, refugee crises, land use and wildlife management policies and cross-border movements of giraffe.

We encourage interested parties who have knowledge of giraffe status, reports, surveys or a general interest in the species to help us build this important piece of work. Furthermore, if you aware of any people, organization or institution that would be able to provide information, please feel free to contact them and/or provide details to the IGWG. If you are interested in receiving a questionnaire to assist with the GiD, please forward your details and area of interest/knowledge to either:

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Historical Giraffe Census Data
African Antelope Database (East 1988)

Estimated Population/ Relative Abundance	Population Trend	Data Category
Ab: abundant	I: increasing	TC: total count
C: common	S: stable	AS: aerial survey (sample count of more extensive areas)
U: uncommon	D: decreasing	GS: ground survey (sample count of more extensive area)
R: rare	?: unknown	QS: questionnaire survey of private landowners
V: occurs only as a vagrant		IG: informed guess by knowledgeable observer(s) with experience of the area concerned
x: definitely present but abundance unknown		FO: information on occurrence and estimates of relative abundance and population trend based on direct field observations by informant
		LP: information on occurrence and estimates of relative abundance and population trend based on reports by local hunters, pastoralists and other rural people

Country	Location	Area (sq. km)	Year	Est. Population/ Relative Abundance	Population Trend	Data Category
Mali	Ansongo-Menaka	17500	1996	<10	D	TC
Niger	southern rangelands	>2000	1998	<70	I	TC
Burkina Faso	eastern woodlands	-	1991	V	D	FO
Nigeria	northeast	-	1990	V	?	FO
Chad	Zakouma NP	3000	1995	800	I	AS
	Bahr Salamat FR	20600	1989	x	D	FO
	Siniaka Minia FR	4260	1995	20	I	AS
	eastern Salamat	4000	1989	x	D	FO
	southern Chari Baguirmi	3000	1995	R	D	FO
	Binder Lere FR	1350	1996	5	D	AS
	unprot. Areas of Mayo Kebi	2000	1996	R	D	AS
Cameroon	Waza NP	1700	1994	>1000	S	IG
	N. Province	>29700	1998	360	S	IG
Central African Republic	Manovo-Gounda-St. Floris NP	17400	1995	<500	D	AS
	Bamingui-Bangoran NP	11560	1995	<50	D	AS
	Sanga Pilot Zone	1000	1995	<50	I	AS
	northern region HZs	60000	1996	R	D	FO
Dem. Rep. Congo	Garamba NP HZs	12447	1995	280	S	AS
Sudan	Bahr el Ghazal	?	1992	?	?	IG
	southeast	>10000	1996	x	D	FO
Ethiopia	Gambella NP	5061	1990	x	D	FO
	Omo NP-Tama WR	6780	1997	160	D	AS
	Borana CHA	40000	1995	140	S-D	AS
	southwestern Ogaden	?	1997	x	?	LP
Somalia	Bush-Bush NP	4267	1997	x	?	FO
	other areas in south	>5000	1988	U	D	FO
Uganda	Murchison Falls NP & GRs	5500	1995	130	S-I	AS
	Kideop Valley NP	1575	1995	5	D	TC
	Pian Upe GR	3250	1995	10	D	AS
Kenya	Marsabit NP & NR	2090	1995	>300	S	GS
	Samburu-Baffalo Springs-Shaba NRs	743	1993-94	75	S-D	AS
	Meru NP-Rahole-Kora_Bisandi NRs	4528	1995	200	D	AS
	unprot. Areas of northern rangelands	230000	1991-94	26970	S	AS
	Tsavo NP & surrounds	40572	1997	2020	D	AS
	Laikipia ranches	10000	1991-94	1510	S	AS
	Masai Mara NR	1670	1994	340	S	AS
	Mara ranches	3890	1994	1370	S	AS
	Amboseli NP	392	1990-96	50	S-D	AS
	Nairobi NP	117	1990-94	100	S	GS

	Kajiado & eastern Narok rangelands	28000	1991-94	9990	S-I	AS
	Tana River NR & surrounds	200	1995	15	S	AS
	Shimba Hills NR	217	1995	x	?	FO
	coastal rangelands	15000	1991-94	1930	S	AS
	Lake Nakuru NP	139	1993	>100	S-I	GS
	Ruma NP	120	1994	40	S	GS
Tanzania	Serengeti ecosystem	27000	1996	6170	D	AS
	Kilimanjaro NP & FR	1835	1995	x	S	FO
	Arusha NP	137	1987	x	S-D	FO
	Tarangire NP	2600	1994	750	S	AS
	Tarangire GCAs	10000	1994	3500	?	AS
	Mkomazi GR	3615	1996	790	S	AS
	Sadani GR & surrounds	1537	1991-92	280	?	AS
	Biharamulo-Burigi GRs & surrounds	6530	1990	135	S-D	AS
	Moyowosi-Kigosi GRs	19679	1994	1380	S-I	AS
	Moyowosi-Kigosi GCAs	2191	1994	90	S	AS
	Ugalia GR	4760	1991	370	S	AS
	Ugalia GCAs	2140	1991	15	S	AS
	Katavi NP-Katavi-Rukwa GCAs	13341	1995	4100	S	AS
	Ruaha NP & GRs	29280	1993	7210	S	AS
	Ruaha -Rungwa surrounds to NP & GRs	13060	1993	840	S	AS
	Selous GR (northern section) & surrounds	9000	1994	2740	I	AS
	Mikumi NP	3215	1994	130	S-D	AS
	other areas in northeast	>5000	1996	x	?	IG
Rwanda	Akagera NP	1500	1994	20	S	GS
Zambia	Sioma Ngwezi NP	5240	1994	R	S-D	FO
	N. Luangwa NP	4636	1995	V	I	FO
	S. Luangwa	9050	1994	275	S	AS
	Lupande GMA	4500	1994	780	S-I	GS
	other Luangwa Valley GMAs	22840	1994	90	S-D	AS
	private game ranchers	-	1994	16	S-I	QS
Namibia	Etosha NP	22270	1995	1840	S	AS
	Kaudom NP	3841	1988	U-R	S	FO
	Kaokoland	70000	1990	300	I	AS
	other communal lands	-	1988	U-R	S-D	FO
	private farmland	-	1992	4550	I	QS
Botswana	northern prot. Areas & rangelands	80000	1994	10270	S-I	AS
	southwestern Ngamiland	10000	1994	200	S-D	AS
	Central Kgalagadi-Khutse GRs	55300	1994	1200	S-D	AS
	Tuli block farms	250	1994	30	S-D	AS
Zimbabwe	Hwange NP	14651	1996	3000	S	GS
	Matetsi SA complex	3295	1995	50	S	AS
	Kazuma Pan	561	1995	20	S	AS
	Zambezi NP	543	1995	90	S	AS
	Gonarezhou NP	4972	1995	200	S	AS
	forestry areas	2344	1995	20	S	AS
	private farmland	-	1996	2050	S_I	QS
South Africa	Kruger NP	21682	1993	5000	S	AS
	other NPs	-	1995	30	I	TC
	Hluhluwe-Umfolozi P	965	1994	300	S	AS
	Mkuzi GR	251	1994	180	S	TC
	Itala GR	259	1994	200	S-I	TC
	other provincial reserves	-	1994-96	540	S-I	TC
	private land	-	1994-96	1630	S-I	QS
Swaziland	Hlane GR	163	1994	R	S-D	FO
	Milwane WS	45	1994	U-R	I	FO
	private land	-	1994	x	S-I	FO

Giraffe Taxonomy: Patterns of Subspecies Diversity in the Giraffe

Russell Seymour, PhD
International Giraffe Working Group

The "Camel-Leopard" was originally described as *Cervus camelopardalis* (Linnaeus 1758), allied to the North American Elk. An extraordinary nomenclatural start for an extraordinary species, the giraffe has had a complex taxonomic history. This complexity is largely due to the extreme and obvious phenotypic variation seen between individuals and between populations. Previously classified by some authorities as two separate species (though the authors did not always agree on the division), the contemporary giraffe is now accepted a single species by most taxonomists. However, the complex taxonomic history of this species is indicated by the twenty seven attributed specific or subspecific taxa (Grubb, 2005). The species was long considered to consist of nine subspecies (Dagg 1971), although recent thought has reduced this to six (East, 1999; Grubb 2005).

In a series of articles for *Giraffa* I shall describe my research into the taxonomy of the giraffe that unites traditional taxonomic approaches with contemporary techniques to investigate morphological, pelage pattern and genetic variation. This first article presents the abstract from my PhD thesis (Seymour 2001), to give an overview of the scope of the study. Most of the information in the thesis remains unpublished, but is now being prepared for publication.

Patterns of Subspecies Diversity in the Giraffe, *Giraffa camelopardalis* (L. 1758): Comparison of Systematic Methods and their Implications for Conservation Policy.

This thesis examines the subspecific taxonomic status of the giraffe and considers the role of formal taxonomy in the formulation of conservation policy.

Where species show consistent, geographically structured phenotypic variation such geographic patterns may indicate selective forces (or other population-level effects) acting upon local populations. These consistent geographic patterns may be recognised formally as subspecies and may be of interest in single or multi-species biodiversity or biogeography studies for delimiting areas of conservation priority. Subspecies may also be used in the formulation of management policies and legislation. Subspecies are, by definition, allopatric. This thesis explicitly uses methodology of systematic biology and phylogenetic reconstruction to investigate patterns of variation between geographic groups.

The taxonomic status of the giraffe is apposite for review. The species provides three independent data sets that may be analysed quantitatively for geographic structure; pelage patterns, morphology and genetics. Museum specimens, grouped according to geographic origin, were favoured for study as more than one type of data was often available for an individual.

Population aggregation analysis of forty pelage pattern characters maintained six separate subspecies, while agglomerating some neighbouring populations into a subspecies. A 'traditional' morphometric approach, using multivariate statistical analysis of adult skull measurements, was complemented by a geometric morphometric approach; landmark-restricted eigenshape analysis. Four morphologically distinct groups were recognised by both morphological analyses. Phylogenetic analysis of mitochondrial DNA control region sequences indicates five major clades. Nested clade analysis identifies population fragmentation, range expansion and genetic isolation by distance as

Giraffe Taxonomy: Patterns of Subspecies Diversity in the Giraffe *cont.*

contributing to the genetic structure of the giraffe. The results of the analyses show remarkable congruence.

These results are discussed in terms of the formulation of conservation policy and the differing requirements of biological and legal classification systems. The value of a formal taxonomic framework to the recognition, and subsequent conservation, of biodiversity is emphasised.

The thesis is available to interested individuals. A limited print run of the study is being prepared for publication along with a paper for publication in a peer-reviewed journal. I will welcome any expression of interest from anyone wanting a copy of the full thesis. Please contact me at Rhinoceruss@hotmail.co.uk. The thesis is also available in electronic format.

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THESIS CONTENT:

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Chapter 2: The Taxonomic Status of the Giraffe, *Giraffa camelopardalis* (L. 1758).

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The Niger giraffe *G. c. peralta*: an overview

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OVERVIEW

The giraffe of Niger are the last in all West Africa. It is threatened. They are both genetically and ecologically distinct from other giraffe and are therefore an important biodiversity remnant. Although baseline research has been limited, it does provide snapshots of what has happened to the population's numbers and distribution over the past decade. Currently, the population is increasing and genetically healthy, however, its range has been significantly reduced and habitat loss and fragmentation continues to be a major threat. The carrying capacity of giraffe within its current range is unknown, although naturally the population does require seasonal habitats and forage across habitat types. Standardised yearly monitoring has been established and the programs ongoing success is imperative.

Ecological research on the giraffe and their habitat is critically important, however, greater collaboration and integration of efforts between government and non-government organizations, coupled with appropriate community based natural resource management, is the key to the survival of these last giraffe in West Africa.

POPULATION ECOLOGY

The Niger giraffes are unique. The population is critical as the last representative of giraffe evolutionary heritage west of Cameroon, which historically ranged over vast areas in the region. The giraffe population of Niger are an important incubator of giraffe history and as a distinct subspecies that is genetically healthy, represent a unique biological resource. They form a distinct branch (evolutionary lineage) from other giraffe populations, having split from a common ancestral population approximately 350 000 years ago (based on mitochondrial and nuclear DNA research). as their closest relative. The Rothschild's giraffe *G. c. rothschildi*, whose current range lies within Uganda and Kenya, are identified

Reduction in giraffe range and habitat availability has occurred throughout Africa, and the West African population has suffered considerably from these direct and other indirect actions. The current extant range of the giraffe population in Niger is restricted, with few exceptions to the south-east of Niger.

The most recent assessment of the giraffe population in Niger identified 135 individuals (2005 survey; 144 in 2006 unpublished). The population has increased markedly, essentially doubled, since first surveyed in 1994 (67 individuals). Over the past decade the population has under gone considerable change, with an initial decline attributed to poaching and capture/translocation, and a subsequent increase stemming from targeted on ground conservation programs, as well as immigration of individuals from isolated or small meta-populations.

The population is currently not stable, and the carrying capacity of their current range is unknown. Population growth over the past decade equates to 7.7% per annum (this is highly variable and dependent on the variable figures quoted), and since 2002, <6%. The high rate of increase for giraffe in Niger can possibly be attributed to the lack of natural predators; however, it is highly variable.

The population is currently female dominated [male:female (1:1.41)], although this has varied greatly over the past decade, enabling a potentially positive repro

The Niger giraffe *G. c. peralta*: an overview *cont.*

ductive capacity (at least in the short- to medium term) with respect to population growth.The population continues to show good reproductive capacity, despite historical and current risks and threats. In some areas of their extant range, only one fifth of all giraffe reach sexual maturity, a result of a combination of factors, including predators.

The density of the giraffe population in Niger is extremely low (0.01 km^2), one of the lowest in Africa. The low densities are directly correlated with the population's low numbers and the extensive range required fulfilling their biological requirements. This low density does not highlight the importance of key areas, i.e. Kouré, Fandou and the Dallol Bosso, as supporting markedly higher densities of giraffe, and the reliance on these areas year round for the majority of the population. Arid conditions, 'competition' for habitat with an expanding human population, large seasonal rainfall variability, shifts in surface water availability and core forage resources contribute to the low giraffe densities and potentially a lower population carrying capacity in Niger.

There are three major areas in the giraffe's range (commonly referred to as the

zone): Fakara Plateau (Kouré, Fandou), Harikanassou (Dallol Bosso) and Intermediate zone. Giraffe appear to range, and increasingly so, between all three areas, predominantly associated with seasonal availability of forage. The seasonal movements of giraffe correspond with local human activities, which have led some to describe this as a form of on the Kouré Plateau, synchronisation; aggregating in the rainy season and expanding more into the Fandou Plateau, attributed to the relatively dense forage availability and increased primary productivity of the 'Tiger Bush'. New leaves and shoots are available, correlating with more favourable chemical quality of preferred species i.e. increased protein and water content, and reduced fibre. During the dry season giraffe return to the Dallol's where the vegetation is sparser but species such as *Faidherbia albida* (formerly *Acacia albida*) provides essential seasonal forage in the form of new leaves and pods. As mentioned above, an intermediate zone, the area between the rainy and dry season habitats, is an important zone of transition for the giraffe as they seasonally migrate.A parallel between environmental conditions, densities and range of giraffe is evident. In arid Niger, giraffe have lower densities, larger home range sizes, less stable herds and increased mobility. The average home ranges of giraffe in Niger was the largest for any population in Africa, males 842 km^2 and females 367 km^2; maximum home range up to 1564 km^2 and 1378 km^2, respectively (late 1990s). The need for such a large home range often correlates with the population's increased biological and ecological requirements e.g. forage, mates, space, competition, conflict, etc., and thus a need to range further a field.

The Niger giraffe *G. c. peralta*: an overview *cont.*

THREATS

An array of threats faces the conservation and survival of the giraffe in Niger. These threats range in both size and complexity, however, habitat loss, degradation and fragmentation are the major threat critical to the giraffe's to the long-term conservation of the species in Niger. As an example, the significant loss of available tiger bush over the past 30 years, coupled with an increase in human agriculture and pastoralist activities in these areas. Epidemiological risks are not considered high in comparison to human pressures.

The majority of threats arise from conflict and competition (direct, indirect or perceived) for resources with humans and their domestic stock. Ongoing monitoring and management from government and non-government organisations alike is required to both better understand the current or potential threats, and mechanisms to abate or remove them.

FUTURE RESEARCH

No long-term research has been undertaken on the giraffe population in Niger, and very little on populations Africa-wide. With the last population of giraffe in West Africa residing in Niger, the need to undertake ongoing, long-term research is important. It is this lack of long-term research that remains the most limiting of factors in understanding giraffe home range and ecology. Over the past decade, research, conservation and management efforts for the giraffe in Niger has increased, relatively, however, it remains poorly coordinated with limited direction.

A marked degree of variation exists in the research and data quality undertaken over the past decade data available for the giraffe population in Niger. Therefore, some discrepancies and inconsistencies exist e.g. varied counting methodology, area surveyed, a lack of reliable historical data.

The following are critical when designing future research for assessing the long-term conservation of giraffe in Niger:

- Population numbers and dynamics
- Forage and resource availability and habitat assessment
- Movement behaviour
- Human-wildlife conflict
- Population genetics
- Epidemiology
- Population and Habitat Viability Assessment (PHVA)

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Giraffes of Niger—2006 census

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INTRODUCTION

At the beginning of the 20th Century, giraffes were distributed across the Sudano-Sahélian zone in West Africa from Chad to Senegal. In 1996, the last 50 giraffes of West Africa remaining lived close to Niamey, the capital of Niger. The decline of West African giraffes over the 20th century was mostly due to poaching, habitat loss and fragmentation. The giraffes of Niger are genetically unique, and live in an unprotected area, sharing the habitat with the local people and their livestock.

2006 CENSUS

Since 2005 an annual giraffe census in Niger has been financed by Doue la Fontaine Zoo (France) and South Lakes Wild Animal Park (Great Britain) - see Vol.1 Issue 1. The aim is to gain a better understanding of the Niger giraffe population dynamics by: 1.) Counting every individual, 2.) Creating an identification card for each individual, 3.) Determining the demographic structure of the population by sex and age class.

The censuses are initiated by the ASGN (Association for Saving the Giraffes of Niger) in collaboration with the environment minister of Niger, Ecopas, the local foresters, Peace Corps volunteers, and international students. The census was supervised by the French biologist Jean-Patrick Suraud, Association Arborescence.

DISCUSSION

The census methodology appears to be efficient because 96% of the individuals photographed in 2005 were identified again in 2006. The 2006 census allowed correction of errors from the 2005 census (15% of the album appears false due to double counting or the profile not corresponding to the individual). Nevertheless, we are confident that 135 individuals is a very good estimation of the population.

The population seems to be stable or growing as 26 new calves and young were identified for the first time in 2006, and 13 females appeared pregnant. The Nigerian environment minister listed only 5 deaths in between the 2005 and 2006 census (accident with a car, poaching, and natural death).

After 21 days of census in the Koure Plateau, no new individuals were identified. It is assumed the counting was almost exhaustive in Koure where around 90% of the population was present. In the Fandou Plateau 5 new individuals were identified on the last day of the

RESULTS

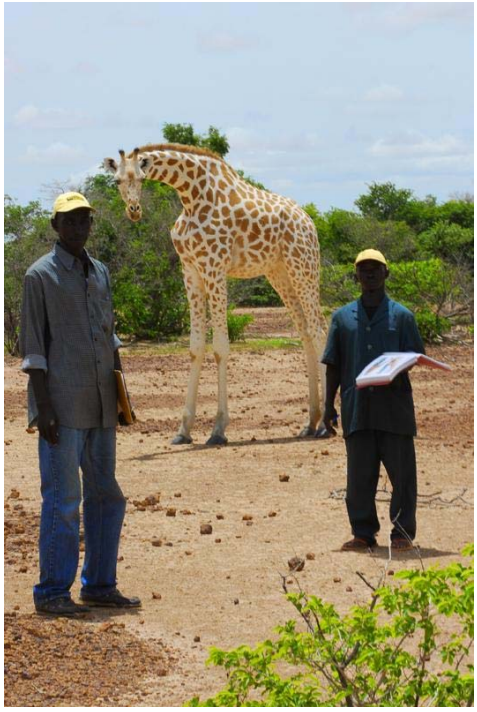
2006	Adult	Subadult	Young	Calves	TOTAL
Females	50	10	12	5	77*
Males	36	11	11	9	67
TOTAL	80	21	23	14	144**

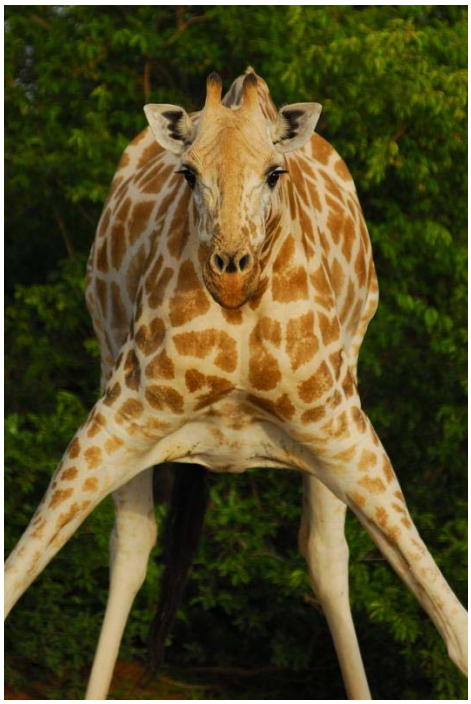
*13 pregnant females
**131 individuals listed in Kouré and 13 in Fandou

Giraffes of Niger—2006 census *cont.*

census. We suspect that some individuals were not listed in Fandou. Adult males roam around alone and are less likely to be observed than other age and sex classes, so this category was probably underestimated.

It is assumed the number of giraffe of Niger was around 150 individuals in 2006. With a population of 50 individuals in 1996, and a minimum of 144 in 2006, the annual average increase of the population is 11.2%. We attribute this population growth to the efforts of the authorities to stop poaching and the conservation awareness campaign aimed at the local population conducted by the Purnko in the 1990s and now continued by the ASGN.





CONCLUSION

From a methodological perspective, we think that the 2006 census was better than the 2005 census. It is a long and expensive process, but it is the only way to gain a precise idea of the demography of the population and provides essential baseline data for future studies.

The giraffes of Niger are still very threatened by the very rapid destruction of their habitat by agriculture and pastoralism. We have no idea about the carrying capacity of their current range and conflict for resources between giraffes and the local people and their livestock are increasing. The 2006 workshop organised by Ecopas to determine the national strategy for giraffe conservation in Niger revealed the lack essential baseline ecological knowledge of this population. A long-term ecological survey of the Niger giraffe population is essential to developing a strategic framework for their conservation.

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Notes: Giraffe Highlights from the 2006 Association of Zoo Veterinarians Conference

Summary by Thomas W. deMaar, DVM
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Descriptive Statistics of Captive Giraffe (*Giraffa camelopardalis*) Mortality in American Zoo and Aquarium (AZA)-Accredited Facilities from 1988-2005. *Long, L.J., St. Ledger, J., Dennis, P.M., Saville, W.J.A., Bingaman Lackey, L. and Harper, E.* Proc. Am. Assoc. Zoo Vet. 2006:55.

Data from 210 giraffe mortalities was collected from 44 institutions and analyzed with respect to age, management practices, reproductive and behavioral information. Most common cause of death in neonates was infections, failure to thrive, trauma and stillbirth. Sub adult mortalities were related to trauma and nutritional deficiencies. Adult mortalities were related to arthritis, hoof problems and wasting.. A large number of deaths were acute with no associated disease. Further statistical analysis is ongoing.

Corneal Trauma in a Giraffe (*Giraffe camelopardilis).* Lee, A.H., Chin, S.C. and Chung-Tien Lin. Proc. Am. Assoc. Zoo Vet. 2006:112.

Dr. Lee and a group from the Taipei Zoo and National Taiwan University treated a neonatal giraffe with a corneal injury. Sufficient anesthesia was achieved with intramuscular xylazine and isoflurane gas. Initial treatment consisted of a third eyelid flap which provoked suture friction and secondary damage to the cornea. A second stage consisted of a temporary tarsorrhaphy (suturing together of the eyelid margins). Complete recovery was achieved in two months.

Use of Thiafentanil (A3080), Meditomidine, and Ketamine for Anesthesia of Captive and Free-ranging Giraffe (*Giraffa camelopardalis).* Citino, S.B., Bush M., Lance, W., Hofmeyr, M. and Groubler, D. Proc. Am. Assoc. Zoo Vet. 2006:211-13.

Dr. Citino and colleagues from the USA and South Africa performed numerous anesthetic procedures on captive and free-ranging giraffe using a new drug combination. Meditomidine and ketamine is currently effective for captive giraffe however better techniques for wild giraffe are needed. With the new combinations marked differences between dosages required and recumbency time between captive, free ranging ground darted and free-ranging, helicopter darted subjects were noted. The new combination of thiafentanil, meditomidine and ketamine is considered useful for captive and free-ranging, ground darted giraffe. Respiratory support or oxygen supplementation is needed. Re-sedation potential from the meditomidine needs to be monitored.

Thermography-assisted Diagnosis of a Distal Phalanx Fracture in a Reticulated Giraffe (*Giraffa camelopardalis reticulata).* deMaar, T.W., Stewart, P. and Rosenstein, D.S. Proc. Am. Assoc. Zoo Vet. 2006:268-9.

A thermographic camera was used to define a focal increase in temperature in the leg of a lame giraffe that showed no other signs localizing the point of injury. Subsequent radiographs defined a fracture of the third phalanx within the hoof. The giraffe was treated with anti-inflamatories, stall rest and application of a wood block on the unaffected toe of the same foot. Thermography is a useful remote, non-invasive diagnostic tool for larger animals.

Notes: Unusual Tactics used in browsing by the Luangwa Giraffe, Zambia

Philip S.M. Berry

The feeding behaviour of the giraffe *Giraffa camelopardalis* Linnaeus is well-documented and summarized in Dagg and Foster (1982). Nevertheless, apart from giraffe rearing up on their hindlegs to reach otherwise inaccessible food there is no mention in the existing literature of any other method used for this purpose. However, an alternative way of achieving access to food beyond their normal fully-extended reach was observed by some individuals of the Thornicroft's giraffe *G. c. thornicrofti* Lydekker, over a 2-year period. This giraffe is a subspecies endemic to the Luangwa Valley in eastern Zambia and it has been the subject of a continuing study by the author (Berry 1973; 1978; 1994; and unpublished data) for more than thirty years.

The technique referred to was observed on four separate occasions by three different giraffe, twice by one male and once each by another male and one female. An adult black male was seen on 3 January 1984 (with colleague V.W. Baillie) trying unsuccessfully to browse the extremities of three different branches on one tree *Schrebera trichoclada* Welw. The leaves were just beyond its reach even when its prehensile tongue was fully extended. Failing in its efforts, the male deliberately transferred his attention to the bare lower stems of the same three branches. Each stem was grasped with the extended tongue and pulled down until the male could hold the stem in its mouth. The branch was then bent even further until it broke, bringing the terminal leaves within reach. These were then stripped away. This method was repeated in exactly the same fashion on all three branche, each of which averaged approx. 20mm in diameter where it broke.

This same black adult male was observed more than three years later, on 16 July 1987, using a similar technique. After browsing a small tree *Trichilia emetica* Vahl at head height, but failing to reach inaccessible foliage higher up, the giraffe grasped the relevant branch stem near the base. The branch was then bent over at a 90° angle without breaking and the terminal leaves consumed. Young *Trichilia emetica* branches are quite pliable and can bend without snapping whereas those of *Schrebera trichoclada* are brittle and break easily.

The third observation was of an adult female using the same method. On 20 October 1995, the female was browsing on a young *Trichilia emetica* tree and it was apparent that a clump of leaves was beyond herreach. The giraffe gripped the slender branch stem in her mouth (the tongue was not used for this purpose) and gently bent it down until she could strip off a big bunch of leaves. The branch was not broken on this occasion.

In the fourth instance, on 26 September, 1996, a brown adult male was pulling off several lengths of a vine *Cocculus hirsutus* (L.) Diels from the top of a leafless tree *Diospyros senensis* Klotzsch. Intervening branches prevented him from reaching the remainder of the vine. Grasping one of the obstructing branches with its mouth, the giraffe inclined his head sideways until the stem snapped. A second stem was subsequently broken in the same way. Both branches were less than 25mm in diameter. After the branches were broken the male pressed them lower with its chin until he could reach in and extract the remaining vine from the undamaged branches higher up. In this instance, although the same method was used to facilitate access to the desired food, the circumstances were somewhat different. On the first three

Note: Unusual Tactics used in browsing by the Luangwa Giraffe, Zambia *cont.*

occasions the giraffe deliberately chose to break or bend at the base those specific branches to which the sought-after leaves were attached thereby bringing them within reach. In the fourth case, however, the giraffe removed branches that impeded his access to food that was located on other unrelated branches. In doing so, this animal revealed remarkable cognizance of the best way in which to achieve his objective.

These are the only occasions when tactics of this nature have been observed by the author during many years of observing browsing activity in the Thornicroft's giraffe. Nevertheless, although very unusual in the author's experience, the described tactics might possibly be more frequently used than is realised, especially as such behaviour could easily be overlooked amidst normal browsing activity. One might also speculate that considering how each of these objectives was achieved, it is possible that giraffe may have a limited degree of reasoning ability. However, a much more intensive scientific approach is needed to prove whether or not this suggestion has merit.

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Recently Published Research

Hassanin, A., Ropiquet, A., Gourmand, A-L., Chardonnet, B. and Rigoulet, J. 2007. Mitochondrial DNA variability in Giraffa camelopardalis: consequences for taxonomy, phylogeography and conservation of giraffes in West and central Africa. *C R Biol.* **330 (3):**265-274.

The giraffe (Giraffa camelopardalis) still survives in four countries of West and central Africa. The populations of Niger and Cameroon are generally assigned to the subspecies peralta, but those of Chad and the Central African Republic are taxonomically problematic, as they are referred to as either peralta, or antiquorum, or congoensis. In this study, a mitochondrial fragmentof 1765 nucleotide sites, covering the complete cytochrome b gene, three transfer RNAs and a large part of the control region, was sequenced to assess the relationships between several populations of giraffe. The phylogenetic analyses performed on the 12 identified haplotypes indicate that northern giraffes constitute a natural group, distinct from that of southern giraffes. Surprisingly, the giraffes of Niger are found to be more closely related to the giraffes of East Africa (subspecies rothschildi and reticulata) than to those of central Africa. We conclude therefore that the subspecies peralta contains only the Niger giraffes, whereas the subspecies antiquorum includes all populations living in Cameroon, Chad, the Central African Republic, and southwestern Sudan. We suggest that the ancestor of the Nigerian giraffe dispersed from East to North Africa during the Quaternary period and thereafter migrated to its current Sahelian distribution in West Africa, in response to the development of the Sahara desert. This hypothesis implies that Lake Mega-Chad acted as a strong geographical barrier during the Holocene, preventing any contact between the subspecies peralta and antiquorum. Our study has direct implications for conservation management, as we show that no subspecies peralta is represented in any European zoos, only in Niger, with a small population of less than 200 individuals.

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News, Stories, Articles Abstracts &

We are interested to hear from individuals, institutions, non-government, government and zoos who are working with, in and/or on giraffe with the intention of including it in this forum. If you have some interesting findings, news or observations please submit or request further information from the editors:

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