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Giraffa: Tall tales from the wild and captive world!

Greetings again to you all!

Although a little later than planned...the current changes which are going on in the world, including the economic upheaval, continued demise of Zimbabwe and of course the soon to be change in Heads of State in the USA have had their impact, but none of them really on the production of this newsletter! I and others in the IGWG have had some personal and professional changes over the past year but more importantly we have managed to bring out a bumper issue for 2008 which will see you through the festive season and into 2009 with increased enthusiasm.

This Issue of 'Giraffa' has a good mix of both *in-situ* and *ex-situ* stories and updates from the giraffe world, and I am happy to say that both communities have embraced the concept of the newsletter and excellent feedback has been received.

The lead story is both fascinating and potentially contentious with the issue of giraffe taxonomy as confusing as the current day stock market! David Brown and co. research has set the benchmark for ongoing giraffe genetic work which will hopefully be used as the baseline to define and in turn develop population conservation and management decisions in key areas of their range. JP Suraud continues to provide positive news on the increasing population in West Africa whom were recently given status as 'endangered' under the IUCN Red List 2008.

In the captive world, Marc Damon provides an in-depth update on the status of giraffe in Europe which is a must read while Terry Web gives us insight to the trials and tribulation of hand-rearing a giraffe. Considerable publications have been sourced to bring their abstracts to you whilst a new section call 'Tall Tales—updates from the giraffe world' will hopefully keep you abreast of what is going on in the giraffe world—and we would love you to contribute to this and other features in future!

Till 2009...ho ho ho!

Julian

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:

How many species of giraffe are there & why should we care?

David Brown
International Giraffe Working Group

For many years there was thought to be only one species of giraffe (*Giraffa camelopardalis*) with somewhere between six and nine subspecies. These subspecies of giraffes are defined by differences in their spot (pelage) patterns, ossicones (horns) and skull shapes. Importantly, different giraffe subspecies have interbreed with each other in zoos. This observation lead to the assumption that giraffe subspecies also interbreed with each other in the wild.

By analyzing mitochondrial DNA sequences and nuclear microsatellite loci, my colleagues and I showed that there are at least six genealogically distinct lineages of giraffe in Africa, with little evidence of interbreeding between them. Some of these lineages appear to be maintained in the absence of contemporary barriers to gene flow, possibly by differences in reproductive timing or pelage-based assortative mating, suggesting that populations usually recognized as subspecies have a long history of reproductive isolation. The paper showing the genetic differences between the giraffe groups and containing all of the methodological details of the study can be read or downloaded for free at this URL: http://www.biomedcentral.com/1741-7007/5/57.

The current taxonomic classification of Giraffa as one species obscures the threats to the existence of these giraffe lineages. There has been an estimated drop of 30% in giraffe population numbers in the past decade to less than 100,000 giraffes remaining on the continent. The results of the recent genetic study suggest that each of the genetically different giraffe species need individual conservation assessments and management plans. Some of the potential giraffe species are greatly endangered, as recently highlighted in the IUCN Red List 2008 update.

The reticulated giraffe group was estimated to be stable until the 1990s (27,000 individuals). However, severe poaching and armed conflict across its range in Somalia, Ethiopia, and northern Kenya has reduced it to perhaps fewer than 3000 individuals, one-tenth of its former population size.

Within the peralta group of West-Central African there are only about 200 giraffes

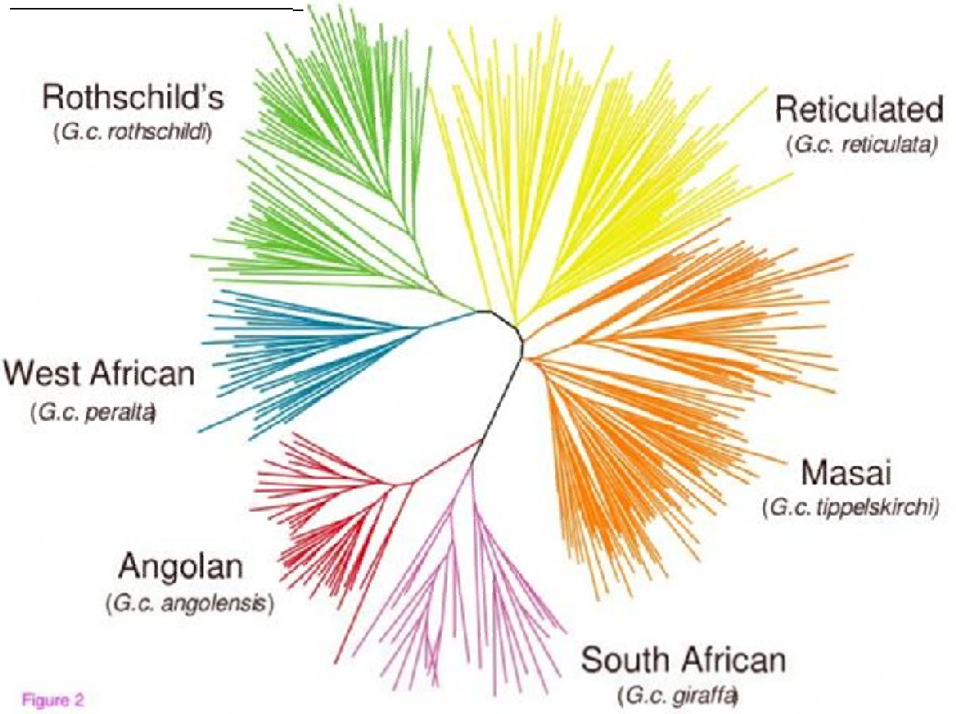

Figure 2

How many species of giraffe are there & why should we care?
cont.

remaining in all of West Africa west of Cameroon were until the mid-20th century there were perhaps thousands.

The rothschildi giraffe group was steadily reduced in numbers and geographic range over the past century. Populations of the rothschildi giraffe group have been eliminated 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 number a few hundred individuals.

Southern Sudan was historically the epicentre of giraffe evolution. There may have been up to four taxonomic giraffe subspecies living next to each other within an 800 km^2 region of into the late 20th century. The fate of this rich zone of giraffe evolutionary potential was until recently thought to be lost because of civil war. WCS biologist's recent discoveries of intact populations of large mammals in Southern Sudan open the possibility that relatively good giraffe populations may still exist there, although more surveys are required.

The discovery of potential giraffe species may not be over. The Thornicroft's giraffes are a morphologically distinct population of giraffes endemic to the Luangwa Valley in Zambia, and a key link between the African continent's north and south populations. The population is biologically isolated from other giraffe populations and as such is ecologically and potentially genetically unique.

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Giraffes of Niger, 2007 census and perspectives

Jean-Patrick Suraud
International Giraffe Working Group and ASGN

Introduction

At the beginning of the 20th Century, giraffes were distributed across numerous countries of the Sudano sahelian zone: from Chad to Senegal. In 1996, the 50 last giraffes of West Africa concentrated close to Niamey, the capital of Niger (Ciofolo, 1998). Such a decline from several thousands to a few dozen in less than a century was mostly due to poaching, habitat loss and fragmentation. The giraffe of Niger are genetically unique: a 2006 study showed the last *peralta* subspecies are the giraffes of Niger (Hassanin, 2007). A 2007 study suggests that giraffes are not a unique species with 9 subspecies, but at least 6 species with more sampling to be undertaken (Brown, 2007). According to this study, the giraffe of Niger would represent a single species. Giraffes of Niger live in a non protected area, without natural predators, sharing the habitat with the local people and their livestock.

The giraffe census

In 2007, the annual Niger giraffe census was financed by Nature & Découverte Foundation, Doue la Fontaine zoo (France), South Lakes Wild Animal Park (Great Britain), ECOPAS and Touroparc (via the CEPA association). The aim of the census was to have a better understanding of the population dynamics by:

1. Counting every individual,
2. Establishing an individual identity card, and,
3. Determining their distribution and population structure (sex and ages classes).

Like in 2005 and 2006, the censuses was undertaken as a collaboration between ASGN (Association for Saving the Giraffes of Niger), The Nigerian environment minister, Association Arborescence, ECOPAS, the local foresters, Peace Corps volunteers. The mission was supervised by the French biologist Jean-Patrick Suraud, Association Arborescence.

The census took place during the rainy season (July-September) as the population aggregates during this period in the Koure and Fandou plateaus, 60km East of Niamey. As per previous surveys, the method was a total census of the population using photo identification. Every animal has a unique pattern of spots (pelage) allowing individual identification. To assist in this recording and identification, both the left and right profiles of each animal were photographed.

Results and discussion

A total of 164 giraffes were photographed in 2007 (Table 1). The current methodology (individual photographs) appears efficient as 95% of the

Table 1: Results of the 2007 census and categorization of counted individuals

	Adults	Subadults	Young	Calves	Total
Females	59	16	8	3	75*
Males	41	14	5	15	86
Total	100	30	13	18	**164**

*30 pregnants females.

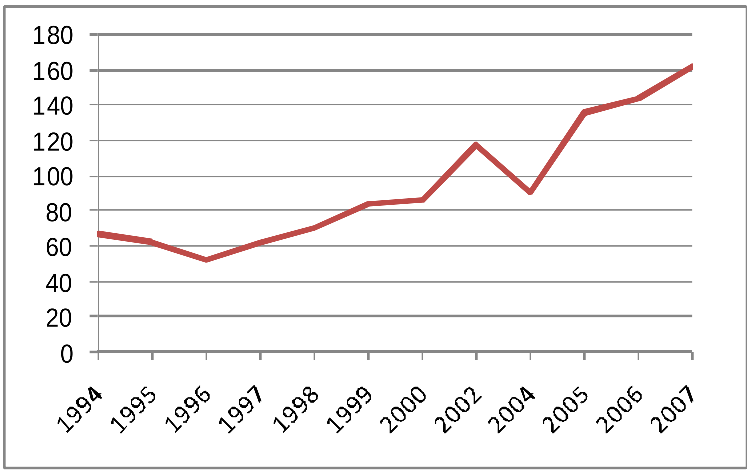
N.B. Sex of three calves unknown

Giraffes of Niger, 2007 census and perspectives *cont.*

individuals photographed in 2006 were re-photographed in 2007. Considering our knowledge of the population, thanks to the previous censuses, and the 95% 'recapture' rate, the population is estimated to be between 175-180 individuals. The slightly lower value recorded in 2004 (Figure 1) is assumed to be related to an underestimation by the methodology employed – line transects sample count.

The population of Niger's giraffes seems healthy whilst the population appears to be increasing: half of the females giraffes showed signs of being pregnant, and at least 25 new calves and young were born between the 2006 and 2007 census (Table 1). In 2007, we had the first precise data on birth intervals: 24 months. The 2007 census confirmed a remarkable annual rate of growth around12% between 1996 and 2007 (Figure 1). Until 1996, the population of giraffe in Niger had been slaughtered and almost disappeared. Since then, the population has continued to increase at such a rapid rate, attributed to the absence of predators (in others population, predators such as lions can kill 50 – 70% of the calves, thus having important repercussion on annual growth rates: avg. 3- 5%, the ceasing of poaching, and the sensitization of the population by the ASGN: Association for Saving the Giraffes of Niger.

Fig 1: Population growth of the giraffes of Niger population since 1994 to 2007



It appears that the sex of newly born giraffe in the population is male biased .The Trivers–Willard model predicts that in a polygynous species, given certain assumptions, mothers with extra resources should bias investment towards sons by adjusting sex ratio at birth and/or by differential provisioning of sons and daughters (Mark Hewison, 1999). For ungulates, body size and/or condition and social rank are important parameters. This sex ratio biased could be due to the better than average life condition of the population although only long-term studies should be able to confirm this hypothesis.

On the other hand, as expected in a mammal population increasing in number, the adult class currently favours greater numbers of females.Current living conditions for giraffes in Niger seem close to ideal: no poaching,, no predators, and sufficient amount of resources. However, it is reasonable to assume that this high yearly growth rate will not be maintained over a much longer period of time. Even though the population of giraffe continues to increases quickly, their rainy season habitat, the tiger bush, is decreasing quickly as a result of increasing agriculture. Between 1975 and 2002, agriculture in the giraffe zone rose from 50 to 80% of the area (Nouhou Abdou, 2005).

With respect to the populations movements and range, adequate census and collection of GPS data has been undertaken since 2002. As the censuses methods evolved, and the number of positions have increased, it appears that the giraffes home range during the rainy season increases across the Koure plateaus. Indeed, 2002 and 2003 data indicates that the giraffes were present almost only in the north plateau, whilst in 2006 and 2007, the giraffes were present across both the

Giraffes of Niger, 2007 census and perspectives *cont.*

north and south plateaus (Figure 2). Long-term surveys of the giraffe's home range will allow us to have more precise data to better support their needs and subsequent management.

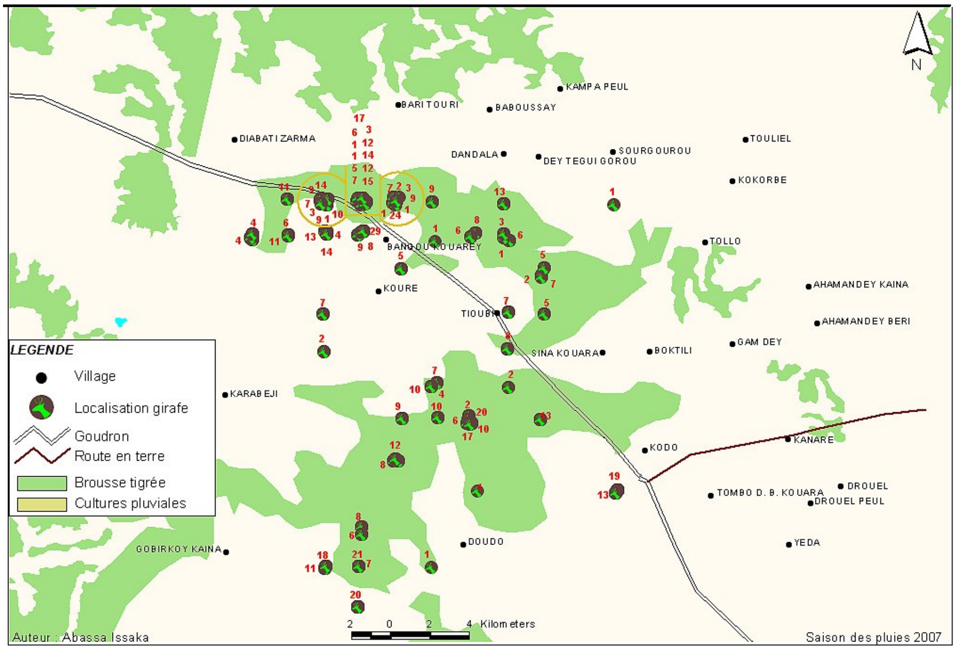
The critical population size to escape the endangered status, following IUCN Red List Assessment criteria, should be at least 400 individuals. We are still far from this number. Several studies such as the analysis of the carrying capacity, long-term surveys of the population dynamics, assessment of home range, evaluation of human-giraffes conflicts, and the undertaking of a Population and Habitat Viability Analysis (PHVA) process, will allow us to propose an effective management plan and strategy for the long-term conservation and management of the Niger giraffe and its habitats.

Perspectives

A long-term study of the giraffes in Niger and it's habitat began in 2007 with, in particular, two PhD students working on this unique population.

Mr Boube Morou, a Niger student, laboratory Garba Moukaïla department of biology University Abdou Moumouni, Niamey, financed by Unseco MAB, is finishing his PhD on the giraffe habitat. Mr Jean-Patrick Suraud began a PhD to better understand the determining factors of the population dynamics and home range of this giraffe population Through the University Lyon, France, team Evolutionary Ecology of Populations, lab, Biometry and Evolutionary Biology. Mr Suraud's PhD is financed by the Prince Albert II Foundation, and supported by Cerza and CEPA.

Fig 2: Range map of the giraffes in the Koure plateau during the 2007 census



These two PhDs are complementary with Mr Suraud assessing the species current home range, whilst Mr Morou is mapping and characterizing the species habitat. To highlight one aspect of integration, Mr Morou is assessing the diet of giraffes through direct observations and analysis of faecal samples (quantitative approach), whilst Mr Suraud is testing the quality of their diet through chemical analyses (tannins, alkaloids, fibre, water quantity etc.), Seasonal use and quality of forage in relation with changes in seasons is probably one of the major factors influencing the giraffe's home range (Fennessy, 2003).

The ASGN research project is seeking additional financial support to put GPS satellite collars on several giraffes to obtain a more precise idea of the giraffe's home range. This will be the best method to better understand their daily and seasonal movements. With the assistance of the collars, we will be able to test the hypothesis: poor quality habitat implies a larger home range and the low

Giraffes of Niger, 2007 census and perspectives *cont.*

reproduction seasonality and sexual dimorphism imply that male's home ranges are bigger than the female's home ranges.

The study of the giraffe's home range is essential in term of conservation of the giraffes and its habitat in Niger. How can we effectively conserve this unique population without identifying migrations routes and forage habitats? This work follows on from an initial study of Niger's giraffe's home range undertaken at the end of the 1990's by Isabelle Ciofolo and Yvonick Le Pendu. Since this study, the giraffes habitat continues to disappear quickly because of the uncontrolled timber and fuel wood harvesting (due to its proximity to the capital, Niamey) and the increase of agriculture and pastoralism. The destruction of the habitat has repercussions on giraffe movements, with individuals already exploring new areas. In September 2007, two giraffes were photographed in Tilabéry (300km to the west of the giraffe zone) region where no giraffe had been observed in more than 20 years. Sadly, in October 2007, two giraffes ventured into Nigeria, and at least one was immediately killed by the poachers. It is very likely that giraffes have accelerated their prospecting, in search of new habitats. It is not without consequences on the survival of the population, and not unlikely that the current populations may soon split into several populations.

Other complementary studies, financed by the Prince Albert II de Monaco Foundation, are about to begin which will enable us to have a better understanding of human-giraffe conflict in the region. In particular, we will try to obtain an overview of the amounts of wood cut in the region. Many legal and illegal wood markets are present in the giraffe zone, and currently we have no idea about the quantity of wood sold every month/year, and we ignore how many people are supported by the wood cut. This information will be critical to find alternatives solution to the degradation of the habitat. To complete this study, we are working with Professors of Niamey University, to determine the possibilities of regeneration of the habitat, in particular the tiger bush.

Conclusion

This long-term research program will allow us to have a better understanding of the giraffe's habitat, its population dynamics, home range, activity behaviour, etc. Monthly surveys of the population (location, herd dynamics, births and deaths) will provide significant data, including identifying birth peaks, which in turn could replace the need for an annual census. However, the annual census is the only period during the year when all the actors involved in giraffe conservation work together. Additionally, the annual presentation of the photo identification album to the environment Minister is an important event: in 2007, several TV channels, international radios and many journalists were present and communicated this and the specificities of this unique giraffe's population to a broader audience which is important awareness raising.

This ecological data will be integrated into a PHVA process to be attended by various international experts (IUCN CBSG, IGWG, CIRAD, etc). The PHVA process is a powerful management tool which tries to predict the evolution of the population over time by looking at past knowledge of the population, species and the current and perceived threats. This tool and the other scientific studies will be important components in drafting a national strategy for the conservation of giraffes in Niger which will hopefully be undertaken in 2009.

(see refs on page 19)

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Giraffes in Europe

Marc Damon
EAZA Giraffe EEP coordinator

The number of giraffes in the wild is estimated to be around 100,000 (Fennessy, 2007). Additionally, there are about 2,000 giraffes in captivity, who serve as ambassadors for their congeners in the wild. This article gives an overview of the giraffe population in Europe and describes the difficulties in maintaining a sustainable population in captivity.

History of giraffes in captivity

Unknown outside of Africa for centuries, the giraffe so excited foreigners' senses of curiosity that it was sometimes sent as a diplomatic gift to other countries.

The most famous giraffe in history is undoubtly the story of Sennari (after her origins in Sennar, Sudan), which was sent as a gift to the King of France by the Sultan of Egypt. She was caught in 1826, taken up the Nile in a felucca and sent across the Mediterranean. It overwintered in Marseilles and in the spring of 1827, took several months to walk to Paris along with a gaggle of distinguished scientists and four cows, whose milk was used to feed the young, unweaned giraffe. The animal caused a great sensation in France – the last giraffe seen in Europe had been in Venice during the Renaissance in the 16th century. This giraffe eventually even inspired the building of the most celebrated structure in France, the Eiffel Tower. She died in Paris in 1945, being 19 years old!

In 1984 the Musée de l'Ile de France, organised an exhibition entitled "Une Girafe Pour Le Roi" (A Giraffe for the King) which celebrated the giraffe on whose life "Tall Horse" is based. A French academic, Daniel Dardaud, gave the exhibition's title to his book, published in 1985, which told the story of the giraffe's journey to Paris. The story has continued to inspire writers, Leith Hillard in the children's book "A Giraffe for France", May Jo and Peter Collier's "The King's Giraffe", Nancy Milton's "The Giraffe That Walked to Paris", Lynn Sherr's "Tall Blondes: A Book About Giraffes", published in 1997, which traced the cultural history of the giraffe, and Michael Allin's "Zarafa" published in 1998.

However bizarre this story may seem, it is not actually that unusual. There is evidence of even earlier diplomatic gifts in the form of giraffe. In 1414 the Chinese emperor Yong'le began funding spectacular voyages seeking to reassert a Chinese presence on the Western seas and enhance the prestige of his rule and dynasty. In 1414, a fleet led by the explorer Zheng, was sent north to Bengal, India, where the Chinese travellers saw a giraffe for the first time.

Romans were just as intrigued by animals as the Egyptians were, and by the first century BC private menageries on the estates of the wealthy were prevalent, even fashionable. A man named Fulvius Lippinus may have been the first Roman to establish such a preserve. According to Pliny, shortly before 50 BC he built a 27 acre enclosure with boars, stags and wild

Table 1: Number of giraffes in captivity according to by different sources

	2005 Global Census (Christman, 2006)	ISIS 2008 (www.isis.org)
South Africa (captivity)	8 in 6 facilities	17 in 4 facilities
Europe	617 in 140 facilities	595 in 112 facilities
North America	579 in 142 facilities	457 in 109 facilities
Central & South America	58 in 14 facilities	32 in 6 facilities
Asia	275 in73 facilities	97 in 16 facilities
Australia	67 in 13 facilities	73 in 13 facilities
Total	1613 in 387 facilities	1271 in 260 facilities

Giraffes in Europe *cont.*

sheep. He went on to stock more exotic species such as bears, lions and even giraffe.

Giraffes in captivity: an overview

It is impossible to determine the exact number of giraffes currently kept *ex situ*. At the moment the number of giraffes outside Africa can be estimated between 2,000 and 2,500.

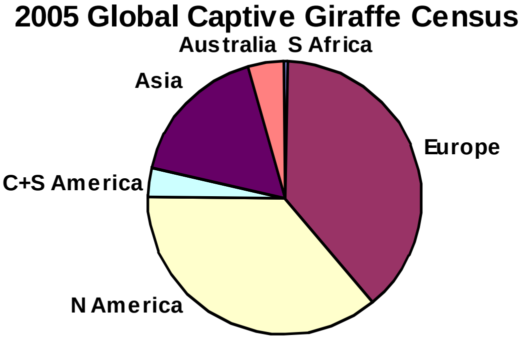
As giraffes are not protected by CITES regulations, their exact number will never be known, as no-one is obliged to report their number to any authority. However, some systems do exist, including ISIS – the "International Species Information System" which is used by approximately 600 zoological institutions to register their animal collection. For members of the Association of Zoos and Aquariums (AZA) in the United States, the Australian Regional Association of Zoo (ARAZPA) and the European Association of Zoos and Aquariums (EAZA) the use of ISIS is strongly recommended, if not obliged. However, at least in North America and Europe, there are many animal collections that are not affiliated member of the regional association, so their number of giraffes (and other species) can only be estimated. To give an idea about the accuracy of the data mentioned above: according to ISIS there are 595 giraffes in 112 European collections as of March 2008. In the European studbook for giraffes there are 722 giraffes in 137 institutions listed as of the end of 2007 and at least one hundred giraffes are known in Europe that are not included in the studbook. The number of giraffes in Europe is estimated at around 850 individuals - 40% higher than ISIS indicates.

Finally, one should not conclude from the data below, that the number of giraffes in captivity is declining; both sources (Christman, 2006 and ISIS, 2008) are not comparable; in the European Giraffe stud book the number of birth outnumbers the deaths each year, and there is no reason to expect another trend in other regions.

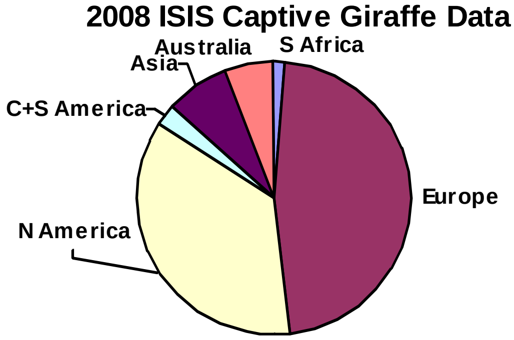
The EAZA Giraffe EEP

Since 1988 EAZA has established breeding programmes for endangered species, or species that are of great importance to the European zoo community, the so-called EEPs (European Endangered species Programs). Currently there are about 175 EEPs in Europe. The goal is to establish and maintain a sustainable population of a certain species (or subspecies) in captivity, to be independent from additions from the wild with the ultimate goal to be able to make animals available for IUCN-approved reintroduction projects. In the United States AZA has developed something similar: SSPs, the Species Survival Programs. However, as giraffes are not considered to be an endangered species, AZA decided not to establish an SSP for giraffes, but Baringo, Reticulated and Masai giraffes are managed by the lesser Population Management Plans (PMPs); here a studbook keeper is keeping an eye on the population to see if it develops in the desired direction. EAZA, however, has decided that the giraffes in Europe needed more control to avoid problems and therefore they

2005 Global Captive Giraffe Census



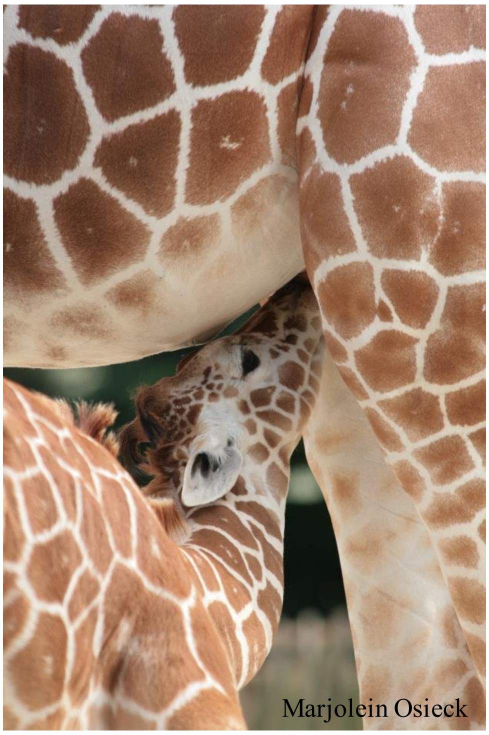
2008 ISIS Captive Giraffe Data



Giraffes in Europe
cont.

established an EEP. Within an EEP a coordinator can, together with the Species Committee, make recommendations that should be followed by the participants. By means of this there is more control about the development of the population.

When the Giraffe EEP was established in 1988, only 26♂ and 43♀ (69 total) Reticulated giraffes kept by 20 institutions were registered. In the first EEP report the coordinator, Dr. Brotzler from Stuttgart Zoo, wrote that one of the major problems is that many institutions keep both pure giraffes plus hybrids in a breeding situation. Nowadays this problem is still not completely resolved because of various political matters associated with giraffes. Dr. Brotzler also kept an unofficial register for all ‘other’ giraffes known to him and in 1991 EAZA decided to expand the Reticulated giraffe EEP into the Giraffe EEP, which included also hybrids and giraffes of unknown origin. Dr. Brotzler developed his own software program to enter all giraffes known. Unfortunately this program was not compatible with the internationally accepted studbook software program SPARKS, and recently almost 3,500 giraffes (historically) had to be entered into SPARKS. Because of the workload of this growing EEP in 2003 it was decided to split this EEP into two separate EEPs, each for a number of subspecies, together still covering all giraffes. In 2006 Stuttgart Zoo decided to stop coordinating the Reticulated giraffes after 18 years of hard work and both EEPs were reunited into one Giraffe EEP again.



Reticulated giraffes (*G.c. reticulata*), Rotterdam Zoo, Netherlands.

By invitation of Dvur Kralove, one of the most experienced giraffe keeping institutions in Europe, eight people gathered in 2004 to discuss husbandry guidelines for giraffes and to prepare an initial draft. This draft was circulated amongst both species committees and was accepted as the EAZA guidelines in 2006. When both Giraffe EEPs were re-united it was decided to accept all species committee members in the new giraffe EEP; therefore there are twenty species committee members now. The EEP has also advisors for nutrition, veterinary matters, genetic issues and for conservation projects. The previous EEP coordinator, Dr. Günther Schleußner from Stuttgart, serves as one of these general advisors.

The current European giraffe population

As of the end of 2007, there are 722 giraffes in 137 European institutions registered in the studbook. Unfortunately these giraffes are of six different pure subspecies, whilst about one third are hybrid or unknown giraffe subspecies. The first goal of the EEP is to phase out the unknown giraffe subspecies by assigning a pure or hybrid subspecific status to them. The other goal is to phase out the hybrids by preventing them to breed, either through birth control measures like the use of contraceptives or by placing them in single sex groups. By means of this the number of spaces available for pure giraffes will increase.

Giraffes in Europe
cont.

Kordofan giraffes
(*Giraffa camelopardalis antiquorum*)

This subspecies is, from a historical perspective, mainly kept by French institutions, as this subspecies occurs mainly in former colonies of France. Until last year there was only a small population of Kordofan giraffes in the EEP, as well as a slightly larger number of Nigerian giraffes (*Giraffa camelopardalis peralta*). However, a study carried out under supervision of the Musée National d'Histoire Naturelle (MNHN) demonstrated that all so-called Nigerian and Kordofan giraffes in Europe, as well as their crossbreeds, are in fact pure Kordofan giraffes. There are no Nigerian giraffes in Europe; they only exist in a small population of less than 200 individuals in Niger. For the EEP this was a favourable conclusion, as now both populations could be managed together, which increased the number of founders to 6 individuals. The gene diversity is 0.78 and the population is unfortunately not really growing as the death ratio is quite high. It is hoped that this will decrease now with both subpopulations able to be more intensively mixed, resulting in a higher gene diversity and higher fitness. About 20% of these animals are being kept in Paris Zoo; other successful breeding groups reside at Doué-la-Fontaine, Les Sables d'Olonne, Jurques and Sigean - all in France.

Cape giraffes
(*Giraffa camelopardalis giraffa*)

When purely looking at figures, this population has a healthy future. There are 43 Cape giraffes in the EEP population, kept at 10 institutions. Mosty animals are young and wildcaught and are potential founders once they start breeding. However, these 10 institutions are scattered thoughout the region and because of veterinary restrictions, transfers between most of these institutions are not allowed. These giraffes are being kept in France (2 institutions), Russia (2 institutions), Israel (3 institutions) and the United Arab Emirates (3 institutions). The majority of these institutions have not much experience in giraffe keeping and this, together with the fact that a high percentage is wildcaught, most likely will result in a high death ratio of this subspecies.

Angolan giraffes
(*Giraffa camelopardalis angolensis*)

Only four institutions are keeping Angolan giraffes; two in Germany and two on the Iberian peninsula (Spain and Portugal). Although the transport distance is long and the occurrence of blue tongue in western Europe restricts transfers, it is still not impossible to organise transfers between these two regions. The current population of 19 animals derives from four founders. Gene diversity is still relatively high at 0.84 but it is inevitable that this

Table 2: Number of giraffes in Europe per subspecies as of 31 December

Subspecies	Number of giraffes (♂.♀)	Number of institutions
Kordofan giraffes (*G.c. antiquorum*)	62 (20.42)	13
Cape giraffe (*G.c. giraffa*)	43 (19.24)	10
Angolan giraffe (*G.c. angolensis*)	19 (6.13)	4
Masai giraffe (*G.c. tippelskirchi*)	7 (2.5)	3
Reticulated giraffe (*G.c. reticulata*)	112 (57.55)	33
Baringo giraffe (*G.c. rothschildi*)	281 (106.175)	65
G.c. hybrids	151 (67.84)	50
G.c. unknown subspecies	47 (14.33)	26
Total	722 (291.431)	137*

*: several institutions are keeping more than one subspecies, in particular as bachelor groups

Giraffes in Europe *cont.*

will decrease in the next generation. Reproduction should be optimized, but this may be restrictive due to veterinary restrictions.

Masai giraffes
(*Giraffa camelopardalis tippelskirchi*)
Most likely we will lose this subspecies within a few years. Basel Zoo in Switzerland is keeping 5 females of this subspecies; two other individuals (a male and a female) are being kept by two Israelian zoos - these two giraffe are related to the Basel stock and cannot be transferred to Switzerland because of veterinary restrictions (N.B. one of them died shortly before this article went to press). The management of Zoo Basel strongly wishes to continue keeping and breeding this subspecies and they are trying to import one or two males from another region, but this is difficult from both a veterinary and financial perspective.

Reticulated giraffes
(*Giraffa camelopardalis reticulata*)
This population has been kept under coordination of an EEP since 1988; although unfortunately it did not do as well as it could do and during these years the average annual growth rate was only 2%. Last year the growth increased to about 6% per annum, a positive step. This population is healthy with 23 founders who were mostly imported in the 1960s and 1970s. Gene diversity is still quite high at 0.94. The majority of these giraffes are being kept by Dutch and German city zoos, who have limited space and who are only keeping small breeding herds of one male with 2 or 3 females. These zoos have maintained very good records and therefore a hundred percent of all pedigrees are known: many of these institutions, until the early 1990s, had good contact with brokers.

Baringo giraffes
(*Giraffa camelopardalis rothschildi*)
The history of this subspecies began with the era of the safariparks in the early 1970s. Hundreds of Baringo giraffes were imported from Uganda and transferred to safariparks in the Czech Republic, United Kingdom, the Netherlands and Germany. This subspecies is also historically held in larger groups where one male had more females than in the Reticulated giraffe situation. Therefore fewer males had the chance to reproduce resulting in only 41 founders, although well over a hundred Baringo giraffes were imported. These safariparks on the average did not keep very good records and therefore only 67.9% of the pedigree of this subspecies is known. Gene diversity is 0.95, but the value of this is lower than in the reticulated giraffes, where the whole pedigree is known. This subspecies forms the largest group in Europe with currently 281


Marjolein Osieck

"Hilvarenbeek": Baringo giraffes (*G.c. rothschildi*), Safaripark Beekse Bergen, Hilvarenbeek, Netherlands

Giraffes in Europe *cont.*

individuals kept in 65 institutions, equating to 39% of all giraffes in the Giraffe EEP.

Hybrid giraffes

These comprise of proven crossbreeds of two giraffes of different subspecies. As the goal of the EEP is to maintain sustainable populations of pure (sub-)species, the goal of the Giraffe EEP is to phase out the hybrid giraffes in order to make space available for pure subspecies giraffes. At the moment there are 151 hybrids in 50 institutions, and over half of them are in non-breeding situations. We can not currently completely stop the breeding of hybrids; both for political reasons (some zoos simply refuse to stop) as well as the limited number of pure giraffes to supply to all participants; so it is really a matter of balance. However, the growth of hybrids is slower than the growth ratio of pure giraffes. New, inexperienced institutions all have to start with a single sex group to gain experience; all hybrid males that are being born are placed in bachelor groups.

Unknown subspecies giraffes

For several giraffes, their complete pedigree is unknown. In several cases, especially safariparks, the sire is known as they had more (sub-)adult males in the group. Not all institutions cared about subspecies decades ago, and as such giraffes of different subspecies were kept together, resulting in offspring of partially unknown parentage. The goal of the Giraffe EEP is to phase out this group by filling in the gaps; making them either a hybrid or a purebred giraffe. Over the past year, an attempt to trace the origin of many of these giraffes , and as such it seems that in many of these cases we will never be able to find out the exact subspecies. As an example. this applies to three giraffes that were imported by Rome Zoo shortly after World War II. They came from an unknown destination and it could only be found out that they were shipped from Addis Ababa, Ethiopia. They have been mixed in 6 generations with different subspecies making the majority of the progeny definitely hybrids, but there might still be some of pure subspecies. However, all attempts to trace the origin ended up with no result.

General problems

Giraffes are a high profile species in zoos, which makes management sometimes a difficult task. Many institutions strongly prefer to keep a breeding group of giraffes (zoos have a commercial interest as well), although at the moment no females are available. Transports of giraffes are not only stressful to the animals (and the staff involved!) but also a very expensive event. For all these reasons giraffe transports are restricted as much as possible, but they are inevitable for zoo management and for the management of the European giraffe population.

Once the EEP and the individual participants have agreed upon a giraffe transfer, the problems just start. Europe comprises many relatively small countries and all countries have, although the majority belongs to the EU, their own veterinary requirements. Most of them require negative tests on tuberculosis and brucellosis before allowing hoofstock, including giraffes, in their country. Taking a blood samply from a giraffe is a risky event, as only a minority of the institutions are capable of doing this without sedation. It is very risky to put a giraffe down as each year several giraffes die under sedation, mostly because of neck or leg fractures. As a result, many zoos refuse to take blood samples. Apart from this risk, blue tongue has been diagnosed in western Europe, resulting in several countries closing their borders for hoofstock from blue tongue infected areas. This was a big problem in 2007, although the management of this is getting better.

Giraffes in Europe
cont.

Conservation

Zoos are trying to support animals in the wild by showing them and increasing education awareness to visitors. Additionally, Zoo Doué-la-Fontaine in France and South Lakes Wild Animal Park in Dalton-in-Furness in United Kingdom are supporting the "Association pour la Sauvegarde des Girafes du Niger" (ASGN) [Association for the protection of giraffes in Niger] which has a programme to protect Nigerian (or West Africa) giraffes and their habitat, while improving the wellbeing of the local people in Niger. More institutions are expected to support in the future.

Final remarks

In short, it can be said that the European breeding program for giraffes is a real challenge; as all conservation efforts require the animals...and people! The European giraffe population is doing well and has a bright future, but close monitoring and coordination will be needed over the next decade. Special thanks go to all participants in the giraffe EEP, to all species committee members and to all advisors; together we care about the future of giraffes in Europe, and in Africa!

References:

- Christman, 2006. A history of AZA Giraffe; there and back again. Presentation given at EAZA/AZA Joint Hoofstock Meeting, Hannover 2006.
- EAZA Giraffe EEPs. 2006. EAZA Husbandry & Management Guidelines for *Giraffa camelopardalis*. Burgers' Zoo, Arnhem.
- Fennessy. 2007. GiD: development of the Giraffe Database and species status report. In: Giraffa; Bi-Annual Newsletter of the International Giraffe Working Group (IGWG), Volume 1, Issue 2: 2-6.
- Hassanin *et al*., Mitochondrial DNA variability in Giraffa camelopardalis: consequences for taxonomy, phylogeography and conservation of giraffes in West and central Africa, C. R. Biologies (2006), doi:10.1016/j.crvi.2007.02.008

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"YT5W": Baringo giraffes (*G.c. rothschildi*) transported from Maubeuge Zoo, France, to Rhenen Zoo, the Netherlands.

Hand-Rearing a Giraffe (*Giraffa camelopardalis reticulata*) at Miami MetroZoo

Terry D. Webb, Curator of Mammals

Introduction

Maternal neglect of giraffe calves has been documented both in the wild and in captivity. The most commonly believed reason is that the calves do not stand and attempt to suckle in a quick manner. The mother's maternal instincts are released by the calf's successful efforts to help itself to the udder and therefore only the strongest survive. Some giraffe calves have been observed to nurse within the first ten minutes of life (Dagg and Foster, 1976).

Hand rearing is not recommended as an elective process and especially not for male giraffes (Giraffe Husbandry Resource Manual, AZA and Giraffe Taxon Advisory Group, 2004). In almost all cases, the philosophy of zoo managers is for the offspring of captive born species to be parent-reared. At times this goal can not be obtained for various reasons. When an animal needs to be hand-reared it is very important to have a clear plan of action for intervention by staff. The dietary, medical, and social needs of the species all should be included in the hand-rearing protocols.

On 12 August 2005 a male giraffe was born to a multiparous female at Miami MetroZoo. This calf was normal in appearance and was immediately rejected. This female had rejected her previous two calves. The first calf had a hoof deformity and was euthanized. The second calf was normal in appearance and was immediately rejected with violent behavior from the dam. It was pulled and sent to another institution for hand-rearing, but did not survive.

Hand-rearing protocols and process

Once maternal rejection of this male calf was confirmed (4 hours of aggressive behavior from the dam), the keeper staff, managers and veterinary staff met and decided to attempt to hand rear this individual.

Day 1 - Late in the afternoon a bottle was offered and calf refused to suckle. Staff next hand restrained the calf, a blood sample was obtained, umbilicus was cleaned with Betadine(chemical disinfectant), injections of vitamin E and antibiotics were given, and a weight obtained. The calf was then tube fed one liter of carnation milk mixed with freeze-dried commercial bovine colostrum.

Day 2 – Staff continued to try different nipple types and offered a bottle hourly without any success. The calf was given SQ electrolytes and dextrose in the afternoon.

Day 3 – Staff continued to attempt to bottle feed without success. At 14.30 the calf was tube fed with 500 ml of electrolytes and at 17.30 the calf was tube fed with1 liter of electrolytes and a blood sample taken.

Day 4 – Calf restrained and a commercial "small-calf nipple was forced into the calf's mouth. Calf suckled for the first time at 11.00 and consumed five liters of carnation milk. At 13.00 calf took nipple on its own and consumed 800 ml. 17.30 – 900 ml. 21.00– 900 ml. Found small amount of defecation overnight for the first time and urinated 4 times after stimulation at each feeding.

Day 5 – Calf continues to take bottle well. Urinating and defecating without stimulation. Body temperature = 100.4 F. Feeding schedule established to be 1000ml at each feeding for 5 feedings per day.

Day 6-10 – Calf continues to take bottles well. Day 10 body temperature = 100.9 F.

Day 11 – Body Temperature = 100.3 F.

Hand-Rearing a Giraffe (*Giraffa camelopardalis reticulata*) at Miami MetroZoo

Eating 100%.

Day 12-16 – Eating 100%.

Day 17 – Formula increased to 1200 ml per feeding for 5 feedings per day.

Day 19 – Neonatal exam done, blood draw, tetanus, clostridium, and leptospirosis vaccines given.

Day 21 – Began housing and socializing calf to adult female and juvenile female. No problems observed and calf separated for the evening.

Day 35 – Calf lethargic, ears down, reduced appetite at multiple feedings. Started Rx Pepcid AC, 10mg, PO in formula at each feeding UFN.

Day 36 – Pepcid AC reduced to 3 feedings per day. BT = 99.5 F. Fecal sample negative for pathogens. Rx single dose, Sulfamethoxazole-Trimethoprime (TMPS), 1920mg, PO.

Day 37 – Diet amount reduced to 800ml per feeding for 5 feedings daily. BT = 100.6 F. Urine sample submitted and all values within normal limits.

Day 38 – Rx Panacur, 15ml (de-wormer), single dose, PO, in formula.

Day 39 – Manual restraint, x-rays taken of chest, ultrasound of umbilicus, and blood sample taken, and no abnormalities observed.

Day 40 – Rx change, Pepcid AC stopped and Gastroguard, 0.7ml, PO, SID, UFN.

Day 42 – Diet increased to 1000ml per feeding. Refused all feedings throughout the day, blood sample taken for culture, given injection of Naxcel (antibiotic) and Eqstim (immune booster).

Day 43 – Rx Naxcel injection IM, SID, for 3 days due to poor weight gain and appetite and no confirmed illness.

Day 46 – Eating well, no defecation seen in 3 days, urinating well. Rx Eqstim 1X weekly UFN and Naxcel injection SID, UFN.

Day 47 – Immobilized for standing sedation. BT = 99.4 F. Blood sample taken and injections given of Naxcel and Banamine. Aspirated raised area filled with brown fluid on back and submitted sample for culture. Seramune (equid immune booster) was administered IV via (1) liter of LRS. Gastroguard stopped.

Day 49 – Formula increased to 1200 ml per feeding.

Day 51 – Naxcel stopped and Rx Sulfatrim 2.5 tabs, PO, BID, UFN.

Day 54 – Eqstim injection.

Day 57 – Formula increased to 1400ml per feeding for 5 feedings.

Day 60 – Eqstim injection and Sulfatrim increased to 3 tabs, PO, BID.

Day 84 – Changed from 5 to 4 feedings per day.

Day 89 – Observed eating hay and grain.

Day 120 – Changed from 4 to 3 feedings per day and increased to 1600ml per feeding.

Day 151 – Changed from 3 to 2 feedings per day.

Day 180 – One feeding per day.

Day 231 – weaned.

Hand-Rearing a Giraffe (*Giraffa camelopardalis reticulata*) at Miami MetroZoo *cont.*

Data for progress of growth

- Birth weight – 47.27 kg (104.0 pounds).
- Weaning weight – 140.91 kg (310.0 pounds).
- Total weight gain from birth to weaning – 93.64 kg (206.0 pounds).
- Weight at one year of age – 219.1 kg (482.0 pounds).
- Total weight gain from birth to one year of age – 171.82 kg (378.0 pounds).
- Average weight gain per month from birth to one year of age – 14.91 kg (32.8 pounds).

Socialization

The socialization process for this calf began at day 1. This calf was given a chance to nurse from its mother. The decision to hand-rear this calf included that the location for the process be in the giraffe barn where the herd and the calf could, smell, hear, touch and see each other through chain link fencing. At day 22 the decision was made to house the calf with a 29 year old experienced female and her 6-month old calf during the day when keepers were present to observe the group. No aggression was observed and this management style was used for the remainder of the hand-rearing process without any problems. The calf was separated out for bottle feedings and housed alone at night. This social grouping is believed to have been beneficial for this animal's species specific behavioral interactions and for his future integration to another herd at another facility.

Conclusions

Hand-rearing is a difficult, challenging, and labor intensive, especially during the early portion of the process. With this giraffe, the most difficult and challenging aspect for the staff and the animal was nipple acceptance and the recognition that it was the location for nursing. A chute or restraint area may have been helpful during the early part of this project. After the calf recognized and accepted the nipple, and a few medical hurdles were cleared, the hand rearing of this individual was very successful.

Acknowledgements

The senior keeper, Amy Neill, of this area was instrumental in getting this project to be successful. Her dedication and husbandry skills were very valuable. The primary keeper in the area, Nick Pottratz also did a great job. Dr. Christine Miller provided great guidance and patience with dietary needs and medical issues. Everyone deserves thanks and appreciation for their efforts.

References

- Burgess, A. (Ed.) 2004. The Giraffe Husbandry Resource Manual, The Association of Zoos and Aquariums Antelope Giraffe Taxon Advisory Group.
- Dagg, A. I., and Foster, J. B. 1976 The Giraffe Its Biology, Behavior, and Ecology.
- Robert E, Krieger Publishing Company, Malabar, Florida.

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Recently Published Research

Fleming, P. A., Hofmeyr, S. D., Nicolson, S. W. & du Toit, J. T. 2006. Are giraffes pollinators or flower predators of *Acacia nigrescens* in Kruger National Park, South Africa? *Journal of Tropical Ecology*, 22, 1-7.

Fleming, P. A., Hofmeyr, S. D. & Nicolson, S. W. 2007. Role of insects in the pollination of *Acacia nigrescens* (Fabaceae). *South African Journal of Botany*, 73, 49-55.

Tasty morsels

We examined the relationship between giraffes (*Giraffa camelopardalis*) and knobthorns (*Acacia nigrescens*) in Kruger National Park, South Africa, to determine whether these tall ungulates may be providing a pollination service for the trees, or are simply flower predators (Fleming et al. 2006). We compared the nutritional content of knobthorn flowers with alternative available browse, quantified florivory and subsequent fruit set in the presence and absence of giraffes, and recorded potential insect visitors to the trees. Knobthorn flowers are clearly a substantial dietary reward for giraffes, with ~50% more water, almost twice as much protein and about 33% less acid detergent fibre than alternative browse. Although knobthorn flowers contain almost three times as much condensed tannin than leaves, giraffes consume large quantities of flowers (~85% of flowers within reach), resulting in distinct browse lines on trees. This substantial florivory was detrimental to the overall fecundity of knobthorn, with significantly reduced fruit set at heights on trees that are accessible to giraffes. Giraffes were therefore effectively flower predators of knobthorn in the season (2003) we examined.

Acacia nigrescens produces small quantities of concentrated nectar, and has abundant pollen resources available to potential pollinators (Fleming et al. 2007). We recorded large numbers of insect visitors and most fruit set on the tops of trees, beyond the reach of giraffes. Wasps, flies and solitary bees were the most numerous visitors and are likely to play a significant role in knobthorn pollination.

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A hungry giraffe browsing on knobthorn (*Acacia nigrescens*) flowers.

Recently Published Research *cont.*

Clauss M, Franz-Odendaal T, Brasch J, Castell JC, Kaiser T (2007)
Tooth wear in captive giraffes (*Giraffa camelopardalis*): mesowear analysis classifies free-ranging specimens as browsers but captive ones as grazers. Journal of Zoo and Wildlife Medicine 38: 433-445

Abstract: Captive giraffe (*Giraffa camelopardalis*) mostly do not attain the longevity possible for this species, and frequently have problems associated with low energy intake and fat store mobilization. Abnormal tooth wear has been among the causes suggested to potentially underlie these problems. In this study, we apply a tooth wear scoring method ("mesowear") used in paleobiology to museum specimens of free-ranging (n=20) and captive (n=41) giraffe. The scoring system differentiates between attrition- (typical for browsers, as browse contains little abrasive silica) and abrasion-(typical for grazers, as grass contains abrasive silica) dominated wear. The resulting wear signals of the two populations were compared to literature data. The dental wear pattern of the free-ranging population is dominated by attrition, resembles that previously published for free-ranging giraffe, and clusters within browsing herbivores in comparative analysis. In contrast, the wear pattern of the captive population is dominated by abrasion, and clusters among grazing herbivores in comparative analyses. A likely explanation for this difference is the content of abrasive elements in zoo diets; whereas silica content (measured as acid insoluble ash) is similarly low in browse and alfalfa, not only grass hay, but also the majority of pelleted compound feeds contains distinctively higher amounts. It can be speculated that the abnormal wear pattern in captivity compromises tooth function in captive giraffe, with deleterious long-term consequences.

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Giraffes of Niger, 2007 census and perspectives cont.

Jean-Patrick Suraud

References

- Ciofolo, I. 1998. Rapport final de mission du projet Projet d'Utilisation des Ressources Naturelles de Kouré et du Dallol Bosso Nord. PURNKO, Niger
- Hassanin, A. et al., 2007. Mitochondrial DNA variability in Giraffa camelopardalis: consequences for taxonomy, phylogeography and conservation of giraffes in West and central Africa. C. R. Biologies **330** : 265-274.
- Brown, D. et al., 2007. Extensive population genetic structure in the giraffe. BMC Biology 2007, 5-57.
- Fennessy, J. et al., 2003. Distribution and status of the desert-dwelling giraffe (*Giraffa camelopardalis angolensis*) in northwestern Namibia. Afr. Zool. **38** : 184-8.
- Hewison, M. et al., 1999. Successful sons or advantaged daughters? The Trivers–Willard model and sex-biased maternal investment in ungulates. TREE. **14** : 229-234.
- Abdou, A. 2005. Master report : Etude prospective des sites de formationscontractées dans certaines zones de l'Ouest nigérien (Fandou et Tombo) dans la perspective de la décongestion de la zone de Kouré habitat actuel des Girafes.

Recently published research cont.

Doherty, J.B. 2006. Why do giraffes occur in aggregated dispersion patterns? MScThesis. Submitted in partial fulfilment of the requirements for the degree of Magister Scientiae (African Mammalogy), Mammal Research Institute, University of Pretoria, Republic of South Africa

Supervised by Prof. Johan T. du Toit and Dr. Elissa Z. Cameron

The spatial and social organisation of giraffe populations is unusual by comparison with those of other large herbivores. Aggregated dispersion patterns are not matched by social cohesion and long-term bonds between individuals seem not to exist. Some of the selective advantages of group living postulated in the literature may not require stability of group composition for the behaviour to be maintained. In this paper, the results of three separate studies are used to test two non-mutually exclusive possibilities: (i) that aggregation allows individual giraffes to reduce the time they spend on anti-predator vigilance by pooling their efforts with others', and (ii) that monitoring and cueing on the foraging success of conspecifics allows individual giraffes to increase their own rates of nutrient- and energy acquisition. The results are inconclusive but they suggest that aggregation in giraffes is essentially a female strategy; that both of the tested benefits of aggregation are influential, albeit at low levels; and that males forego these benefits for much of the time in their search for reproductive opportunities. The paper is an exercise in constructive replication, which is relatively uncommon in the study of animal behaviour.

Postscript:

John has recently begun a PHD through Queen's University, Belfast looking at: 'Giraffid social and reproductive strategies' supervised by Dr Michael Scantlebury and Professor Bob Elwood.

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Fennessy, J. 2008. An Overview of Giraffe *Giraffa camelopardalis* taxonomy, distribution and conservation status, with a Namibian comparative and focus on the Kunene Region. Namibia Journal NWG / Journal NSS Band / Volume 56: 65-81.

Limited knowledge of the giraffe's taxonomy, distribution and conservation status currently exists at the species and subspecies level. This lack of understanding has compounded the species long-term conservation Africa-wide, including in Namibia where waves have been made regarding the species potential conservation down listing based on little, if any, scientific evidence. This study provides the first concise overview of the Namibian giraffe in respect to its taxonomy, conservation status, population numbers and historical distribution, and in context of the entire extant population of Africa.

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Recently Published Research *cont.*

and monitored their endocrine status using fecal steroid analysis. We have previously validated an assay for fecal pregnanes and here we report our validation for fecal estrogens. Both sex steroid concentrations were suppressed in two females, although one female exhibited an immediate post-implantation positive feedback response. Sexual activity nearly disappeared in one animal, whereas the other showed regular sexual behavior. The contraceptive effect lasted for at least 472 d, and successfully suppressed estrous cyclicity in one female for >2 y. We conclude that deslorelin implants provide a minimally invasive means for long-term suppression of reproduction in female giraffe.

Bercovitch, F.B., Bashaw, M.J., Penny, C.G. and Rieches, R.G. 2006. Maternal Investment in captive giraffes. Journal of Mammalogy. 85(3): 428-431.

Sex-biased maternal investment involves differential allocation of resources to production and rearing of sons or daughters as a function of their anticipated reproductive output. We examined reproductive investment among captive giraffes (*Giraffa camelopardalis*) over a 21-year period to determine extent to which females invest differentially in offspring by sex. We found an unbiased sex ratio at birth and comparable interbirth intervals following rearing of either sons or daughters. Early neonatal mortality compressed interbirth interval and females probably conceived while lactating. We suggest that females invest equally in sons and daughters because males surpass females in size subsequent to the period of infant dependency.

Del Castillo, S.M., Bashaw, Patton, M.L., Rieches, R.G. and Bercovitch, F.B., 2005. Fecal steroid analysis of female giraffe (*Giraffa camelopardalis*) reproductive condition and the impact of endocrine status on daily time budgets. General and Comparative Endocrinology. 141: 271-281.

Gestation and lactation can impose substantial energetic costs on female mammals. We developed a non-invasive means to determine reproductive condition in female giraffe using fecal steroid analysis. Giraffe may be especially challenged during their reproductive cycle because of two characteristics: they are impregnated while lactating and they do not breed seasonally. We studied the social behavior and endocrinology of seven female giraffe in a large naturalistic outdoor enclosure in order to chart connections between maternal physiology and behavior across the reproductive cycle. We found that giraffe gestation averages 448 days among females producing a calf that survived, with fecal pregnane concentrations reaching a zenith during the last trimester of pregnancy. Resumption of ovarian cyclicity following parturition was accelerated after neonatal calf mortality, but ovarian cycles resumed as early as 39 days post-parturition while nursing. Although time spent feeding was unaffected by reproductive state, pregnant females significantly reduced time allocated to social behavior and had a tendency to locomote less than when cycling or acyclic. We suggest that modifications in foraging strategies as a function of reproductive state among wild giraffe derive from anti-predator activity rather than from metabolic demands. Female giraffe probably cope with simultaneous lactation and gestation by producing high quality milk for neonatal calves commensurate with slow fetal growth and accelerating fetal growth simultaneous with weaning of nursing calves.

Recently Published Research *cont.*

Bercovitch, F.B., Bashaw, M.J. and del Castillo, S.M. 2006. Sociosexual behavior, male mating tactics, and the reproductive cycle of giraffe *Giraffa camelopardalis*. Hormones and Behaviour. 50: 314-321.

Female distribution exerts a major impact on male mating tactics. Giraffe cows have a reproductive cycle, and a social system, that should favor a male roaming reproductive tactic. We conducted a 2-year study of female Rothschild's giraffe (*G. c. rothschildi*) reproductive endocrinology in order to characterize attributes of the reproductive cycle and investigate how female endocrine and behavioral cues influence mating activity. We used non-invasive fecal steroid methods to determine reproductive state among females residing in a herd in a large outdoor enclosure. We found that females had an estrous cycle of 14.7 days and that they regularly had multiple ovarian cycles prior to conception. Adult males were more likely to associate with, and sexually investigate, females when they were cycling than when they were either pregnant or acyclic. During the estrous cycle, male–female proximity and sociosexual behavior were more pronounced during the probable fertile phase than the rest of the cycle. Sexual activity between giraffe coincided with the periovulatory period, with male interest in females peaking during the fertile window in the absence of proceptive behavior by females. We conclude that males detect reliable cues revealing female reproductive status and partition their reproductive effort in response to such cues. We propose that male giraffe adopt a roaming reproductive strategy with their large size, enabling them to search for and mate guard fertile females while minimizing metabolic costs.

Bashaw, M.J, Bloomsmith, M.A., Maple, T.L. and Bercovitch, F.B. 2007. The structure of social relationships among captive female giraffe (*Giraffa camelopardalis*). Journal of comparative psychology. 121(1): 46-53.

Giraffe herds have been characterized as random associations of individuals, but recent evidence suggests giraffe have a more complex social structure. The authors formulated 3 hypotheses designed to evaluate whether a herd of captive giraffe (*Giraffa camelopardalis*) associated randomly or patterned their behavior and proximity in a manner indicative of social relationships. Affiliative interaction, proximity, and nearest neighbors for 6 captive female giraffe living in a large outdoor enclosure were analyzed, and all three measures were nonrandomly distributed, indicating female giraffe had social preferences. Furthermore, preferences were consistent across measures and time, suggesting that adult female giraffe maintain relationships. Mother-daughter pairs and pairs with large age differences between members interacted and associated most often. The social structure of this captive herd is influenced by social relationships between individual adult females, and the social behavior of individual females should be examined more closely in the wild.

Patton, M.L., Bashaw, M.J., del Castillo , S.M., Jochle, W., Lamberski, N., Rieches, R. and Bercovitch, F.B. 2006. Long-term suppression of fertility in female giraffe using the GnRH agonist deslorelin as a long-acting implant. Theriogenology. 431-438.

Zoological institutions provide an environment conducive to studying proximate mechanisms influencing reproduction that can provide guidance to both field and captive settings seeking to manage their stock. Both national parks and zoos have space limitations that sometimes require the use of reversible contraception in order to reduce reproductive rate or limit specific individuals from reproducing. We designed a study to test the efficacy of a long-lasting contraceptive in female giraffe monitoring reproductive endocrinology and behavior. We implanted two animals with the GnRH agonist deslorelin

Notes: Giraffe highlights from the 2007 AAZV, AAWV, AZA/NAG Joint Conference

Summary by Thomas W. deMaar, DVM
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Serum fatty acid concentration comparisons between free-ranging and captive giraffe by Debra A. Schmidt et al. Lincoln Park Zoo (current address: Zoological Society of San Diego)

Serum concentrations of fatty acids in captive giraffes were compared to values obtained from free-ranging giraffes in an effort to identify potential nutritional differences in the captive population. Serum samples from 20 captive giraffes at 10 zoological institutions in the United States were compared to previously collected samples from 24 free-ranging giraffes in South Africa. To standardize results all samples were analyzed at a laboratory in South Africa. Of the 22 quantified fatty acids, 13 (59%) were significantly different between captive and free-ranging giraffes. Only linoleic, arachidonic, and docosapentaenoic acids were found in higher concentrations in zoo giraffe; all other fatty acid differences were higher in free-ranging giraffes. All significantly different omega-3 fatty acids were 2 – 3x higher in free-ranging giraffes than captive giraffes.

A simple field ventilator for large ungulates by Scott Cittino, White Oak Conversation Center, et al.

A simple, effective ventilator utilizing either and electric or gas powered leaf blower as the drive source was designed as an emergency field ventilator for giraffe. This ventilator is made of commonly available parts, has a pop-off valve and pressure gauge to prevent over-inflation, an expiratory valve to provide post expiratory end pressure, and is compact and easy to carry in the field. The device was used on three giraffe (580-700 kg) and adequate ventilation was achieved as demonstrated by increased oxygen and decreased CO2 levels.

Influence of diet transitions on serum calcium and phosphorus in captive giraffe by Elizabeth Koustos of Mazuri Exotic Animal Nutrition et al.

The giraffe at Omaha's Henry Doorley Zoo received 3 diet types, a commercially available diet and 2 reduced-starch diets for one year each. Blood was collected and analyzed for Ca and P. Calcium levels were not affected however blood phosphorus was reduced and thus Ca:P ratios were changed to 0.98 +/- 0.04. Ca:P ratios before the diet change were 1.26. Free-ranging giraffe serum Ca:P average 1.04, thus the optimum ratio for captive giraffe warrants further discussion.

Copper oxide wire particles for controlling intestinal parasites in giraffe by Allyson Kinney and colleagues of Louisiana State University and Busch Gardens Tampa Bay.

Endo parasite infection in captive wild hoofstock is a challenge due to anthelmintic resistance, animal compliance and lack of fecal egg count monitoring. This study evaluated multiple doses of copper oxide wire particles (COWP) in giraffe to prevent Haemonchus spp. infection.

Fecal egg count reductions of 27-95% were achieved. Toxicity to COWP was not noted but needs to be monitored closely

Notes: Giraffe highlights from the 2007 AAZV, AAWV, AZA/NAG Joint Conference
Cont.

The impact of nutritional factors on the development of phosphatic uroliths using meat goats as a model of captive giraffe by Kathleen Sullivan and colleagues from North Carolina State University and The Wilds (present address: Disney's Animal Kingdom)

Obstructive urolithiasis is a documented problem in domestic ruminants, such as the meat goat, and exotic herbivores, such as captive giraffe. These two species develop phosphorus based uroliths and are considered browsing ruminants. Due to the logistical challenges of performing studies with captive giraffe, a metabolic trial was conducted using meat goats as a model. The intent of this study was to determine the impact of type of diet (ADF-16 or Wild Herbivore complete pelleted feed) and complete pelleted feed to hay ratios (20 or 80% hay) on the development of urolithiasis in meat goats, in the context of captive giraffe feeding practices. The diet in which ADF-16 pellets were fed in combination with 20% hay had the lowest levels of fiber, the lowest calcium (Ca) to phosphorus (P) ratio, and the highest level of P compared to the other 3 diet treatments. From our results, we concluded that feeding the ADF-16 pellets with hay as 20% of the diet, produced a trend of high urinary P over the four week experimental period. There was also a tendency for a higher crystal count in the urine when hay was 20% of the diet. These can be considered strong risk factors for the development of phosphatic uroliths and warrants further investigation.

Further comparisons between free ranging and captive giraffes Other parallel papers comparing physiologic elements between free ranging and captive giraffe that are under way are:

1) A paper comparing serum nutrient profiles between captive and free-ranging giraffes by Dr. Debra A. Schmidt et al. which is currently under review

2) A paper comparing serum chemistries between captive and free ranging giraffe by Dr. Ray Ball et al.

Classic giraffe book still available

The classic and out of print book: GIRAFFE: Its Biology, Behavior and Ecology by Anne Innis Dagg & J. Bristol Foster , 1976, reprinted in 1982, ISBN 0-89874-275-7 is still available from Krieger Publishing Company in the USA.

www.krieger-publishing.com

Giraffe husbandry and hoof health: what factors have significance?

PhD research being performed by Dr. Anke Egglebusch, Frankfurt Zoo and University of Giessen).

Email: Anke.Eggelbusch@gmx.de

Hypothesis: Hoof and joint problems do not depend on a single factor but are caused by an interaction of conditions: movement level, floor substrate, nutrition, heredity, and weight/size.

Part one: Movement level is closely associated with time of exercise, size of enclosure, group composition (sex, age, other species) and interaction between individuals. Observations of the movement of different composition groups of giraffes in captivity and the utilization of their enclosure have been conducted at the Frankfurt Zoo (171.5 hours), Zoo Köln (79 hours) and the Zoo of Nürnberg (70 hours).

Part two: A web based census form was created which includes general information about giraffe husbandry as well as specific information about each animal and its hoof health. Over 50 zoos from all over the world have answered, mainly Europe and North America.

Notes: Giraffe highlights from the 2007 AAZV, AAWV, AZA/NAG Joint Conference *Cont.*

Giraffe Body Scoring

Recently completed by Joe Christman, Disney's Animal Kingdom and colleagues. This project was a result of the Giraffe Nutrition Workshop sponsored by the Lincoln Park Zoo in May of 2005.

Working towards a standard body scoring system, a call was made to all North American giraffe holders for standardized digital photographs of their giraffe, showing full left side, full frontal and full rear views. The response to the request was excellent, with over 300 photos provided from 70 institutions.

In order to make the project manageable a random subset of 100 photos was selected based on photo clarity and composition. This subset of 100 photos was scored by 7 giraffe experts across the US, using a standardized set of five line drawings as a basis for comparison. The rating scale was one through five with five being the heaviest or fattest and one being the poorest condition.

The purpose of this exercise is to provide giraffe managers a basis for comparison, allowing them to view a wide variety of body types and conditions in different facilities across the US and to make decisions regarding the body condition of their own animals. No hard and fast assumptions are made regarding the relative merits of the five body conditions – there exists a wide range of body types and sizes across the giraffe population. Each institution should carefully view their animals and make the determination as to their physiological state. Any changes in giraffe diet to adjust the perceived body condition should be done carefully and with the input of a veterinary nutritionist and veterinary staff.

Other literature of interest:

Schmidt, D.A., R.L. Ball, D. Grobler, M.R. Ellersieck, M.E. Griffin, S.B. Cittino, and M.I. Bush. 2007. Serum concentration of amino acids, fatty acids, lipoproteins, vitamins A and E and minerals in apparently healthy, free-ranging southern giraffe (Giraffa camelopardalis giraffe). Zoo Biol: 26(1):13-25.

Twinning in giraffe: two examples in 2007 reported by Thomas W. deMaar, Gladys Porter Zoo and Steve Wilson, Caldwell Zoo.

At the Gladys Porter Zoo a multiparous 14 year old reticulated/Rothschild mix delivered two calves through natural birth. This cow had required some manual assistance on three previous pregnancies. Calf #1 was live, fully developed, 92 lb calf. Calf #2 was a dead 45 lb slightly mummified fetus that showed no hair emergence. Calf #2 was estimated to have died in utero several months prior to the parturition.

At the Caldwell Zoo an 11 year old reticulated giraffe delivered two still born, late term, female fetuses during the second pregnancy. The fetuses were equal in size, showed full hair development, first incisor teeth were erupting, and considered to be normal.

This appears to be similar to equine species were twins are rarely both born live. Either both offspring are expelled before completing gestation or one offspring dies in utero while the other is carried to term.

Tall Tales—updates from the giraffe world!

Giraffe Red List Update 2008

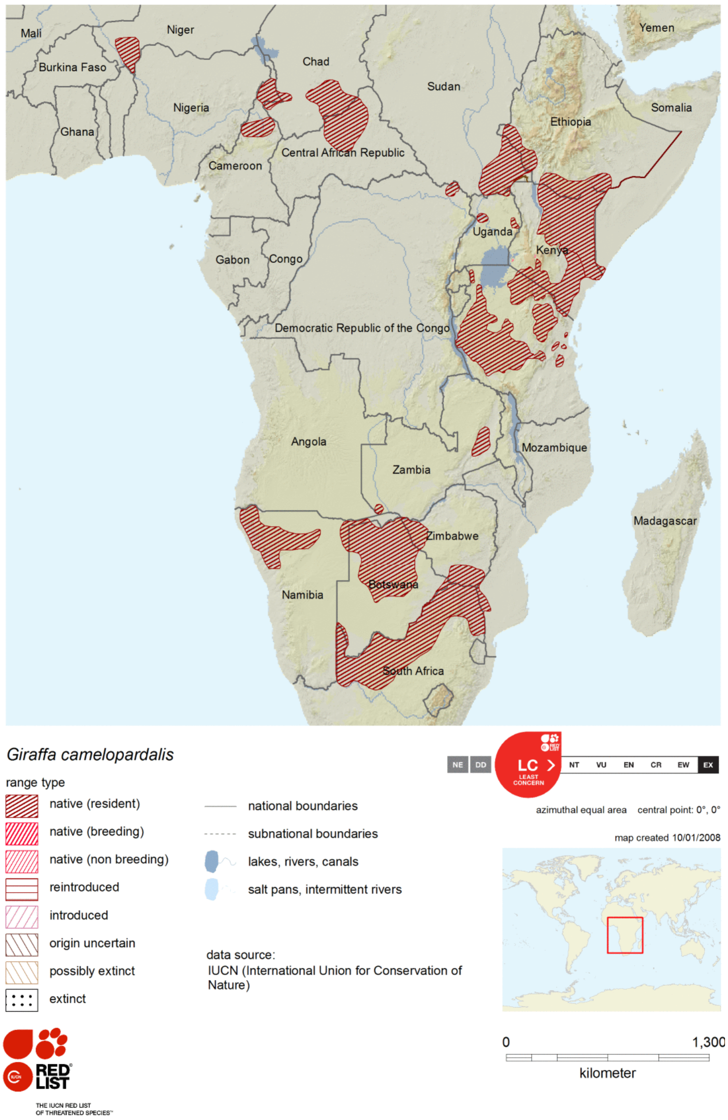
For the first time in over a decade the status of the Giraffe *Giraffa camelopardalis* in the IUCN Red List www.iucnredlist.org has been reviewed. However, it must be said that the current paucity of data available from across the continent limited the review and as a result the species remains at 'Least Concern', despite the assumption that numbers may have plummeted across the continent over the last decade. Fundamentally, the lack of data limits any understanding of their status and subsequent management needs. Additionally, with the recent research highlighting distinct (sub-) species of giraffe (see feature by Brown et al. page 2), the need to better understand numbers, range and threats to support their conservation is key!

One very important component of the review was the listing of *G. c. peralta* – Niger or West African giraffe, as 'Endangered'. The infra-specific taxa was assessed based on its significant decline throughout its range over the past century and although over the last decade numbers continue to increase - slowly (see feature by Suraud page 4), less than 200 individuals make up the entire subspecies. This was the International Giraffe Working Group's first attempt to assess a subspecies status, using recent genetic studies to clearly identify range of subspecies in the wild – some of the projects are ongoing (see brief snippet from Zambia project on page 27). It is hoped that further assessment work on the various subspecies can be undertaken to obtain a greater understanding for their potential conservation and management objectives.

Another important outcome of the Red List was an updated map of the species current range. Although an improvement and the most realistic range map available to date, refinement is still required in key giraffe strongholds in Eastern and Central Africa, whilst the need to highlight areas of introduced population is important e.g. Rwanda and Senegal.

What is the take home message from all of this? A greater need for data through collaboration to better understand the species status is critical! Please help us fill in the gaps. If you have any data for the Giraffe Database, contacts of key people, organisations or governments for us to communicate with, contact us through:

Julian.Fennessy@gmail.com



Tall Tales—updates from the giraffe world! *cont.*

Niger PHVA

In late September/early October 2008 the first ever Population and Habitat Viability Analysis (PHVA) was undertaken on a giraffe population in the wild. Held in Niamey, the capital of Niger and only 60km from the 'giraffe zone' where the majority of the remaining 200 or so West African giraffe inhabit. This was a great coup and with the valued support of EU, ECOPAS, the Niger government, CBSG and local NGOs and players, a 4-day workshop was held to discuss the ins and outs of the species current and future conservation. The final report is under development and once complete it will hopefully serve as the basis for a solid giraffe conservation strategy.

We would like to take this opportunity to send our well wishes to Arnaud Desbiez who was one of the two facilitators (along with Kristin Leus) of the workshop.

Arnaud was hit with an extremely bad case of malaria and has been battling it ever since. He is now on his way to recovery and we look forward to his continued support to the giraffe world. Get better soon!

Thornicrofts Giraffe Research Expedition

In June 2008 Julian Fennessy coordinated a team, including IGWG's David Brown and his wife, Andy Tutchings, Simon Morris, Monica Wrobel and Julie Maher (WCS) and his own family, to the Luangwa Valley in an attempt to better understand the status, distribution, conservation health and genetic architecture of the endemic Thornicrofts giraffe subspecies *Giraffa camelopardalis thornicrofti*.

Supported by The Wilderness Wildlife Trust, Chester Zoo, Wildlife Conservation Society, and the researchers themselves, the research findings will hopefully be incorporated into the long-term wildlife monitoring programmes of the Zambian Wildlife Authority (ZAWA) and non-government organisations, as well as provide critical scientific knowledge on the populations genetic relatedness to other populations in Africa.

The project set to undertake the first scientific research of the Thornicrofts giraffe since the late 1970s, incorporating local and historical knowledge. Wildlife, particularly mega herbivores such as the endemic Thornicrofts giraffe, is becoming increasingly important income generators for local communities, while sound scientific information is required to guide their conservation and management. This revenue has the potential to contribute to rural livelihood development as well as ensuring good monitoring practices in the long-term.

The team conducted driven transects throughout the South Luangwa National Park and adjacent Lupande Game Management Area. The non-intrusive access to this area provided the team with the ideal opportunity to conduct wildlife density and population survey. The objective of the research was to record numbers and GPS locations of giraffe, as well as eight other focal mammal species. These results are being analysed and will provide basic wildlife densities in the surveyed areas whilst raw data has already been provided to ZAWA.

Additionally, and key, the expedition involved the collection of genetic samples (42 separate individuals in total) using a remote biopsy method to undertake analysis of the giraffe genetics in comparison to other populations across the continent. This work will potentially highlight the importance of this population as genetically unique which in turn should increase its priority for long-term conservation and management

Tall Tales—updates from the giraffe world! *cont.*

support.

The information obtained will be combined and implemented at a practical management level, with the aim of better enabling sustainable management of wildlife populations in partnership with the relevant stakeholders. Stay tuned for an update in the next issue!

If you would like to know more about the project, please contact Julian Fennessy at: Julian.Fennessy@gmail.com

Factors driving change in the Serengeti giraffe population

According to long-term census data, the giraffe population in the Serengeti National Park is declining despite increases in woody vegetation. Giraffes are thought to be food limited, so this surprising finding begs the question: *what is driving down the Serengeti giraffe population?* It is possible that studies have underestimated the role of predation and disease in regulating giraffe populations. The decline may also be the result of a shift in woody species composition in the Serengeti. Beginning in the late 1970s, *Acacia robusta*, a browse species avoided by giraffes, began to regenerate and has now regained dominance in the woodlands. Or maybe the downward trend in giraffes is due to environmental stochasticity. By investigating these and other scenarios, we hope to better understand the complex ecological interactions driving demographic change in the giraffe population. The aim of this project is twofold: 1) to investigate the mechanisms regulating and limiting the Serengeti giraffe population and 2) to re-evaluate the relationship between giraffe browsing and woodland composition first examined by Pellew in the 1970's. Several methods are employed to study giraffe population dynamics including tracking of known individuals, mark-recapture surveys and aerial surveys. Woodland composition is determined using the point-centered quarter method. Field data is combined with long-term habitat data to address the research questions. It is expected that this project will provide insights into giraffe population regulation and improve our understanding of giraffe-woodland dynamics. In addition, the results will inform management of the Serengeti giraffe population. The project began in 2008 and is scheduled to be completed in 2011.

If you would like to know more about the project, please contact Megan Strauss, PhD Student, University of Minnesota at: strau102@umn.edu

Kenya Giraffe Project

With valuable support through a Rufford Small Grant, Julian Fennessy is coordinating research on the population dynamics of three populations in Kenya. This project intends to establish baseline ecological and conservation "health" assessment of key giraffe populations (Nairobi NP, Nakuru NP and Samburu NR) and in turn three different subspecies (Masai, Rothschild and Reticulated giraffe, respectively) in Kenya. Working collaboratively with the Kenyan Wildlife Service (KWS) and key NGOs e.g. Save the Elephants, AWF and KLCT, the project hopes to build robust ecological assessment of the populations with a focus on the Nairobi NP population where giraffe migrate into the Kitengela communal areas and its peri-urban environment. The collaborative efforts seek to provide capacity building and ongoing information gathering to facilitate the long-term success of the project.

Mr Thadeus Obari, an MSc student at the University of Nairobi and KWS researcher is undertaking research on the giraffe in the Nairobi NP and dispersal area, while Mr John Doherty, a PhD student at Queens University, Belfast, Northern Ireland, has undertaken a recon trip to

Tall Tales—updates from the giraffe world! *cont.*

Samburu to build the first of the population there. Over the next year a greater knowledge of these populations will be gathered and hopefully assist in the species conservation and management in Kenya.

If you would like to know more about the project, please contact Julian Fennessy at: Julian.Fennessy@gmail.com

Ethiopia's Omo Giraffe

In late 2008, African Parks withdrew their activities in Ethiopia from the management of Omo National Parks where one of the last remaining populations of giraffe in the country inhabit. African Parks highlighted that considerable challenges arose from the unsustainable use by one or more ethnic groups, often in competition and conflict with each other.

IGWG had good contact with Pascal Fust who was undertaking an MSc on the giraffe population there but unfortunately due to the situation he was unable to complete this. Subsequently, attempts to obtain genetic samples from the population for analysis also failed. Having less than 20 individuals remaining in the entire population it will be interesting to see if their numbers grow or they succumb to human pressures over time.

Giraffe in Omo NP, Ethiopia

IGWG Update

The International Giraffe Working Group (IGWG) has had a recent rush of blood and targeted enthusiasm. As a result of this Terms of Reference for the Group have been finalised and Officers elected. The new Chair of the IGWG beginning January 2009 is Dr Julian Fennessy, supported by Dr Rick Brenneman as Deputy Chair, Dr Russell Seymour as Secretary and Dr Tom de Maar as Tresurer.

The first new member to the Group has also been confirmed, that being Jean-Patrick (JP) Suraud. JP has been working in Niger since 2005 and is currently undertaking a PhD on the ecology of the endangered West African giraffe whilst working collaboratively with local NGOs in his capacity as scientific advisor. As a regular contributor to 'Giraffa' we welcome JP to the team and look forward to collaborating with him.

The IGWG has also initiated the development of a dedicated website to support its activities but also as a 'one-stop' for information on giraffe conservation and management which we hope individuals, organisations and institutions will both use, provide information to and link accordingly. Initial funding for the website has been provided by a private individual with some matching support from the Gladys Porter Zoo – thanks! We will let you all know once the website has been constructed.

If you wish to contribute to this section of 'Giraffa' please send any snippets of giraffe news and updates, either in the wild or captive world to:

Julian.Fennessy@gmail.com
