



**Bi-Annual Newsletter of the
International Giraffe Working Group (IGWG) Est. 2003**

Volume 1, Issue 1
2006

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***Giraffa*: Tall tales from the wild and captive world!**

Welcome to the first bi-annual newsletter of the International Giraffe Working Group (IGWG). Being one of the most charismatic African species, one would assume that solid research underpins our knowledge of the world's tallest and often most revered species. However, in comparison to many others, little is known. In particular, research on the giraffe sub speciation and comparative work is limited, while also no long-term ecological research has been undertaken on wild populations. It is the intention of this forum and the IGWG to provide an outlet for a more coordinated and targeted integration of knowledge on the species, with the intention of feeding back findings to decision makers, whether they be IUCN, government or local community based natural resource programs.

What is the IGWG? It is an independent working group with IUCN affiliation focussing on giraffe conservation. It was founded by an array of international scientists who undertake research on or work with giraffe; ranging from taxonomy to ecology, and genetics to captive populations. The Mission Statement of the IGWG is:

Preserving the evolutionary potential of all giraffe populations utilizing:

- 1) Morphometric and molecular genetic analysis
- 2) Behavioral ecology
- 3) Population dynamics
- 4) Landscape conservation
- 5) Zoo and wild management strategies
- 6) Awareness and education
- 7) Scientific and popular communications

IGWG Mission Statement

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It is through this forum we hope to increase the awareness of giraffe conservation and their habitat. It is through the readers that both scientific and popular news, stories, abstracts and articles from both the wild and captive populations can be disseminated. I hope you enjoy this first issue and we look forward to sharing our and your collective knowledge of giraffe throughout the broader community.

Until the next issue, enjoy!

Julian Fennessy (co-editor)

Ecology of the desert-dwelling giraffe *G. c. angolensis*

Julian Fennessy. PhD Thesis Abstract.

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The desert-dwelling giraffe of the northern Namib Desert survive at the edge of the species range. They are genetically distinct and behaviourally and ecologically different from other giraffe throughout Africa.

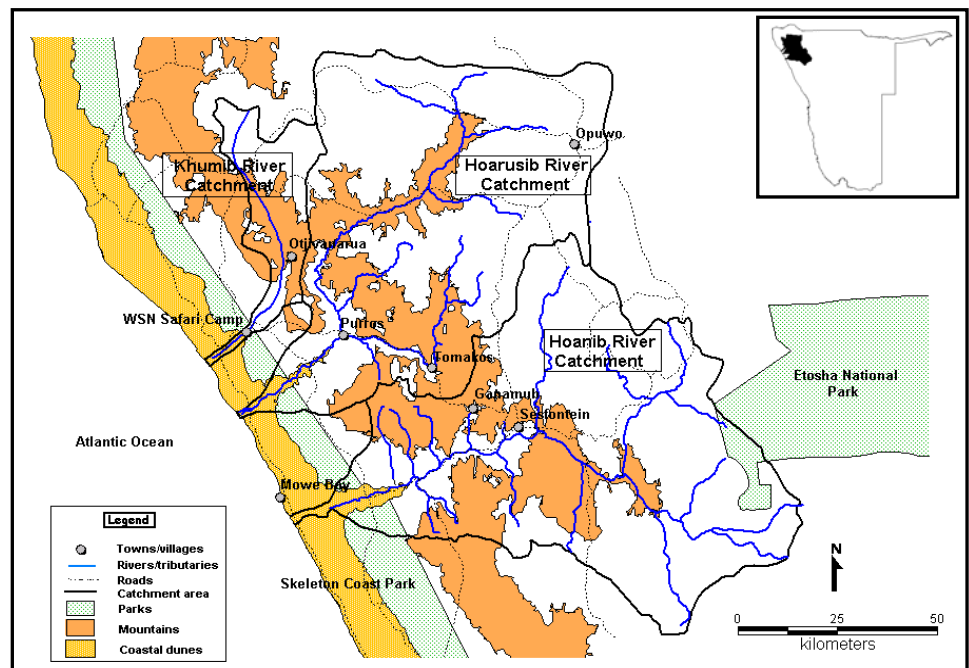
Genetic evidence indicates that Namibian giraffe are distinct and that they differ, in particular, from Cape giraffe *Giraffa camelopardalis giraffa* Lydekker 1904, their taxonomic classification for the last century. The five unique haplotypes observed in the desert-dwelling and Etosha NP populations of giraffe indicate that the Namibian taxon has not interbred with other giraffe subspecies for an extended period. The genetic differences, coupled with geographical isolation of the population, warrant further investigation into the appropriate taxonomic classification of Namibia's giraffe. Unfortunately, the recent extinction of Angola's giraffe population limits genetic comparisons. However, there is evidence that the populations of Namibia and Angola overlapped historically. Upon further genetic investigation, appropriate morphological and ecological research, the Namibian giraffe may be formally reclassified as *G. c. angolensis*. The weight of evidence for this reclassification is strong, and Namib-

ian giraffe have been considered to be *G. c. angolensis* in this chapter.

In Namibia, limited gene flow was evident between giraffe in the desert and those in Etosha NP, despite their close geographical proximity. Indeed, the only gene flow appeared to have resulted from recent translocations of giraffe from Etosha into the northern Namib Desert. Large-scale movements of giraffe in the northern Namib Desert suggest that intermixing occurs between populations within the study region. However, increasing growth of human populations in this marginal farming environment may limit giraffe movements in future if ac-

cess to forage areas is restricted or if direct conflicts arise.

The arid conditions of the northern Namib Desert shape aspects of the population dynamics of giraffe, such as the very low population density. However, aridity is not the only factor, as historical poaching pressures, low fecundity, limited food and low, spatially variable rainfall combine to reduce the rate of population growth. Individual associations and population structure also varied greatly within the subpopulations of the study region. For example, more associations were observed among bulls in the Hoarusib River study area, where bulls predominated;



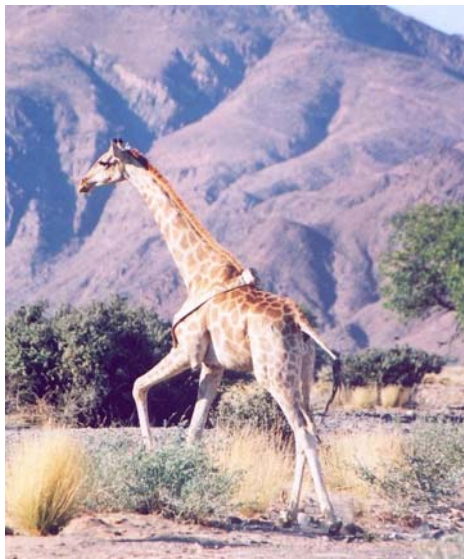
Ecology of the desert-dwelling giraffe *Gc. angolensis* cont.

while cows preferred the areas away from the Hoarusib River. Limited food in the tributaries restricts the year-round presence of giraffe so that cows move to the broader riparian woodlands to forage in the hot-dry season, and risk the closer proximity to the communal farmers. In the small, cow-biased population of giraffe in the Khumib River, by contrast, cows associated more strongly and a matrilineal social structure was observed. In general, my observations showed that giraffe in the northern Namib Desert depend critically on the riparian woodlands of the ephemeral rivers for year-round forage and shade resources.

Direct observations and tracking showed that giraffe in the study region have large home ranges, with some individual bulls showing the largest home ranges of any giraffe yet recorded. The large home ranges were associated with low population density, but also with sparse food resources and increased searching for receptive cows. This study confirmed the occurrence of extensive movements between study areas.

The activity budgets of the desert-dwelling giraffe are strongly biphasic. Energy consuming activities such as feeding and walking were reduced at midday and during early afternoon when ambient

temperatures were greatest, whilst energy conserving activities such as resting increased during the same period. Dispersal of surplus metabolic heat when temperatures are lower, evaporative cooling and adaptations for water conservation contribute to the biphasic pattern of diurnal activity. Behavioural responses such as the selection of microclimates (shade, wind and body orientation), also help to



conserve energy and water.

The activity budgets of Namibia's desert-dwelling giraffe differed markedly between sexes, as observed in other giraffe populations (Leuthold & Leuthold, 1972; Pellew, 1984a; van der Jeugd & Prins, 2000), but the time spent in different activities differed between this and other studies. All giraffe in the study region spent most of the day feeding. Cows

spent more time feeding and resting, while bulls walked and ruminated more often, and juveniles mostly fed and rested. Feeding, combined with walking, resting and ruminating, occupied more than 95% of the activity time of giraffe.

Giraffe cows exhibited an energy 'maximizer' strategy characterised by increased feeding during the cold-dry season; this would increase fat deposition and reduce energy consumptive activities for better survival during the long hot-dry season. In contrast, bulls exhibited an energy 'minimizer' strategy; here, feeding increased in the hot-dry season as available forage in the canopies became limited. Similar strategies have been reported in other giraffe populations in Africa, but are not as marked as in the study region. Social interactions observed during this study provided valuable insight into the bonds and hierarchy of giraffe society, although longer-term research would help to better understand such dynamics.

Selection of food plants by giraffe was driven by a combination of factors, such as chemical content, seasonal abundance and phenology. Giraffe seasonally selected forage with increased levels of moisture and crude protein, which in turn was influenced by rain and fog precipita-

Ecology of the desert-dwelling giraffe *Gc. angolensis* cont.

tion. Although the study area is arid and has a limited diversity and richness of plant species, selection of forage by giraffe did not always correlate with plant abundance, but did correlate with phenological changes and the seasonal availability of fresh leaves.

Giraffe have caused distinct structural changes in plant species in the study region, in particular *Faidherbia albida*. Approximately 80% of *F. albida* trees in

River has probably reduced the pressure on forage in the riparian woodland since the 1980s and contributed to the observed shift in dynamics of *F. albida*. However, hydrological and climatic events, as opposed to wildlife impacts, have been the major influences on the population dynamics of *F. albida* in the Hoanib River.

Giraffe foraged predominantly in the riparian woodlands, but also moved seasonally into other habitats to exploit alterna-

In summary, there is a small but persistent population of desert-dwelling giraffe in north-western Namibia that has, until now, not been studied in detail. Limited historical evidence suggests that it may be vulnerable to disturbance in the riparian refugia of the Hoanib, Hoarusib and Khumib catchments and throughout the broader Kunene Region.

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the Hoanib River have browse heights in excess of 3 m—a direct impact of giraffe. Aside from structural changes to individual trees, 20 years of assessment of the *F. albida* population indicates a marked shift in size class distribution, indicative of a non-equilibrium population (Nott, 1987; Viljoen & Bothma, 1990b; Jacobson & Jacobson, 1998). Increased residence periods by elephant away from the Hoanib

tive sources of food; the mountains were used mostly in the cold-dry season. I hypothesised originally that, in the Hoanib River, the moisture content of food would influence seasonal small-scale movement. However, giraffe were shown not to need free-water, and evidence suggests instead that seasonal nutrient quality and abundance of forage most influence giraffe movements.

Conserving evolutionary potential in the giraffe

David Brown. PhD Candidate UCLA, USA “Conserving evolutionary potential in the giraffe”

Rick Brenneman. PhD. Conservation Geneticist, Center for Conservation & Research ,Omaha’s Henry Doorly Zoo, USA

Conserving the evolutionary potential of species (i.e., the ability of a species to adapt to changing environmental conditions by natural selection and potentially undergo further speciation over evolutionary time) is a major goal of conservation biology. The evolutionary potential for many terrestrial large mammal species ended in the late Pleistocene when these species went extinct. Africa may be the last place that large mammal evolution endures on a large scale and the evolutionary potential of many of these species is increasingly threatened by human alteration of their habitat. Systematics and population genetics information when combined with ecological and morphological data can give us deep insight into the processes that originate and maintain species. This information can be used to conserve these processes into the future.

Between November 10–14, 2003, researchers working independently and in loose collaborations met at Omaha’s Henry Doorly Zoo to present research and discuss directions for future research towards the goal of the conservation of the species and better understanding the evolutionary potential of giraffe. The group formalized under an umbrella collabora-

tion as the International Giraffe Working Group (IGWG). We are working to develop a comprehensive understanding of the evolutionary history of giraffes by integrating systematics and population genetics with ecology and functional morphology. We are working to build a model of giraffe evolutionary potential that can be used to identify and maintain landscape connections that might still exist between critical giraffe habitats, monitor genetic health of giraffe populations that are now permanently isolated from gene flow by habitat fragmentation, and guide evolutionarily meaningful restoration of giraffe to habitats where they have been previously eliminated.

Information surfaced in the meetings indicating that giraffe ranges, populations, and numbers may be significantly reduced from the last IUCN Red Book report. While we estimate that usable corridors still exist from southern and eastern Kenya southward, giraffe habitat from central Kenya to the Atlantic Ocean can now be considered permanently fragmented and under current conditions, gene flow disrupted between isolated populations. All is not lost as governments of Kenya, Mozambique, Niger, and

Uganda are expressing interest or actively attempting reintroduction of giraffe into depleted but protected areas. We believe that it is imperative to establish the nature of the populations that were endemic to an area to better understand which of the remaining populations may harbor closely related genetic diversity that will maximize the likelihood of the survival of the translocated individuals for the persistence of the species.

Understanding connections between giraffe populations across landscapes using genetic information

Genetics information is useful for understanding patterns of gene flow between populations that may not be obvious from contemporary ecological observations. This principle is illustrated in our work on the Maasai giraffe. Mitochondrial DNA (mtDNA) and nuclear intron data show that Maasai giraffe populations in southern Kenya and northern Tanzania, a landscape spanning several hundred kilometers, have historically been connected by continuous gene flow. We can use this information to track how giraffes have moved through this vast landscape prior to its complete fragmentation by humans.

Conserving evolutionary potential in the giraffe cont.

Genetic analysis of reticulated giraffes from across their range in northern-central Kenya demonstrates that populations of giraffes genetically sampled in several sites over a long distance have been historically connected by gene flow.

Population genetics data can be integrated into models of regional land use to understand movements of wildlife populations over temporal and spatial scales that cannot be directly observed. This information can subsequently be used to define and protect landscape corridors between protected areas in order to maintain gene flow between populations, thus conserving an essential evolutionary process.

Understanding connections between giraffe populations between landscapes using genetic information

In central to West Africa, the conservation model will be somewhat different. Human population expansion and encroachment has forced habitat fragmentation isolating populations from future natural gene flow and exchange of genetic diversity. This has restrictive implications on the evolutionary potential for the species. Isolated populations and populations having undergone bottlenecks are in danger of progressive mating of relatives that will eventually result in increased

levels of inbreeding. Artificial gene flow or translocation of individuals will be required for the future genetic maintenance of these populations. Additional study must be entertained that will establish the interactive relationship between the giraffe population and the ecosystem to better understand how to manage giraffe numbers within confined areas as that relates to carrying capacity.

Monitoring the genetic health of confined giraffe populations

The range of the Rothschild's giraffe historically extended across Uganda and western Kenya. The Rothschild's giraffe became highly endangered in Kenya over the 20th century with numbers reduced to one small herd of less than 150 individuals in western Kenya. Several groups were translocated to parks from which giraffes presumably had previously been eliminated including Mwea and Nasalot Game Reserves, Ruma and Lake Nakuru National Parks, and two private herds, Giraffe Manor and Yoder Flower Farm (the latter herd has recently been moved to Mwea Game Reserve for a second reintroduction attempt). In Uganda, giraffes are found only in Murchison Falls National Park and Kidepo Valley National Park. The Kidepo Valley population was

largely exterminated in the 1970s and has been augmented now for the second time. These parks are isolated from each other there is no natural gene flow of the Rothschild's subspecies between Kenya and Uganda or within these countries. Although these populations are exposed to the agents of natural selection acting upon unmanaged giraffe populations (e.g., predation pressures, disease, seasonal fluctuations in forage abundance and quality), their long term evolutionary potential may depend upon human genetic management (i.e. translocation of individuals between parks to maintain natural levels of genetic variability and prevent inbreeding). The proposed study will provide baseline information on the genetic structure of giraffe populations that will be used in the long-term genetic management of these populations.

Using genetic information to guide evolutionarily meaningful giraffe translocations and restoration to former range

Giraffes have been eliminated from large parts of their range in the last 50 years. Giraffes have been virtually extirpated from West Africa with only one small population left in the region, approximately 100 individuals in Niger. Angola and Mozambique have lost most or all of

Conserving evolutionary potential in the giraffe cont.

their giraffe and other large mammal populations. The range of the Rothschilds giraffe in Eastern Africa has been reduced to a few hundred individuals in Murchison Falls National Park in Uganda and a couple hundred individuals in Kenya. Restoration of wildlife populations in some of these countries is being contemplated, particularly in Southern Africa and Uganda. We can provide information to wildlife authorities in these countries about where the most closely related source populations are for restoration by comparing genetic information taken from museum samples collected from areas prior to extirpation to genetic information in existing populations that are candidates for restoration sources. Sampling existing giraffe populations in Botswana, Zambia, and Zimbabwe will be especially important for addressing this question in Southern Africa.

Project status and future goals

To date, we have sampled 435 individual giraffe from 28 populations in Niger, Uganda, Kenya, Tanzania, Namibia, and South Africa. These represent six of the nine recognized giraffe subspecies. There is concern that two of the subspecies (*G. c. camelopardalis* and *G. c. antiquorum*) no longer exist as giraffe have possibly been effectively exterminated from Ethio-

pia, Somalia, and Sudan. Giraffe numbers are not known and may be severely compromised in the Democratic Republic of the Congo which is the last possible location of the *G. c. antiquorum*. Sampling has been done using biopsy darting by remote delivery system. The biopsies are imported to the Henry Doorly Zoo genetics laboratory where DNA is extracted for mtDNA sequencing, nuclear gene sequencing (both of which are done at UCLA), and microsatellite genotyping (HDZ).

Our goal in this study is to genetically sample giraffe populations across their entire remaining range in Africa in order to understand the evolutionary dynamics of gene flow between these populations. We hope to sample the West African giraffe in the last ranges of Cameroon, the Thornicroft's giraffe of Zambia and to establish the relationships between the populations of Botswana and those of Namibia, South Africa, Zambia, and Zimbabwe. Sampling of these populations is crucial to establishing the genetic baselines for phylogenetic reconstruction, population architecture, and relationships among populations considered for appropriate conservation management and reintroduction plans.

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The giraffes of Niger are the last in all West Africa

Jean-Patrick Suraud. Conservation Manager. Zoo de Doué-la-Fontaine

Omer Dovi. General Manager. Association pour la Sauvgarde des Girafes du Niger (ASGN)

The giraffes of Niger, *Giraffa camelopardalis peralta*, are the last remaining in all West Africa. They survive outside of protected areas, roaming this vast landscape alongside local villagers and their livestock. In 1996 the numbers of giraffes in Niger plummeted to their lowest recorded level; less than 50 individual giraffes remained alive. Since this period these unique animals have been growing in number thanks to, first, measures taken by the Purkno conservation project and now, since 2001, thanks to the actions delivered by the ASGN, Association pour la Sauvgarde des Girafes du Niger. ASGN, financed by Doué la Fontaine zoo (France) helped by South Lakes Wild Animal Park (Great Britain) since 2005, acts to protect the giraffes and their habitat while developing the economy's area in a sustainable way and increasing awareness among the local population and foreign visitors.

Even if the giraffe population grows, have the giraffe overcome the risk of extinction? Firstly, it is necessary to understand the number of individual giraffes and the dynamics of their population, including studying their sex and age class composition.

In 2005, an expedition to count the number of giraffes in Niger, investigated by ASGN took place and was financed by the Doué la Fontaine zoo (France) and the South Lakes Wild Animal Park (Great Britain). The expedition used a number of survey methods and involved teams in 4WDs during the rainy season (August and September) as the population are reported to aggregate during this period. French biologist Jean-Patrick Suraud coordinated the expedition, which comprised three teams: members of the Association de Sauvgarde des Girafes du Niger (ASGN), leaders of the environment ministry, foresters of Niger, and were aided by both Peace Corps volunteers and Ecopas.

The expedition set out to obtain baseline knowledge on the current population numbers and structure. Firstly, photographs of each giraffe were taken to accurately identify the population density - giraffe's pelage (spot) patterns are like a human fingerprint, allowing them to be individually identified. Secondly, the structure of the population was assessed, recording the sex and age class of each animal. Two teams worked in Kouré plateau and the last team worked in Fandou plateau. In theory these plateaus are criss-

crossed following transects which are spaced 500 metres apart. In reality the transects are very difficult to follow because of vegetation and cultivation. As the giraffes were able to hide in the vegetation, the plateaus were continually checked until no new giraffes were discovered.

135 individual giraffes were photographed and categorised, of which at least 17 females appeared pregnant. It is likely that the population could be around 150 individuals as many adult males roam around alone, many of which were not observed. We can affirm, however, that the giraffe population has increased rapidly, almost tripled in less than 10 years, especially considering the length of time between 2 generations. This encouraging result is attributed to the cessation of hunting, education raising awareness and social development aids in local communities by ASGN, and the expansion of ecotourism, which ultimately benefits the local population.

Despite the encouraging result, there are still a number of threats. These unique giraffes of West Africa are far from saved. How long will the plateaus be able to sustain these unique creatures?

The giraffes of Niger are the last in all West Africa cont.

The destruction of their rain season habitat, “the tiger bush”, is out of control and excessively rapid with an overburden on demanding wood market. Another threat is that we do not have precise knowledge of giraffe movements – where do these giraffes go after the rainy season? Significant threats still remains outside of the

plateau, particularly when giraffe venture areas shared with villages. Locals in these villages are less likely to be as well educated in regard to preserving and protecting these unique animals than those trying to conserve them. Annual counts can provide a good indication on the state of the giraffe population in Niger, but long time

scientific surveys are a better approach and are strongly recommended. Ultimately, the most important and necessary measures for the last of West Africa’s giraffes involve the conservation of their habitat by educating people and with the search for sustainable solutions that both relieve and get local human populations involved.

Distribution of the 135 giraffes of Niger identified by sex and class of ages :

Adult female	Subadult female	Young female	Calf female
57	11	9	2
Adult male	Subadult male	Young male	Calf male
36	5	8	7

The photo identification album allows recognising the giraffes of Niger, each page of the album identify one individual: picture of its right profile, and of its left profile, and gives additional information

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The example page features two photographs of a giraffe. The top photo shows the giraffe from a right profile view, with a specific spot on its neck highlighted by a red arrow. The bottom photo shows the same giraffe from a left profile view. Below the photos is a table with identification details:

N° d'individu : 1	❖1	Purnko : n°56, Cusseini, Fils de 222, né en février 1997	❖4
Sexe : Mâle	❖2	Classe : Adulte	❖5
Signes particuliers : Corne droite vers l'arrière	❖3	Observations : Nom actuel Sido Adamou	❖6

Example page of the album

Specific spot coloured by computer to help the identification

Additional information

- ❖1 Individual code during the counting
- ❖2 Sex of the animal (male / female)
- ❖3 Particularity of the individual : Scars, Assymetric assicones...
- ❖4 Additional information on the individual by crossing with the album carried out by the PURNKO project.
- ❖5 Class of age of the individual (adult/ subadult/ young/ calf)
- ❖6 Observations : Family link with another individual, name...

Recently Published Research

D. M. Parker* and R. T. F. Bernard. 2005. The diet and ecological role of giraffe (*Giraffa camelopardalis*) introduced to the Eastern Cape, South Africa. *J. Zool., Lond.* **267**: 203–210

With an increase in the popularity of wildlife ranching in southern Africa has come the introduction of non-native (extralimital) mammalian herbivores. Financial gain has arguably been at the forefront of these introductions, with little or no assessment of the ecological consequences. The diet of three populations of introduced giraffe *Giraffa camelopardalis* was assessed by direct observation in the Eastern Cape Province, South Africa between January 2002 and October 2003, as the first step towards understanding the ecological role played by giraffe in the region. Similar to the diet of giraffe within their native range, a deciduous species from the genus *Acacia* (*Acacia karroo*) was the most important species in the diet. Giraffe in the Eastern Cape Province, however, consumed more evergreen species than those within their native range.

The relative lack of deciduous species in the Eastern Cape Province provides a probable explanation for such a result. Seasonal variation in the consumption of the most important species in the

diet was evident with members of the genus *Rhus* being more important in the winter months. This was attributed to the deciduous nature of *A. karroo*. The potential for giraffe to have a detrimental effect on the indigenous vegetation is discussed. We conclude that the study provides a much-needed list of plant species threatened by giraffe browsing in a region where the vegetation is thought to have evolved in the absence of such a browser.

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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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Web Support & Sponsors

If you have web design skills and/or are interested in helping to establish the IGWG web site, then we would love to hear from you.

The IGWG is currently operating without financial assistance. If you are keen to learn more about its activities and/or provide support for its work, then we would be more than happy to highlight our current and prospective range of research ideas. Look forward to hearing from you!
