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## Distribution and status of the desert-dwelling giraffe (*Giraffa camelopardalis angolensis*) in northwestern Namibia

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The population density and distribution of desert-dwelling giraffes was estimated in three study areas in the Hoanib River catchment, northwestern Namibia. Giraffe population densities (0.01 giraffe/km<sup>2</sup>) were equal to the lowest recorded in Africa with population numbers fluctuating over past decades. Sex ratios, herd sizes and age categories differed between all the study areas, while a weak correlation ( $r^2 = 0.66$ ,  $P < 0.001$ ) in giraffe aggregation and the hot-dry season was observed in the Ombonde River. Seasonal movement and use of the riparian environments varied, with large fluctuations observed in the east of the catchment, while the hot-dry season influx and use in the riparian woodland coincided with *Faidherbia albida* podding.

**Key words:** *Giraffa camelopardalis angolensis*, population structure, seasonal movement.

The distribution of giraffes (*Giraffa camelopardalis angolensis* Lydekker, 1903) in Namibia has been poorly documented and misrepresented for decades. Many areas in Namibia that giraffe historically occupied are still distorted in most distribution maps (Skinner & Smithers 1990; East 1999), though they have long vanished from these ranges. The desert-dwelling giraffe of northwestern Namibia occupies an arid to hyper-arid environment, almost solely dependent on the riparian woodlands of the westerly flowing ephemeral rivers (Fig. 1). Their presence in an arid environ-

ment is not unique (Le Pendu *et al.* 2000) yet little is known of this subspecies' ecology.

A historical overview of giraffe numbers and distribution in the region has not been undertaken, although Shortridge (1934) first estimated 200 in the 1930s. More recently, the estimated numbers of giraffe in the northwest were reported to have declined by 15% from Viljoen's (1982) figures of 317, to Loutit & Douglas-Hamilton's (unpubl. 1995) estimate of 267. However, a Ministry of Environment and Tourism survey (unpubl. 2000) estimated the population to have increased to 1105. Giraffe densities for northwestern Namibia have never been calculated; however, their range extends across an area of approximately 78 000 km<sup>2</sup>, and with an estimated population density of 1105 individuals this equates to 0.01 giraffe/km<sup>2</sup>, equal to the lowest giraffe densities recorded (Le Pendu *et al.* 2000).

This preliminary research set out to document various ecological aspects of a desert-dwelling giraffe population, as well as to obtain a historical and current perspective on local giraffe densities and distribution patterns. Research was undertaken in the Hoanib River catchment, one of twelve major ephemeral river catchments in the semi-arid areas of western Namibia. The Hoanib River catchment occupies an area of 17 200 km<sup>2</sup>, 3% of which lies in private farm land, 91% in communal farm lands and 6% is protected in the

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hyaenas spend little time and energy hunting prey (Mills 1990), and most artiodactyls were probably killed by other larger carnivores occurring in the area. Furthermore, since brown hyaenas can cross the border fences of Shayamanzi Game Ranch, the identified food items do not necessarily originate from the study area.

Artiodactyls were the most important mammalian food source, with hair of common duiker (*Sylvicapra grimmia*) being the most frequent food item in the scats (relative frequency: 21 %). This indicates a high mortality of the common duiker, which is not particularly abundant on Shayamanzi Game Ranch. Mortality may be through predation, disease, old age or may reflect poor veld condition. The last possibility is unlikely because Sieling & Stapelberg (2001) found the veld to be in good condition.

The large amount of brown hyaena hair in their own scats (occurrence: 26 %) probably resulted from either auto- or allogrooming (Owens & Owens 1978; Mills 1983). The high percentage of bone remains in the scats (occurrence: 89 %) reflects the findings of other studies that much of their food consists of small pieces of bone and other scraps (Skinner & Smithers 1990). The high percentage of plant remains in the scats (occurrence: 89 %) may indicate that the brown hyaena is omnivorous, or that plant material is unintentionally consumed with carrion (Mills 1990).

In conclusion, and as experienced by Mills (1992), studies of hyaena diet are difficult because of problems collecting scats, identifying hairs, and determining if food was scavenged or killed by the brown hyaenas. Nevertheless, the analysis of scats has provided a basic description of the brown hyaena diet from a previously unstudied area.

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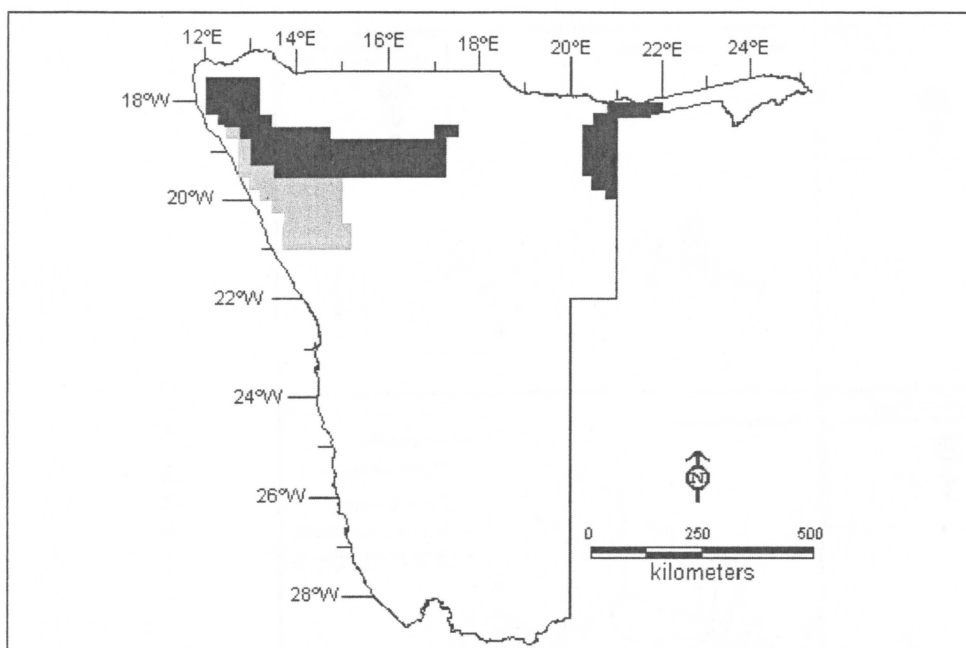


Fig. 1. Distribution map of giraffe in Namibia: natural occurrence (Ministry of Environment and Tourism (MET), 2001, unpubl. data; Fennessy *et al.* 2001); black, MET data; grey, this study.

Etosha National Park (NP) and Skeleton Coast Park (Jacobson *et al.* 1995). Rainfall in the north-west is highly variable, up to 50% annually in the east and 90% in the west, so drought or periods of high aridity are normal occurrences (Jacobson *et al.* 1995).

Three different study areas were focused upon within the Hoanib River catchment – the lower Hoanib River and Omboonde River, both riparian environments, and Hobatere game park, a 'semi-closed' concession area. These areas differ with regard to precipitation levels (spatially) and human and giraffe population pressures.

Observations of giraffe ecology were conducted periodically over a two-year period – between October 1998 and October 2000. The data were analysed on the basis of three distinct seasons: wet (January to April), cold-dry (May to August) and hot-dry (September to December). Seasonal distribution data of giraffe herds was collected using GPS coordinates of herd observations and from yearly aerial surveys.

Giraffe numbers in the lower Hoanib River have varied little – from 29 in 1977 (Viljoen 1982) to 35 in 1992 (Scheepers 1992). Between 1999 and 2000, use of the riparian environment increased from 29 to 38 individuals, respectively. Giraffe are seemingly dependent on the riparian environment during

the hot-dry season, relying heavily on browse availability, particularly *Faidherbia albida*. Lower giraffe numbers were observed during the wet (17) and cold-dry seasons (25), and increased during the hot-dry season (38) (Fig. 2). In the lower Hoanib River, restricted food availability outside of the river course plays a role in their reduced population growth and carrying capacity (Viljoen 1988; Scheepers 1992).

Throughout the study a similar number of giraffes was observed using the Omboonde River during the hot-dry season: 42 in 1998, 41 in 1999 and 43 in 2000, a consistent seasonal use (Fig. 2). During the cold-dry season (1999 and 2000) only a small number of giraffe was observed in the river (5), while no giraffe were observed in the Omboonde River during the wet season (1999 and 2000). With the mean rainfall in the Omboonde River area markedly higher than that in the lower Hoanib River, coupled with more arable land, forage availability outside of the riparian course is more abundant during the wet and cold-dry seasons. Furthermore, use of the Omboonde River correlated negatively with increased rainfall and availability of free water and forage in the veld (Leggett *et al.* 2001).

An increased number of giraffe in Hobatere game park was observed in the past decade, from

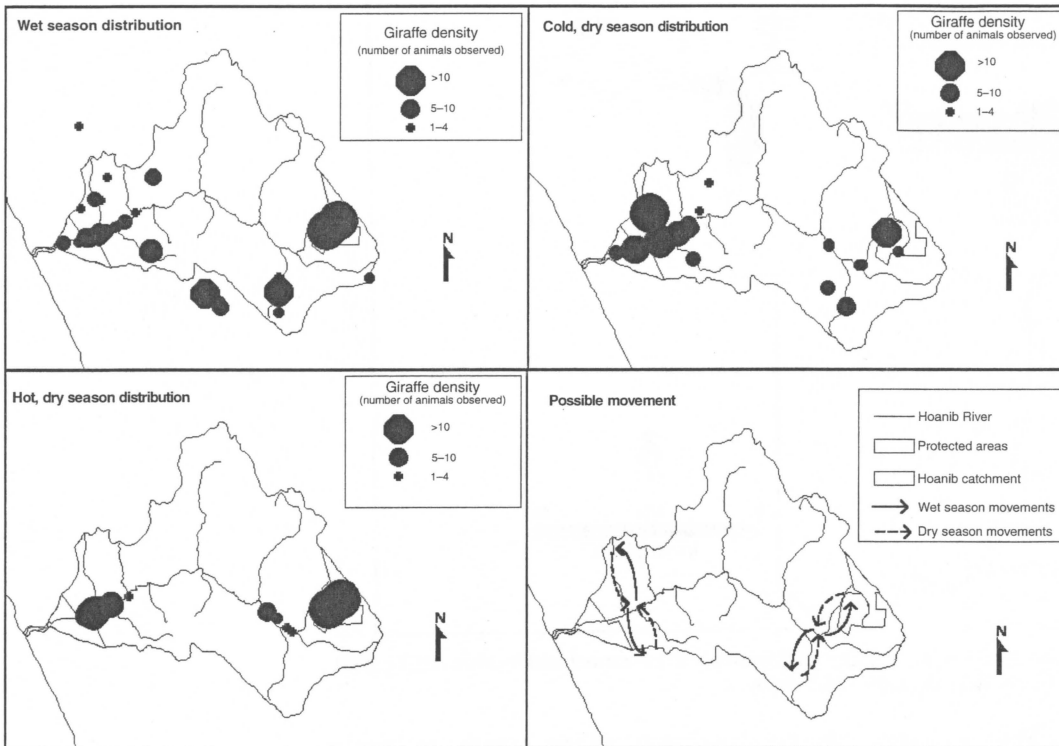


Fig. 2. Seasonal movements and distribution of giraffe in the Hoanib River catchment, 1999–2000.

63 (1990) to 120 (2000). Hobatere game park's giraffe numbers were highest in the wet season (120), reduced in the hot-dry (97) and lowest in the cold-dry season (67) (Fig. 2). The decline in numbers during the hot-dry season can be attributed to the above-average mean rainfall in 1999/2000 (Leggett *et al.* 2001). Giraffe move in and out of the park's western boundary and this local migration is based on seasonal food availability. The impact of increased numbers of giraffe, as well as other wildlife, over the last 10 years on the vegetation and water resources of Hobatere game park is a concern, and seasonal movement helps to relieve grazing and browsing pressure in the park.

In the lower Hoanib River giraffe densities fluctuated marginally throughout the year though a distinct increase in use was observed in the hot-dry season, 1.06 giraffe/km<sup>2</sup>, and 0.72 giraffe/km<sup>2</sup> and 0.93 giraffe/km<sup>2</sup>, in the wet and cold-dry seasons, respectively. The riparian environment provides an important year-round refuge for giraffe, particularly forage availability and necessary shade.

The Ombonde River closed riparian woodland provides valuable forage during the hot-dry season

in the form of *Faidherbia albida* pods, and in turn giraffe densities increased six-fold to 3.62 giraffe/km<sup>2</sup>. Throughout the wet and cold-dry seasons (0 and 0.59 giraffe/km<sup>2</sup>, respectively), the area outside the Ombonde River offers increased forage and water availability, thus reducing the use in the river and pressure on it.

Hobatere game park had higher densities of giraffe year round, particularly during the wet season (3.6 giraffe/km<sup>2</sup>) – 2.09 and 2.52 giraffe/km<sup>2</sup>, cold-dry and hot-dry seasons, respectively. The population in Hobatere game park is not closed and giraffe seasonally migrate out of the park. Higher densities observed in the wet season are thought to be a response to seasonal availability of *Acacia*, *Combretum* and *Terminalia* species in the park (Hall-Martin 1974).

In all study areas solitary bull giraffe were observed most often. In the lower Hoanib River, a gradual decline in the frequency of larger herd sizes (79 herds) was observed. Solitary giraffe represented 32% of all observations, while herd sizes of 2 and 3 each represented 16%. No giraffe were observed in the Ombonde River during the 1999 and 2000 wet season, while in the other

seasons (30 herds), solitary giraffe represented 38% of all observations, while herds of 2 represented 26% of the population. As in the lower Hoanib River, these herd size categories (1 and 2 animals) comprised almost two-thirds of all herds observed in the Omboonde River.

Solitary individuals and herd sizes of 2 and 3 groups (1–3) accounted for 53% of all giraffe observed in Hobatere game park, slightly less than recorded in the other two study areas. The largest herd sizes were observed in the Hobatere game park. Incidental sightings of herds comprising of 19 and 22 individuals were observed following good rains in 1999/2000. A weak correlation between herd sizes and seasonal aggregation in the Omboonde River was observed during the hot-dry season in the Omboonde River ( $r^2 = 0.66$ ,  $P < 0.001$ ), coinciding with the podding of *Faidherbia albida*. The lack of herds sighted during the other seasons prevented any further correlation analysis, while no correlations were observed for the other study areas.

The age structure and sex ratios of giraffe in the lower Hoanib (male:female 1:1.38) and Hobatere game park (male:female 1:1.6) differed from that of the Omboonde River. More males than females were observed in the Omboonde River (male:female 1.62:1) although the data was limited due to large flight distances (in 45% of observations, sex could not be established due to excessive flight behaviour and in 24% age was unknown). However, the adult:subadult:juvenile population ratio in the lower Hoanib River (10.7:5:1) and the Omboonde River (8.8:2.8:1) differed from that in Hobatere game park (2.8:1.2:1). Hobatere game park had a higher juvenile percentage (20%), compared to both the lower Hoanib and Omboonde rivers (both 6%).

Giraffe seasonal movements and their increased use of the riparian environments varied across the catchment, with the use of the lower Hoanib River and its tributaries observed in both the wet and cold-dry seasons. The lower Hoanib River itself acts as an important year-round refuge, similar to that observed for other subspecies by Berry (1973), Leuthold & Leuthold (1978), and Pellew (1984). During the hot-dry season (in both the lower Hoanib and Omboonde rivers) use of the rivers increased, augmenting densities in the riverbed, a response to the availability of *Faidherbia albida* pods, the essential dry-season fodder.

Throughout the wet and cold-dry seasons, use of the Omboonde River was minimal, and only

then as a transient route between available forage in the hills and plains to the north and south. By contrast, Hobatere game park served as a breeding area or sanctuary from which giraffe seasonally migrate. During the cold-dry season increased movement out of the park occurs in search of forage in the hills. The increase in the number of giraffe in Hobatere game park during the hot-dry season is a response to increased water availability from reliable water sources while in the wet season seasonal browse and water is more freely available in the veld.

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