Results of Four Years' Satellite Tracking of Elephants in Northern Cameroon

Hans de Iongh', Martin Tchamba[2], Wil Tamis', Maarten Van't Zelfde', Herbert Prins3, Helias Udo de Haes', Hans Bauer' and Sylvain Tiawoun2

[1]Centre of Environmental Science, PO Box 9518, 2300 RA Leiden, The Netherlands, [2]Centre de Developpement et de l'Environnement, BP 410 Maroua, Cameroon, [3]Department of Terrestrial Ecology and Nature Conservation, Bornsesteeg 69, 6708 PD Wageningen, The Netherlands

INTRODUCTION

Movements and home ranges of two elephant cows have been monitored in the Waza Logone region in north Cameroon during 1994-1997 using satellite and VHF telemetry. The Waza Logone Project, financed by the Netherlands government and implemented in joint co-operation among the Cameroon government, the World Conservation Union (IUCN), Netherlands Development Organisation (SNV) and the Centre of Environmental Science, Leiden University in the Netherlands was initiated in 1990 with the main objective to assist the restoration of the natural floodplain functions in northern Cameroon. In 1994 the project initiated an artificial reflooding by opening a trench of 30 m width in one of the river embankments at Tekele, which resulted in a flooded area of approximately 300 km^2, restoring some 30% of the original natural flood-surface.

The present study aimed to monitor the migration and habitat use by elephants of the southern sub-population in Waza National Park after the artificial reflooding in 1994.

We hypothesised that:

1) improved food supply inside Waza National Park will result in a shift of dry season habitat use by elephants inside the Park;
2) improved food supply inside Waza National Park will induce a longer residence time and a decrease of south- bound migration.

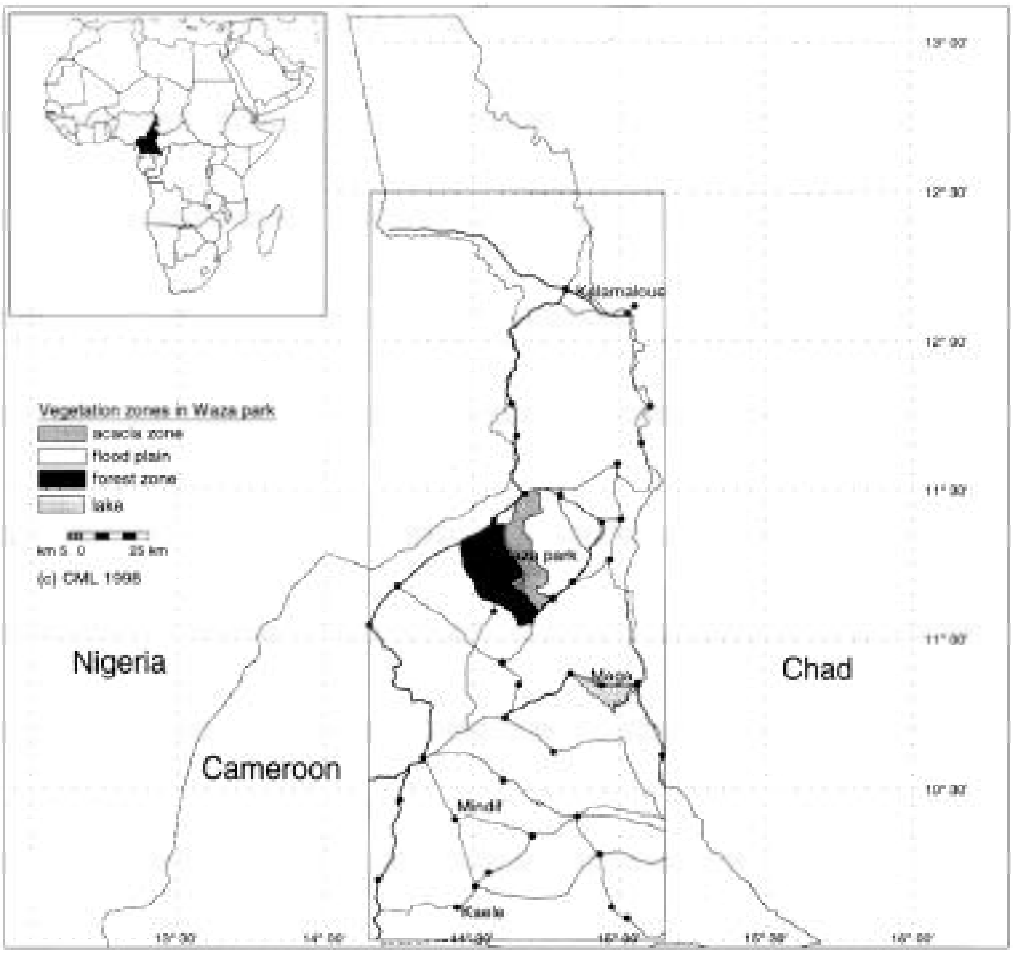
STUDY AREA

The present study was implemented in the extreme north of Cameroon, in the vicinity of Waza National Park and the Logone floodplain (Figure 1). In 1979 an irrigated rice scheme was developed by the Cameroon government with the construction of a dam at Maga. This dam created an artificial lake of at least 120 km^2, and severely impacted the natural floodplain system of the Chari-Logone river systems (4,600-6,000 km^2). Fisheries production and the vegetation cover of perennial grasses in the floodplain decreased and were replaced by annual grasses. Both livestock and wildlife from the nearby Waza National Park suffered from the degradation of the vegetation. Elephant migration to the south gradually increased after the construction of the dam, causing severe damage to agricultural crops around the town of Mindif, with a peak of 2,000 ha affected in 1994. The Waza National Park was devoid of elephants until 1947 when the first groups crossed the Logone river from Chad and travelled to Waza National Park. Since then the population has steadily increased to an estimated 1,100 in 1996, not only due to natural growth, but also to subsequent immigration from Chad and Nigeria. With an elephant density of one per square kilometre, the Waza National Park is likely not to sustain further elephant population growth.

ELEPHANT POPULATIONS

Three elephant sub-populations in Waza National Park have been described. The first sub-population resides in the northern part of the Park during the wet season and migrates to Kalamaloué National Park in the northern-most tip of Cameroon at the beginning of the dry season (January-February) and returns at the end of the dry season (May-June). The second sub-population resides year-round inside Waza National Park. The third sub-population used the central and southern part of the Park before 1994 and migrates to the south at the onset of the rains (June)

Figure 1. The study area in the extreme north of Cameroon.



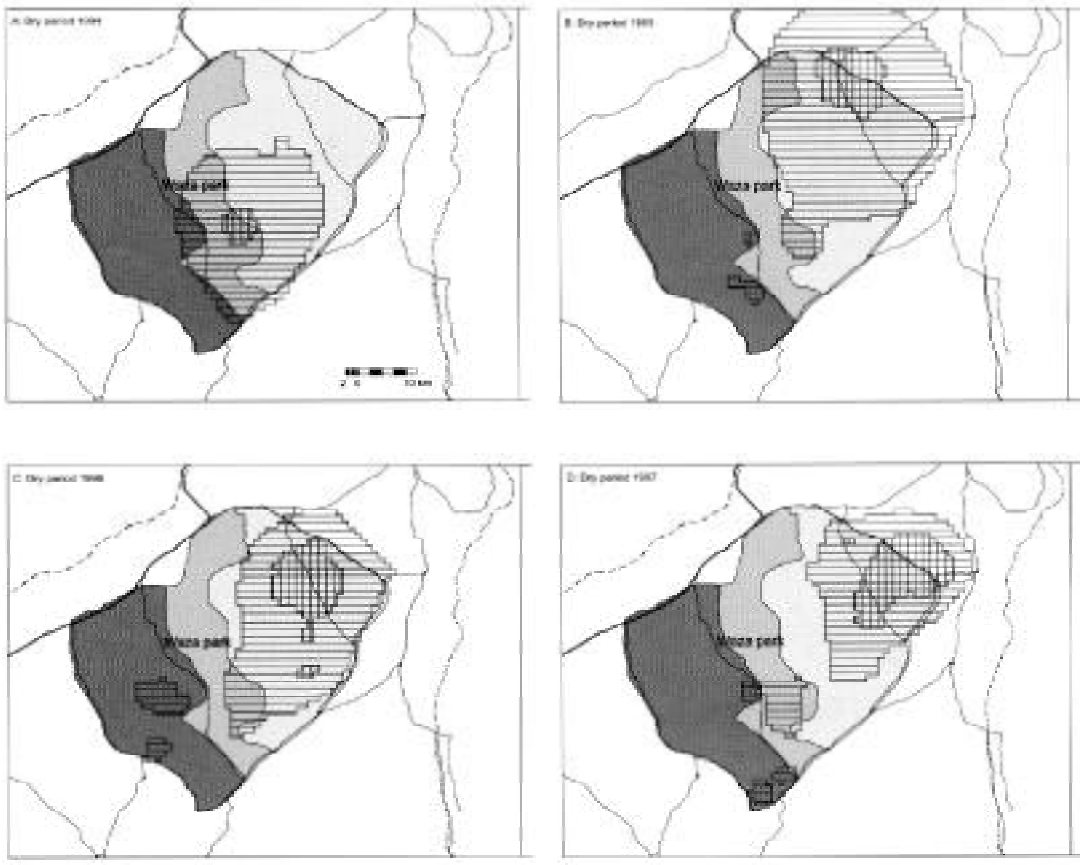
and returns in November-December. These elephants cause extensive damage to crops throughout the wet season in the Mindif area. The mechanisms of the different migrations north and south, and the difference in timing, are still not fully understood, but competition for food between the different sub-populations during the dry season may well play a role.

CHANGES IN HABITAT USE

The analysis of habitat use is based on the 24 hour cycle and 'harmonic mean analysis' of the guaranteed locations of two adult elephant cows of the southern sub-population, during a period of four years. Satellite data showed the movement and habitat use of these individual elephants, and field observations confirmed that the elephants belonged to a mixed family group of cows, sub-adult males and juveniles/babies of variable size (approximately 15-300), due to fission-fusion.

Habitat use and migration was followed before (1994) and after (1995-1997) the artificial reflooding of the plain (Figure 2a-d). The distribution of 'location-cycles' inside and outside the Waza National Park does not indicate a decrease after the reflooding of south-bound wet season migration routes to areas where the elephants cause serious damage to agricultural crops. The distribution of *location-cycles* over the distinct vegetation zones inside Waza National Park during the dry season indicates a pronounced change in habitat use from the *Acacia* zone to the flood-plain. This observa-

Figure 2. Harmonic *mean* of satellite locations representing 50-72.5% and 72.5%+ of respectively (from top to bottom); dry period 1994; dry period 1995;dry period 1996 and dry period 1997.



Vegetation zones in Waza park

acacia zone

flood plain

forest zone

Home range

50 % Harmonic Mean Area

95 % Harmonic Mean Area

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tion is supported by the distribution of home ranges, which also indicate a shift of dry season habitat use from the central and southern part of the Park to the northern part of the Park. These changes are attributed to the preferences of elephants for perennial floodplain grasses, which increased dramatically after reflooding, and the presence of water in natural depressions inside the floodplain after the artificial reflooding.

Dry season distribution inside Waza National Park shows a shift in habitat use after 1994. In 1994 most dry season cycles are inside the' *Acacia* zone, while in 1995-1997 most dry season cycles are inside the floodplain. In addition, the cycles reflect a consistent gradually increasing presence in the woodland zone at the end of the dry season. These differences are also reflected in the home range

coverage *(50%* and *95%* harmonic mean) of the different zones inside the Park during the dry season. The home range distribution confirms a shift in dry season home range from the south-central part of the Park to the north-eastern part of the Park.

Studies based on dung pile surveys and direct observations of elephants before the artificial reflooding in 1994, but after the construction of the dam (in 1980) showed that elephants of the resident and southern sub-populations in Waza National Park predominantly foraged inside *Acacia seyal* scrubland during the dry season. During the wet season, the elephants of the resident and northern sub-population dispersed more and the floodplain became the favoured elephant habitat, while the southern sub-population moved southward to the Mindif area. Studies before the construction of the dam indicate a more dominant dry season presence of elephants inside the floodplain, but these are based on limited observations.

In the years before the artificial reflooding in 1994 two artificial waterholes located inside the *Acacia* zone of the Park were the only depressions holding water at the end of the dry season, since the natural waterholes and depressions dried out completely. These two waterholes are probably an important explanation for the intensive use of this zone in the dry season, during the years before the start of the artificial reflooding. It is generally accepted that the availability and distribution of water is a major factor limiting the habitat use of elephants. During the wet season, when water is no limiting factor, elephants prefered the floodplain, due to their preference for perennial grasses. Such changes of diet by elephants are well documented.

The artificial reflooding transect studies of the floodplain vegetation in Waza National Park indicate a gradual but significant change from annual to perennial grasses during 1994-1997.

The increased availability of water in the floodplain has created the necessary condition for a shift in habitat use. The change of habitat use by the Waza elephants after the artificial reflooding has reducing feeding pressure in the *Acacia* zone.

However, the increased forage base in the Park has not resulted in decreased migration to the south, and human-elephant conflicts in the Mindif region are still on the minds of local farmers and authorities in the area.

Thus, although the artificial reflooding has contributed to an improved ecological management of the Waza National Park and its elephant populations, it has not resolved the conflicts between man and elephant. This problem is very complex and requires an approach with a multitude of integrated actions at national, provincial and local levels such as proper legislation, damage assessment, monitoring and damage-compensation-schemes, village extension and participation, physical barriers and disturbance shooting.