

Short Communication

Holding on in the Djebela: Barbary macaque *Macaca sylvanus* in northern Morocco

Siân S. Waters, Mustapha Aksissou, Ahmed El Harrad, Maria-Elisa Hobbelink and John E. Fa

Abstract A survey of Vulnerable Barbary macaque *Macaca sylvanus* populations in the Djebela region of northern Morocco was conducted in October–November 2004 and the species' presence verified in four areas. This macaque occurs in habitat types ranging from *matorral* (shrub vegetation) to higher altitude fir forest. A total of 89 individuals were observed in nine groups. Comparisons of our survey with the previous one undertaken in the same area in 1980 indicate that group

sizes are similar but the total population size may have decreased. We estimate there is a population of 200–300 Barbary macaques in the Djebela. Although some areas where the species is found are now protected, further work will be crucial to safeguarding this species in northern Morocco.

Keywords Barbary macaque, Djebela, habitat degradation, *Macaca sylvanus*, northern Morocco.

The Barbary macaque *Macaca sylvanus* occurs further north than any other non-human primate species and is unique in being the only macaque found in Africa. The species was previously estimated to number 9,000–23,000 individuals over its entire range in Algeria and Morocco (Fa *et al.*, 1984; Oates, 1996). Recent population estimates in the species' stronghold, the Middle Atlas Mountains of Morocco, found a dramatic decline in numbers over the last 10 years (Camperio Ciani *et al.*, 2005). The Barbary macaque is categorized as Vulnerable on the IUCN Red List (IUCN, 2006), with habitat destruction the main threat. The species also occurs in much smaller numbers in the mountains of northern Morocco and Algeria (Fa *et al.*, 1984). The last survey of the species in the Djebela region of northern Morocco was in 1980, when a maximum *c.* 400 individuals were found in four areas totaling 332 km² (Fa, 1982). During an 8-week survey in 2004 we

surveyed the distribution and abundance of the Barbary macaque in three of the areas (totaling 198 km²) previously surveyed in 1980.

During October–November 2004 we assessed macaque populations in Djebel Moussa (*matorral* or shrub vegetation; 11 km²), Djebel Bou Hassim (deciduous oak forests; 142 km²), and Djebel Talassemtane (fir forests; 45 km²). Descriptions of these sites are in Fa (1982). We also visited El Haouz (*matorral*), outside Tétouan, for 1 day, to verify macaque presence. This area was briefly surveyed in 1980 but no macaques were observed (Fa, 1982). Djebel Bou Hassim is a site of major biological importance in Morocco, with some of the best preserved oak *Quercus* spp. forests in the country. Currently the regional government of Provence Alpes Côte d'Azur, France, and the Ministry of Water and Forests, Morocco, are promoting a model of protected areas governance for Djebel Bou Hassim, driven by the process of decentralization endorsed by the Moroccan government. Part of Djebel Talassemtane has been protected and was declared a National Park in 2004. This 58,950 ha Park is at altitudes of 1,600–2,170 m and is the only protected area in the Djebela apart from the Marine National Park of Al Hoceima (Anon., 2005). The park is fenced because livestock grazing has been a major cause of habitat degradation in this area, as elsewhere in Morocco (Drucker, 1984; Fa *et al.*, 1984; Camperio Ciani & Castillo, 2000). The reserve was established to conserve the unique assemblages of surviving relict Tertiary flora typified by fir *Abies* spp. forests.

A team of 2–3 observers spent a total of 22 days surveying the Barbary macaque. Surveys were between

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Table 1 Number of groups and individuals and mean group sizes of Barbary macaques recorded in three locations (Fig. 1) in northern Morocco in 2004 (this study) and in 1980 (Fa, 1982).

Location (site no.)	This study			1980		
	No. of groups	No. of individuals	Mean group size (range)	No. of groups	No. of individuals	Mean group size (range)
Djebel Moussa (site 1)	1	8		1	11	
Djebel Bou Hassim (site 3)	2	23	11.5 (7–16)	5	68	13.6 (8–27)
Djebel Talassemrane (site 4)	6	58	8.3 (3–19)	7	121	19.0 (7–28)
<i>Total</i>	9	89	9.9	13	200	16.3

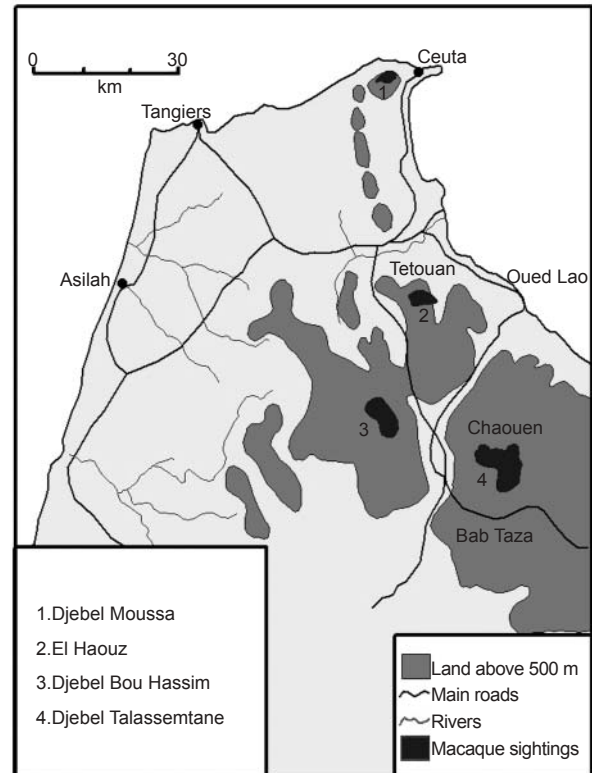
07.00 and 14.00, and with two surveys during 16.00–18.00 in Djebel Talassemrane. The topography of the region makes it difficult to undertake systematic surveys. Consequently, footpaths were followed when first ascending a mountain. The footpaths were walked slowly at $c. 1 \text{ km h}^{-1}$, covering a distance of 7–8 km per day. After the initial ascent, the team separated for $c. 2$ hours, to walk and scan the surrounding areas continuously and to look for any signs of macaques on rocky outcrops. Depending on the size of the area some locations were visited more than once, up to a maximum of 3 days. When a group of macaques was encountered its location, composition (age and sex classes), habitat use and activity was noted. Macaque occurrence was also confirmed in some areas by the presence of fresh faeces.

Barbary macaques in the region were extremely wary of humans and generally fled once sighted. In the three areas surveyed a total of nine groups was sighted and 89 different individuals counted (Table 1). Overall average group size was 9.9 (range 3–19). Outside the main survey areas macaque presence was also verified $c. 10$ km south of the city of Tétouan when a group of seven animals was seen in the El Haouz region (Site 2, Fig. 1). The last verified sighting of macaques in this area was in the 1970s (Alvarez & Hiraldo, 1975). This area contains *matorral* habitat but is not as degraded as that of Djebel Moussa. It is also contiguous with forested areas as far east as Oued Lao (Fig. 1). Another sighting was made of a group of 18 macaques in El Haouz in January 2005 (A. El Harrad, unpubl. data).

Differences in counts between our study and Fa's (1982) for the three surveyed areas (Table 1), indicate significant changes in group sizes and numbers of macaques observed. The lowest numbers were in Djebel Moussa, where only one group was seen in both surveys. This area is heavily degraded and thus may be marginal habitat for the species. Fa (1982) and Alvarez & Hiraldo (1975) suggested that this subpopulation may be linked with others further south along the contiguous mountain chain, in the El Haouz region, outside Tétouan. Thus, although there may be only one resident macaque group in Djebel Moussa, persistence

in such marginal habitat may be possible because of migration between this and adjoining populations. The lower numbers of macaques that we recorded in Djebel Bou Hassim and Djebel Talassemrane compared to those recorded in 1980 (Table 1) may indicate a significant decline. In both areas average and maximum group sizes were lower in 2004 than in 1980, with the largest differences in Djebel Talassemrane.

The results of this survey do not present a complete picture of the current situation of the Barbary macaque in northern Morocco but these are the first data on the species' distribution in this area since 1980 and demonstrate that, even in marginal habitat such as Djebel Moussa and close to the city of Tétouan, the

**Fig. 1** The study area, showing locations of surveys and Barbary macaque sightings during this study (black shading).

species can still exist. We accounted for 89 animals in three survey areas, and, if other areas where the species may potentially occur are included, we believe there may be a population of 200–300 individuals in the region. It is unlikely that the small subpopulations located can survive in the long-term, and our study has shown that numbers in Bou Hassim and Talasemtane have fallen dramatically.

The situation of the Barbary macaque throughout its range is precarious. Even in the Middle Atlas, where the population is substantially larger, forest destruction and habitat deterioration has precipitated a decline in the species (Camperio Ciani *et al.*, 2005) that will continue if protection is not provided. Further data on the current distribution and density of the species, including the potential for genetic transfer between populations, are needed to ascertain the viability of the Barbary macaque in the Djebela. Such data would facilitate assessment of which populations require conservation assistance, and aid the appropriate Government Ministry to develop management plans and, if necessary, protective legislation. We are currently planning to follow up our survey with further studies of the Barbary macaque in this region.

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Biographical sketches

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