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Roles of tourism in the local people's opinion regarding human-macaque conflict in the central High Atlas, Morocco

Historique

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1 Introduction

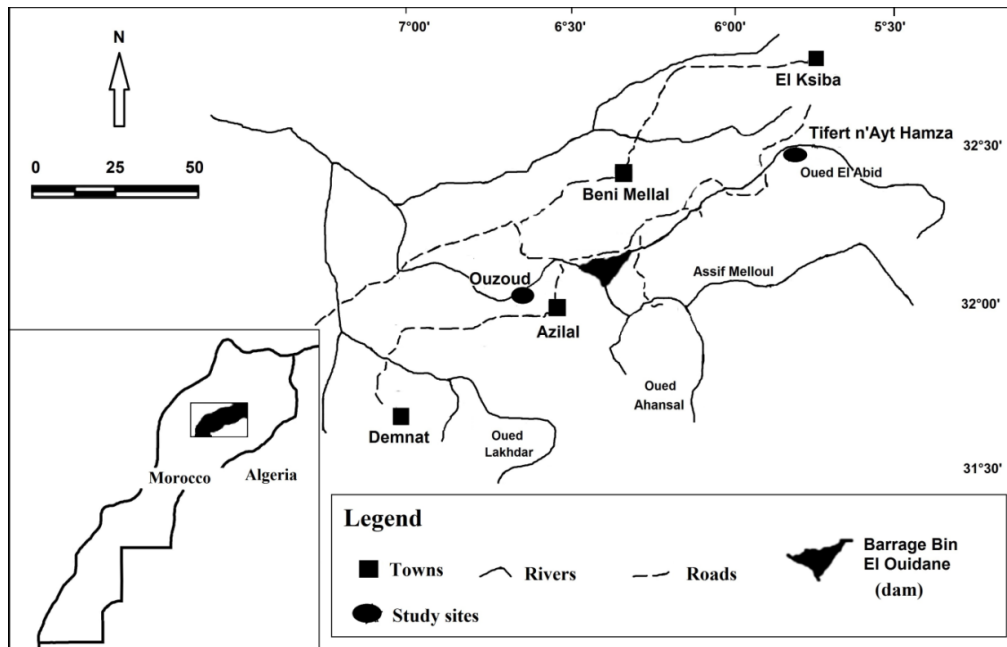
- 1 Since 2008, the Barbary macaque *Macaca sylvanus* has been classified as an endangered species on the IUCN's Red List (IUCN, 2014). The species is threatened by habitat loss, overgrazing and illegal capture (Camperio Ciani *et al.*, 2005; Waters *et al.*, 2007; Van Lavieren and Wich, 2009). In Morocco, tourists interact with Barbary macaques in many regions. For example, in the Cascades d'Ouzoud in the central High Atlas and in forests located near the town of Azrou in the Middle Atlas, Barbary macaques are a major tourist attraction (El Alami *et al.*, 2012). Tourism can have both positive and negative impacts on the survival of this primate. Barbary macaques are favorable for their ecological roles but also for their potential benefits to tourism. Nevertheless the presence of tourists may stress the macaques physiologically (Maréchal *et al.*, 2011) and may also influence the activity budget and feeding behavior of groups living in tourist sites (El Alami *et al.*, 2012).
- 2 Conflict between local people and wild macaques is one of the greatest challenges to *Macaca sylvanus* conservation in Morocco (El Alami, 2014; Van Lavieren, 2004; Van Lavieren and Wich, 2009; El Alami and Chait, 2014). Conservation efforts on behalf of this primate should consider the opinion of local people on the human-Barbary macaque conflict. The objective of this work was to study the effect of tourism on local people's opinions regarding human-macaque conflict in the central High Atlas. For this, we compared views expressed about human-Barbary macaque interactions by the local population in a tourist and a non-tourist site in the central High Atlas Mountains of Morocco.

2 Methods

2.1 Study sites

- 3 This study was conducted in two sites in the central High Atlas of Morocco: in the tourist site of Ouzoud (700-960 m; (6°44'W, 32°00'N)) and in the non-tourist site of Tifert n'Ayt Hamza (1400-2000 m; (5° 58' W, 32° 18'N)) (Figure 1).

Figure 1



Map of the central High Atlas of Morocco showing main rivers, towns, roads and the two study sites where interviews were conducted. The rectangle on the inset indicates the location of the main map in Morocco.

Carte du Haut Atlas central du Maroc montrant la localisation des deux sites de l'étude et les principales routes, rivières et villes. Le rectangle à gauche montre la localisation du Haut Atlas central sur la carte du Maroc.

- 4 Ouzoud (tourist site) is one of the popular recreational sites in Morocco where Barbary macaques are present year-round. By contrast, Tifert n'Ayt Hamza (non-tourist site) is characterized by a low level of tourism development. In Ouzoud, macaques can directly interact with tourists and consumes both natural food and that from human sources. On the contrary, in Tifert n'Ayt Hamza, macaques live in wild groups and have no contact with humans (El Alami, 2014). In both sites, the terrain, mainly calcareous, consists of steep mountain slopes and rocky gorges dissected by swiftly running streams. The two study sites have a Mediterranean climate with four distinct seasons: winter, spring, summer, and autumn (Ouchbani and Romane, 1995). Ouzoud has a semiarid bioclimate and Tifert n'Ayt Hamza has a subhumid bioclimate (Sauvage, 1963; Ouchbani and Romane, 1995). The habitat types in the two study sites are principally composed of holm oak (*Quercus ilex*) mixed with *Juniperus phoenicea*, *Juniperus oxycedrus* and *Tetraclinis articulata*.

2.2 Data collection

- 5 We collected data on the opinions of the local people regarding human-macaque conflict. We conducted interviews in the two study sites from February 2004 to December 2009. Interviews were conducted with 235 local inhabitants (160 males and 75 females) in the tourist site and with 185 inhabitants (149 males and 36 females) in the non-tourist site. The questionnaire was administered in the local language (Tamazight) which is the first language of the authors. Six questions were asked: 1) What is the main economic activity of the interviewee? 2) Are monkeys present in the region? 3) Did the interviewees recognize the picture of the monkey that occurs in proximity of their villages? 4) Is the monkey's presence favorable or unfavorable? 5) What are the disadvantages of the monkey's presence? 6) What are the advantages of the monkey's presence? A two-point scale was used to measure the response to the question 2, 3 and 4: yes (1) and no (0). To assess the differences in the responses of interviewees to these three questions between the two sites, we used the Mann-Whitney U test. Significant differences (Mann-Whitney U test, $n_1 = 235$, $n_2 = 185$, two tailed, $ns = p > 0.05$; $S = p < 0.05$).

3 Results

6 Results of the questionnaire are given in Table I. The main economic activity in the two sites is agriculture, but a large fraction of the interviewees (41%) work in tourism and trade in the tourist site.

Table I

Questions	Tourist site of Ouzoud	Non-tourist site of Tifert n'Ayt Hamza		Significance
1. Economic activities of the interviewees	Agriculture: 42% Trade: 24% Tourism: 17% Public functions: 6% Others: 11 %	Agriculture: 62% Trade: 7% Tourism: 0% Public funct.: 3% Others: 28%		NA
2. Are monkeys present?	Present: 98%	Present: 84%		Mann-Whitney U test, $n_1=235$, $n_2=185$, two tailed $p < 0.05$
3. Identification of the local monkey picture	Yes: 75%	Yes: 48%		Mann-Whitney U test, $n_1=235$, $n_2=185$, two tailed $p < 0.001$
4. Opinion on the macaque's presence	Favorable: 67%	Favorable: 16%		Mann-Whitney U test, $n_1=235$, $n_2=185$, two tailed $p < 0.001$
5. Disadvantages of the macaques	Crops raiding : 31% Disturbance of tourists: 25%	Crops raiding: 74% Competition with livestock: 17%		NA
6. Advantages the macaques	Tourist attraction : 48% Cultural value : 11% Ecological value: 5%	Cultural value: 8%		NA

Comparison of the local people opinion regarding Barbary macaques between the tourist site of Ouzoud and the non-tourist site of Tifert n'Ayt Hamza.

Comparaison de l'opinion des habitants locaux sur la présence des magots dans le site touristique d'Ouzoud et le site non touristique de Tifert n'Ayt Hamza.

7 Results showed that in the tourist site, the percent of interviewees who confirm the macaque's presence and who recognize the picture of the local monkey are significantly higher than in the non-tourist site (Mann-Whitney U test, $n_1 = 235$, $n_2 = 185$, two tailed, macaque's presence: $p < 0.05$; recognize of the picture: $p < 0.001$). The local people's opinions about the presence of macaques differ significantly between the two study sites (Mann-Whitney U test, $n_1 = 235$, $n_2 = 185$, two tailed, $p < 0.001$). Barbary macaques are viewed favorably in the tourist site (67% of the interviewees) for their benefits to tourism (48% of the interviewees). On the contrary, according to 84% of the interviewees, monkeys are viewed unfavorably in the non-tourist site and this is mainly due to crops raiding (74% of the interviewees). The other problems of macaque's presence are the competition with livestock for food resources in the non-tourist site and the disturbance of tourists in the tourist site. Finally, only few interviewees in the two sites recognized the ecological and cultural values of the presence of this primate in their regions.

4 Discussion

8 The local people opinion plays a vital role in the conservation of Barbary macaque populations. In the central High Atlas of Morocco, there are increasing problems of conflict between inhabitants and wild macaques, particularly in the context of crops raiding and illegal capture of macaques (El Alami *et al.*, 2013). In these regions, the wild boar and the Barbary macaque are actually considered the two main pest animals (El Alami, 2014). This study confirms that

- macaques come close to agricultural land and cause damage to crops in the tourist and non-tourist sites, and that this is the main factor for the presence of the conflict with inhabitants.
- 9 The tourism has some disadvantages for Barbary macaques. For examples, recent studies show that the contact between humans and macaques and the inclusion of human food in their diet can have negative effects on the ecology and behavior of Barbary macaques (Unwin and Smith, 2010; Maréchal *et al.*, 2011; El Alami *et al.*, 2012). The tourism also encourages the capture of macaques and an estimated 300 infant macaques are smuggled into Europe annually (Van Lavieren, 2008). However, the tourist activities also have some advantages for the local people economy. In tourist sites, macaques attract a large number of visitors every year and they are favorable for their potential benefits to tourism (El Alami, 2014; El Alami and Chait, 2014). In addition, the opinion of the local people can be ameliorated by the transmission of primate information from tourists (El Alami, 2014).
- 10 Conservation efforts on behalf of Barbary macaques should consider the local people opinion regarding human-macaque conflict and the advantages and disadvantages of tourist activities. We recommend educating the local people about the ecological and economical roles of the Barbary macaque, especially in the non-tourist site where macaques are viewed unfavorably, and placing clear information panels for tourists about the illegal capture and provisioning of macaques in the tourist site.

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Notes

1 The authors declare they have no conflict of interest with people or organizations and that data were collected exclusively by themselves. Other data cited which were not collected by the authors of this article is referenced to their original authors. This research was conducted with the authorization of the University of Caddy Ayyad, Marrakech, Morocco. We thank the local forestry officials of The Moroccan forestry department, the local inhabitants and the tourist guides of the province of Azilal for their cooperation.

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Résumés

Conflict between local people and wild macaques is one of the greatest challenges to *Macaca sylvanus* conservation in Morocco. The objective of this study was to assess the human-Barbary macaque interaction in a tourist and a non-tourist sites in the central High Atlas Mountains of Morocco. From February 2004 to December 2009, we collected data on local people's opinions about the advantages and disadvantages of Barbary macaque's presence. Results showed that in the tourist site, the percent of interviewees who confirm the macaque's presence and who recognize the picture of the local monkey are significantly higher than in the non-tourist site. Barbary macaques are viewed favorably in the tourist site for their benefits to tourism. On the contrary, they are viewed unfavorably in the non-tourist site and this is mainly due to crops raiding and the competition with livestock for food resources. Conservation efforts on behalf of this specie should consider the local people's opinion regarding human-macaque conflict and the advantages and disadvantages of tourist activities.

Rôle du tourisme dans l'opinion des habitants locaux sur le conflit homme-magots dans le Haut Atlas central (Maroc)

L'opinion des populations locales riveraines du Haut Atlas vis-à-vis du magot (*Macaca sylvanus*) peut être construite à partir du conflit entre les habitants et les magots sauvages. Cependant, la prise en considération des avis et opinions de cette population dans les plans

d'aménagement est indispensable pour réussir tout effort qui vise la conservation de cette espèce. Pour évaluer le rôle du tourisme dans l'opinion des populations locales sur la présence des magots, nous avons comparé les avis des habitants locaux sur les magots dans la région touristique d'Ouzoud et la région non touristique de Tifert n'Ayt Hamza. Entre février 2004 et décembre 2009, nous avons mené des interviews à l'aide d'un questionnaire qui a porté sur l'opinion des habitants sur la présence de cette espèce à proximité de leurs villages. Les résultats montrent que les habitants du site touristique ont plus de connaissances sur les magots que ceux du site non touristique. En général, l'opinion publique locale est favorable à la présence des magots à Ouzoud alors qu'elle est défavorable à Tifert n'Ayt Hamza. Le ravage des cultures par les magots constitue un problème commun dans les deux régions, mais avec une intensité plus élevée à Tifert n'Ayt Hamza. Dans ce site, la compétition des singes avec les animaux domestiques constitue le second problème de la présence des magots. Le dérangement des touristes par les singes, plus précisément le vol des repas et l'apparition soudaine et effrayante des animaux, constitue le second problème de la présence des magots à Ouzoud. Dans ce site, l'encouragement du tourisme par la présence des magots participe à l'amélioration de l'opinion des populations locales qui cohabitent avec l'espèce. En plus dans le site touristique, les magots ne sont pas pourchassés par les habitants qui ont l'occasion d'observer le comportement et les relations sociales chez ces primates. Les projets de conservation et de développement doivent prendre en considération les avantages et les inconvénients de la présence des magots et du tourisme sur l'économie et l'opinion des habitants locaux.

Entrées d'index

Mots-clés : conflit homme-macaques, conservation, *Macaca sylvanus*, macaque de Barbarie, tourisme.

Keywords : Barbary macaque, conservation, human-macaques conflict, *Macaca sylvanus*, tourism.