

Effects of human pressure on the distribution of *Macaca sylvanus* in the sector of Ait ouabane, National Park of the Djurdjura, Algeria

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(Received 10 June, 2018; accepted 20 August, 2018)

ABSTRACT

The pastoralism too is present in the territory of the National Park of Djurdjura (N.P.D) In front of increasing number of the livestock frequenting the N.P.D and its settlement, the extensive breeding appears as a major constraint of management. Indeed, this system of breeding affects the animal communities and the functioning of these ecosystems. This system of breeding contributes to the overgrazing which in his turn leads to the degradation of the natural ecosystems by increasing the risk of erosion, the settlement of the ground, the loss of the biodiversity, etc. These constraints have a negative impact on the food behavior and the movements of the populations of the Barbary Macaque (*Macaca sylvanus*) towards some villages. These movements are sometimes at the origin of conflicts with the inhabitants who see their harvests Threatened. *Macaca sylvanus* is moreover considered as a biological indicator of the quality of an ecosystem, as a forest. In our study, we noticed a very strong pressure on pastures due in a livestock more and more numerous and a very remarkable settlement. The rural populations of the N.P.D do not encourage the mobility of their herds, added to it there almost disappearance of the practice of the transhumance. The absence of shepherd in the driving of the herd generates an additional pressure on behalf of the herds on numerous endemic plants listed in the N.P.D. Nevertheless, solutions exist to limit the negative impact of the extensive breeding on the natural ecosystems. We can provide an awareness campaign in the direction of the local populations with the aim to return to the transhumance, maintaining the size of animals at acceptable levels and rehabilitating the function of shepherd.

Key words : Pastoralism, *Macaca sylvanus*, Livestock, Biodiversity

Introduction

Since the highest antiquity, the Mediterranean forest assures a considerable fodder production, which is used by the herds (Quezel and Barbero, 1990).

The exploited pastures are defined by Daget & Poissonet (2015) as being all the surfaces grazed by the domestic herds.

For the farmer, the Mediterranean forest offers numerous resources, which can contribute to the chain of pastoral resources allowing to feed his herd all year round (Hétier and Lilin, 1989). However, the breeding is not a neutral activity towards the environment (Boutrais, 1996).

According to Marion (2011), the pasture can act on plants in a direct way by leading losses of tissues

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by defoliation or by causing damages due to the standing about.

Quezel and Barbero (1990) underlines that on the south lapel of the Mediterranean, the almost permanent overgrazing stopped regenerations, transformed, many forests, into one staked out by pruned trees and profoundly modified the associated soil vegetation.

Daget and Poissonet (2015) calls back that when the soil is too much pressed down, as it can be the case in very old lawns, roots are lacking in-depth air.

In Algeria, the National Park of Djurdjura (NPD), classified also reserve of the biosphere, faces very numerous constraints. That they are of anthropological or natural origin, these constraints represent a threat for the biodiversity and a real danger on the existence of this protected area.

The main threats are the fires, the overgrazing, the illicit forest cups, the exploitation of quarries and the unchecked tourism (Yahi and Benhouhou, 2011). It should be noted that the N.P.D was retained, by the I.U.C.N, as key zone for the biodiversity.

Among the numerous mammalian species populating the N.P.D, we find the Barbary macaque (*Macaca sylvanus*). He is the only representative of the genus *Macaca* outside Asia. Since 2008, *Macaca sylvanus* is Categorized as Endangered on the Red List of Threatened Species of the I.U.C.N. In 2017, he represents from now on the appendix I of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Within the framework of our study, we were interested in the effects of the pasture, such as is practiced in the N.P.D, on the Barbary macaque.

The Barbary macaque colonizes diverse housing environments and is also known for its capacities of adaptation. However the concern of preservation for the species results from the loss of housing environment, the overgrazing, the cup and the collection of firewood and feed, drought and illegal trade (Van Lavieren and Wich, 2009).

Materials and Methods

The National Park of Djurdjura (N.P.D), with a surface of 18550 ha, is situated in the region of Kabylia. He was create, officially in 1983 and set up as Biosphere reserve since 1997.

The territory of the National Park of Djurdjura is

constituted by a mountain range limestones spreading out on 50 km From east to west and having on average 5 km in width. The peak, in 2308 m, is called Lala Khedidja.

The N.P.D is divided, from the administrative point of view, into five Sectors of which that of Ait Ouabane situated in the wilaya of Tizi-Ouzou. The latter, situated in the oriental part of the N.P.D, is the place of our study (Picture 1.).



Pict. 1. Geographical location of the sector of Ait Ouabane

The N.P.D is considered a Hot-spot of the biodiversity so much for fauna and flora. To highlight the impact of the extensive farming on the fauna, our choice concerned naturally to the Barbary macaque.

Results and Discussion

The main economic activity exercised by the local population is the breeding. This neighboring population does not stop increasing and with her, herds size. The Figure 1 shows the evolution of the ratio livestock / population in the sector of Ait Ouabane from 2004 till 2014.

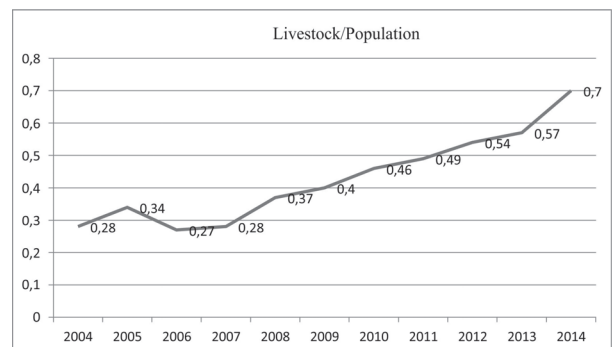


Fig. 1. Evolution of the ratio livestock/population in the sector of Ait Ouabane.

Furthermore, it is the extensive farming which is followed by the group of the breeders. The use of this type of practice is motivated by the financial investment almost nobody on behalf of the owners of these animals (Viramontes and Descroix, 2000).

For the analysis of the size of the herds and the expression of the results, we held the method of calculation adopted by Le Houérou to know the conversion on equivalent sheep (Nedjraoui, 2004).

The Figure 2 presents us the size, converted in equivalent sheep, corresponding to the livestock of the sector of Ait Ouabane.

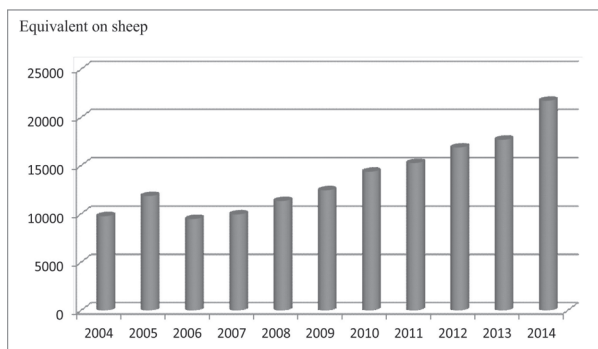


Fig. 2. Evolution of the livestock on equivalent sheep in the sector of Ait Ouabane.

The analysis of data, on the livestock, registered between 2004 and 2014, shows an important growth. The strong pressure exercised, by the herbivores, on the ecosystems leads to the loss, by places, of the plant cover associated with the soil erosion (S.C.D.B, 2010). In Morocco, according to Ménard and Qarro (1999), the overgrazing led a reduction of the vegetable specific diversity. However, in spite of the size of the herds which does not stop increasing in a very important way, at this stage we cannot speak clearly about overgrazing because we have no information about the fodder capacities in Ait Ouabane.

Nedjraoui (2004) mentions, that on the quantitative plan, the overgrazing causes a decrease of the long-lasting plant place setting and the phytomass. So, the collecting of feeds made by these animals, more and more numerous, increase while the plant biomass decreases.

From his part, Boutrais (1996) shows that the reduction of the plant specific diversity is not linear but exponential as the size of the livestock increases, and that beyond a certain threshold the renewal of the fodder capital is questioned.

If we consider the rate of global increase of the

livestock in our area of study, we notice that it is 122.5 % (Table 1). This value is very important, and it means that the number of the livestock is on an ascending curve.

Table 1. Evaluation of the rate of global increase of the livestock

Year	2004	2014
Size (Eq. Ovine)	9761	21723
Rate of increase (%)	-	122,50

Distribution according to the species

The composition by species of the livestock is an information of big importance.

According to Boutrais (1996), the herds, which juxtapose several species of animals, show themselves the most dangerous for the pastoral environment because they consume a wide range of feeds situated at several heights: sweet grasses and coarse, leaves and fruits of shrubs.

The livestock met in the Sector of Ait Ouabane is very diversified. Within the N.P.D, we notice a very strong presence of mixed herds. We find cattle, goats and sheep. The Figure 3 indicates the distribution of these three species for the period from 2004 till 2014.

The specific analysis of our data, presented in the figure 3, reveals that, about is the considered year, sheep are the most numerous. The highest number of sheep, observed in 2013, is 6884. Besides, the maximal values of the cattle and the goats, respectively, 2674 and 2807 are both subordinates in the minimal value, recorded to sheep, which is of 2877. It emerges from these results that it is the sheep's breeding which is preponderant.

The structure and the function of the ecosystem

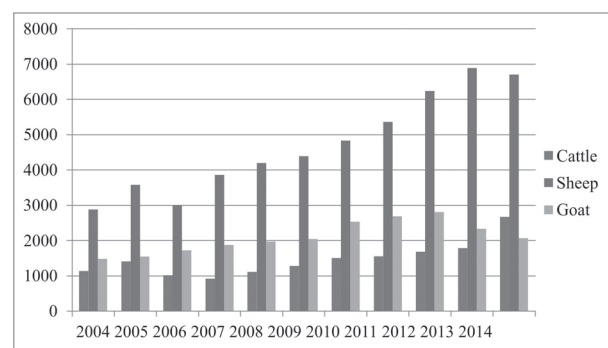


Fig. 3. Distribution of the livestock by species from 2004 till 2014.

decrease much more when it is the cattle and the sheep which graze together than the only sheep (Eldridge *et al.*, 2016).

If we consider every species for 2004 and 2014, we note a large gap in the rate of increase of size (Table 2).

Table 2. Evaluation of the rate of increase by species

	2004	2014	Rate of increase (%)
Cattle	1140	2674	134.60
Sheep	2877	6699	132.80
Goats	1480	2067	39.70

The rate of the highest increase is observed at the cattle with a 134.6 % value followed by that of the sheep of 132.8 % and finally that of the goats with 39.70 %

The N.P.D is threatened by the strong pressure exercised by the pastoralism which affects its various ecosystems. The Barbary macaque is considered as an important biological indicator of the habitat in the Moroccan Middle Atlas (Camperio-Ciani *et al.*, 2003).

Macaca sylvanus faces directly several threats. The habitat of this primate is modified so causing changes in its diet among others. Ménard and Vallet (1986) bring back that 136 species or categories of food are a part of his diet. Always, according to the same authors, 93 % of the food intake, the troop occupying an evergreen forest, are represented by vegetables. Besides, the destruction of the forest procession, caused essentially by the overgrazing, reduces more and more the surface of the habitat of our the Barbary macaque.

The results of the study of Ménard *et al.*, (2014) show that the impact of the pastoralism on the forest is such as the size of the groups of monkey decreased in half.

The overexploitation of the forest by the man can lead to big fragmentations of the populations of monkey (Ménard *et al.*, 2013). The Barbary macaque was registered since July 1st, 1975 on the appendix II of the CITES, and in 2017, we find him in the appendix I.

So, with the livestock without the presence of shepherd, it is all the diet of this monkey which is modified.

These last years, a new phenomenon appeared ; it is the one of the intrusion of monkeys, beyond

their usual territory. This could be explained by the fact that the natural habitat is modified further to the food competition with the domestic herbivores, to the trampling and to the forest clearing. Indeed, we are seeing an increase of the number of requests, sent to the competent authorities (Management of the N.P.D, Forest department).

These requests emanate mainly from inhabitants of two villages situated within the territory of N.P.D, Ait Ouabane and Ait Allaoua. The complaints of the villagers concern essentially the damages, caused by certain monkeys, in their harvests.

The driving of animals in the pasture

The role of the shepherd. He occupies an important place in the management of pastures, and its role was able to be highlighted, by comparing the effects on the pastures of herds in free range and guided herds. So, Leclerc *et al.*, (1986) underline that in free-ranging systems, the pressure of the pasture mainly seems to practice at the level of the botanical species on the whole territory, while in the system of the guarded herd, the pressure would applied rather at the level of the plant grouping chosen by the breeder.

The role of the shepherd is major in the management and the driving of a livestock, because it is brought to modify the pressure of herbivores on the pasture.

Throughout our observations, no shepherd was perceived near the herds met in our zone of study. So, the agri-environmental objectives of the management of environment by the livestock cannot be obtained without the guarding of at least a shepherd and a plan of conduct of the herds (Benhamou, 2003).

The transhumance. Ancestral but almost given up practice, it is very beneficial for the ecosystems because pastures rest. The effects of the pasture are marked all the less as the herds are expected to move and to develop the mobility.

In the case of our study, the livestock frequents the N.P.D in a permanent way and all year round. The settlement of the herds has consequent effects regarding degradation of the ecosystems. It is the case also in Morocco, where the settlement is at the origin of an astounding destruction of the forest course (Tarrier, 2011).

With the aim of limiting the negative impacts of the extensive breeding on the habitat of the Barbary macaque, urgent actions must be taken. The aim,

here, is not to prohibit the pasture, but rather to proceed to its rational management because the pastoralism plays an important role in the preservation and the sustainable use of the biodiversity.

The constitution of fodder reserves will allow additional food contributions the livestock and consequently to protect the numerous endemic plants within the N.P.D, which for some, are a part of the diet of the Barbary macaque.

Within the framework of the sustainable development, the implication of the rural populations is essential. By encouraging integrated resources management of the N.P.D, we are able to reduce the pressure due to the extensive breeding, by slowing down the exponential increase of the livestock.

Besides, rehabilitate the function of shepherd, because the latter occupies an important place in the management of pastures.

Finally, it will be necessary to encourage the breeders to more mobility for their herd and to renew so with the transhumance, formerly practiced, to protect the natural environments.

Acknowledgements

The data presented in this study are obtained from direct observations and from several sources : National Parc of Djurdjura, « Direction de la Planification et de l'Aménagement du Territoire » de Tizi-Ouzou et « Direction des Services Agricoles » de Tizi-Ouzou.

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