The importance of goats to a natural environment: a case study from Epirus (Greece) and Southern Albania

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ABSTRACT

In the Epirus region of North-west Greece, spring flows in villages have reduced dramatically over the last few decades, in some cases with serious economic consequences. We argue here that this has resulted from the major reduction of grazing by mountain goats over the same period together with other associated land-use changes. Normally such a contention would be impossible to demonstrate because many different causes could be invoked. However, prior to 1946 culturally homogenous Greek-speaking communities with identical pastoral practices were separated by the closure of the Greek–Albanian border. Changes of spring flow have not occurred on the Albanian side of the border where heavy grazing has continued. In a region such as Greece where pastoralism has continued for thousands of years, the environment has reached an equilibrium with goat grazing. Apart from the reduction of spring flows, other undesirable ecological consequences are occurring.

It is also interesting to note that long-term water table changes such as those occurring in Epirus have been attributed to tectonic effects and thought to potentially predict earthquakes. The effect however, may be the result of goats and other livestock 'leaving' and not the result of earthquakes 'coming'.

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INTRODUCTION

It is commonly agreed that overgrazing by goats (Perez-Trejo, 1994; Grainger, 1993) has resulted in land degradation in many arid and semi-arid parts of the world. We argue here that this view can be misleading. In Epirus over the last 30 years, the widespread abandonment of sheep and goat pastoralism is a major cause of mountain springs drying and is having other negative environmental consequences.

Since Palaeolithic times the limestone lowlands and uplands of Epirus have supported herbivore populations exploited by humans as their major source of food (Bailey et al., 1992). While details of the exploitation remain obscure, particularly the transition from hunting to domesticated animal husbandry, there is no doubt that some form of transhumant sheep/goat pastoralism was well established (and was affecting vegetation) by 4.5 kyr BP and probably existed as early as 6 kyr BP (Foss, 1978; Hammond, 1967; Turner and Sanchez-Goni, 1994). The deliberate movement of large herds of domestic animals between high and low pastures has been a human economic strategy in the area for the same reason that Palaeolithic wild herds made annual migrations; the amount of vegetation available for grazing or browsing varies in altitude with the seasons. The result has been relentless, though varied, pressure on open browsing and grazing land (McNeill, 1992).

However, since the 1960s, rural to urban migration has nearly emptied many Greek mountain villages in Epirus. As a result, the extensive mountain sheep and goat economy has largely collapsed (McNeill, 1992; Green, 1994). Various government policies are attempting to re-invoke the economy by assisting the development of plains-based agriculture and tourism (Green and Lemon, 1996). However, these efforts are threatened by increasing water shortages, as mountain springs (which have probably flowed for millennia) start to run dry.

Normally it is impossible to unambiguously identify the causes of long-term changes of spring flows. However, a unique feature of the Epirus region makes this possible. The region, always environmentally homogeneous, was culturally homogeneous before it was divided by the closure of the Greek–Albanian border in 1946. Following this closure Albanian land use practices in this area remained largely unchanged, whereas major changes have occurred on the Greek side. We therefore have a natural Control Experiment.

CHANGES IN SPRING FLOWS AND CHANGES IN VEGETATION

This study is part of a larger EU project in Southern Europe (Archaeoedmes) to examine the environment, and in particular how changing water resources can affect desertification and land degradation. We concentrate here on Greece and Albania, in particular the sub-region shown in Fig. 1 which straddles the border, but is largely linguistically and culturally Greek. It consisted of two socio-economic communities, the Pogoni and Dropolis peoples, both of which were split after 1946 by the closure of the Greek–Albanian border (Green and Lemon, 1996). The figure shows significant springs in the area, distinguishing between those experiencing minimal changes of flow and those which have
shown substantial reductions. All of the villages that are indicated as having reductions of spring flow have been visited by one of us (SG) and the local village inhabitants have been questioned. In all cases the reductions have caused and continue to cause major concern. In recent years, there have been frequent occasions, particularly during the summer, when water has had to be rationed in mountain villages to certain hours of the day, and where self-rationing is encouraged by charging extremely high rates for water usage beyond a certain amount per month. Debates in mountain villages frequently circulate around the question of water shortages, creating often heated disputes between different parties.

None of the springs in the case study area was monitored for the period leading up to such shortages, so direct numerical data are not available, but reductions by a factor of 10 or more, at least during dry summers, seem typical. Evidence other than that provided by word of mouth abounds. Stream channels leading from springs are now dry and decorative constructions to spout and store water no longer do so. It should be borne in mind that the springs which have reduced in flow are in Greece, where both population and landuse requiring irrigation has reduced. Thus there is a shortage of water despite a reduction in demand. All of the springs whose flow is unchanged are in Albania, although three springs at Glim, Episkopi and Radat that lie on the Albanian side close to the Greek border have run dry, causing the closure of a water bottling plant (built less than 20 years ago), and the desiccation of a reservoir used for storing irrigation water.

Figure 1b shows precipitation levels since 1952 recorded at the Ioannina weather station (40 km from the fieldwork area). A slightly more distant weather station at Konitsa (50 km) also exhibits the same small decline in precipitation similar to that shown in the figure. Both stations are at similar altitudes to our study regions. No comparable data are available for the Albanian side of the border near to our region. At a larger scale, there are no reports of significant climatic changes in Albania or Greece. It should be noted that total precipitation levels alone do not necessarily deter-

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**Fig. 1.** (a) The central part of the area of study is shown with principal springs marked. Those indicated by open circles have had a substantial drop in water flow over 30 years. Solid circles indicate springs for which little change has occurred. The spring at Goranitz is discussed in the text. Altitude is indicated by three levels of shading. White corresponds to less than 500 m and black to greater than 1500 m. The Greek–Albanian border is marked by a grey line. The area shown in the SPOT image is marked by a rectangle. (b) Variations in the number of mountain goats and precipitation from 1952. The number of goats is taken from 13 mountain villages and precipitation from the Ioannina weather station 45 km from the centre of the region.
not unambiguously distinguish cause and effect. In any event, the two adjacent case study areas cover such a small area that any changes in precipitation levels should have affected both sides of the border equally, particularly as they contain virtually identical geomorphology. Of much greater importance are the changes of spring flows in relation to known changes in land-use in otherwise similar regions. The effects of this change can also be seen in satellite images. Fig. 2 is a SPOT image of the area indicated in Fig. 1a. In many places the border can be identified by a change in the colour/texture of the image resulting from a difference in the vegetation cover. The Albanian landscape is bare while the Greek landscape is well vegetated. The forest and scrub cover on the Greek side has developed over the last 30 years, and contrasts starkly with the barren landscape on the Albanian side.

A straightforward explanation for the loss of spring water on the Greek side in the last 30 years is that new vegetation has progressively prevented precipitation from reaching the aquifers feeding the springs. The same explanation can be applied to the three dry springs in Albania: Glna, Episkopi and Radat. Figures 1 and 2 show that they are close to the Greek border and the topography is such that they must be fed by catchments on the Greek side of the border which have been affected by the growth of vegetation. Changes at the Goranitz spring cannot be explained in this way, but are reported only in the last two years, affect only one of two adjacent springs, and may thus be due to other hydrological processes.

The increase in vegetation in Greece is due largely to the decline in goats and sheep on the hills, a decline which did not occur in Albania until the last three or four years. The reduction in Greece can be seen in official statistics; the decline in the number of goats for 13 mountain villages within the study area is shown in Fig. 1b. Although the drop in goats shown by the statistics is dramatic, the true change is undoubtedly greater. Larger goat populations demand long-distance seasonal migrations, reducing the ability to make accurate animal censuses in any particular area. Furthermore, there were more Greek transhumant pastoralists in the past than is the case today, and these flocks are difficult for local government officials to count accurately. Thus earlier statistics show an underestimate. This tendency was exacerbated by the imposition of grazing fees and taxes based on numbers of animals, which led to deliberate under-reporting (Cowan, 1995). This tendency has been reversed in recent years, with over-reporting of numbers being encouraged by the introduction of EU agricultural subsidies.

Attributing all of the increase in vegetation to a reduction of goat numbers, while broadly true, is an oversimplification. Goats browse the tops of young saplings, shrubs and bushes, stunting their growth, and are thus effective in clearing vegetation and preventing large trees becoming established. However, people, sheep, horses, donkeys, mules and wild animals have all declined commensurately with goats. Sheep graze along the ground and have little effect on tree growth. They do, however, prevent the development of other forms of ground cover. Large human populations collecting wood or brambly scrub and bushes for fuel (about 12 tonnes per family annually) (Green and Lemon, 1996) have also been important in keeping vegetation down and they remain so in Albania. Recent reductions in periodic burning of grazing land to encourage fresh grazing vegetation, abandonment of hillside cultivation on terraces and reductions in the numbers of other wild and domestic herbivores have also contributed to the “reforestation” of the Greek side of the study area.

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DISCUSSION AND CONCLUSIONS

Among those who are concerned with environmental protection, a reduction of human activity that allows the restoration of 'natural' forest is frequently seen as desirable. Animal husbandry, particularly involving goats, is regarded as preventing the return to a 'natural' environment. In Epirus and other places where goats have grazed for thousands of years, this view must be questioned. Even if we ignore the drying of springs that reduces the viability for human habitation, there are other consequences for the ecosystem. First, a dramatic drop in six principal wild fauna is reported: wolves, wild boar, deer, rabbits, hares, and foxes. Despite an increase in urban residents visiting to hunt, this may seem an odd finding for a depopulated area undergoing reforestation. Local residents explain that these animals were attracted by cultivated fields on the hillsides and, for foxes, the available chickens and rabbits in the area. As the local populations left, there was much less available food for these animals. Moreover, the type of vegetation which is now growing is dense and prickly, comprising species or sub-species that only occur in regions of substantial upland animal husbandry and that have apparently co-evolved with goats during several thousand years of browsing (Turner and Sanchez-Goni, 1994). No other control of this vegetation is available. More mature forest may in due course develop with a more diverse ecology, but this will be a slow process. In the absence of 'natural' control of this dense vegetation, selected by intensive sheep and goat pastoralism, it seems equally plausible that the biological diversity of Epirus will be diminished for the foreseeable future.

Similar processes have been noted in contexts other than the one described here. National Parks in Africa have found that the apparently destructive behaviour of elephants is essential to prevent forest smothering the Savanna, and furthermore, heavy grazing by smaller herbivores substantially increases rather than decreases the food supply (Cowen, 1995). Removal of the apparently destructive processes in due course results in a drop in bio-diversity.

A direct relationship is reported here between the density of vegetation and the amount of water reaching the water table. This relationship is notoriously difficult to quantify and some authors suggest that they are independent (de Marsily, 1986). On the assumption that such factors are unimportant, long-term changes of water table in the former USSR and California have been explained as resulting from the volumetric part of tectonic deformation. This, in turn, has been used to suggest that water table variations can be used for earthquake prediction (Kissin and Grimevsky, 1990). However, all of the regions concerned are likely to have been subject to changes in pastoral exploitation over the last 50 years and hydrological effects may be due to this alone.

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REFERENCES

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