ASPECTS OF HUMAN IMPACT IN THE MONTE GRAPPA MASSIF (VENETIAN PREALPS, ITALY)

ČLOVEKOV VPLIV V POGORJU MONTE GRAPPA (BENEČIJSKE PREDALPE, ITALIJA)

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Monica Celi: Človekov vpliv v pogorju Monte Grappa (Benečijske predalpe, Italija)

Pogorje Monte Grappa pripada Benečijskim predalpam, zgrajenim iz apnencev z dobro razvitimi kraškimi pojavi, vključno pomembne izvire v dnu dolin. Človekov vpliv je vezan na dva glavna dejavnika: na vire in na zgodovinski razvoj. Deforestacija, I. svetovna vojna, paša, turizem, so spremenili naravne ekosisteme in danes je razmerje med človekom in okoljem neuravnovešeno. V primerjavi z drugimi deli Benečijskih predalp Monte Grappa ni tako zelo degradirana, vendar jo je treba zavarovati, preden bodo njeni viri nepopravljivo poškodovani.

Ključne besede: krasoslovje, kraška morfologija, varstvo narave, človekov vpliv na kras, Italija, Benečijske predalpe, Monte Grappa.

Abstract UDC 504.05(450)

Monica Celi: Aspects of human impact in the Monte Grappa Massif (Venetian Prealps, Italy)

The Monte Grappa Massif belongs to the Venetian Prealps. It is of limestone and the karstic phenomenous is well developed, with important springs along valley bottom. The dynamic of human impact are linked to two principal factors: the resources and the historical events. The deforestation, the First World War, grazing, tourism have changed the natural ecosystem and today the equilibrium between man and environment is instable. The Massif is, among the others Venetian Prealps system, not much degraded but needs protection before irreparable damages to the resources.

Key words: karstology, karst morphology, nature protection, man's impact on karst, Italy, Venetian Prealps, Monte Grappa.

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INTRODUCTION

The mountain group of Monte Grappa belongs to the Venetian Prealps with the other groups: Monti Lessini, Altopiano di Asiago and the group of Cansiglio Cavallo (fig.1). Each of these groups presents a different aspect of the human impact evolution. Three principal factors induced these differences: 1) the morphology, which has influenced the possibility for men to penetrate inside the mountain, 2) the resources, 3) the historical events.

The combination of this factors, but in particular of the last two, has been very important to determine the actual situation about the human impact on the Monte Grappa.

SOME NOTES OF GEOLOGY AND GEOMORPHOLOGY

Monte Grappa is bounded by the two river valleys, Brenta and Piave. It presents to the east a morphostructural uniformity with the Altopiano di Asiago, broken only by the Brenta valley. Carbonate rocks of Mesozoic age predominate. From the bottom to the top the massif consists of these formations: Dolomia Principale of Triassic age, Calcari Grigi (grey limestone) of Jurassic age, Rosso Ammonitico (red limestone) of upper Jurassic age, and Biancone (white limestone) of Cretaceous age.

On the upper part scattered till deposits of the quaternary glaciation exist.

The relief of Massiccio is asymmetric, more steep toward the plain (south) and gently sloping to the inner part of the Alpine Chain.

The geomorphology is typical of karstic landscape. The epikarstic forms seem not well developed, but there is no surface flow, only dry valleys, and in the last ten years speleologists have explored more than 380 caves. Eight of the caves exceed in depth 100 m. The Monte Oro cave reaches 500 m in depth and a continuation is possible. The development of the caves is strongly controlled by the tectonic structure. The principal fault directions are two, NNE-SSW and ENE-WSW.

NOTES ON THE KARST HIDROLOGY

Along border valleys of the massif there are many karstic springs. The 20 principal springs with their discharge are indicated in tables 1 and 2. They

represent most of the karstic runoff that flows in the massif. Table 3 shows an evaluation of water balance in this system. About the circulation inside the Massif and the structure of the karstic system we can suppose a discontinuous epiphreatic zone. Little basins, influenced by tectonic and local morphological condition determine the localisation and the discharge of the springs. During the rainy periods the Fontanazzi di Solagna spring is the highest discharge one. It is associated with the crossing of the Brenta valley by an important system of faults, along which there are the Monte Oro caves and others, about 7 caves with a mean depth between about 50 and 100 m (fig. 2). A tracing test with fluorescine has indicated a velocity of 34 m/h of flow between the Monte Oro cave and the Fontanazzi di Solagna spring. There has not been dispersion of colorant in the nearest springs. In other sites in the massif the velocity of flow detected was less than 15 m/h.

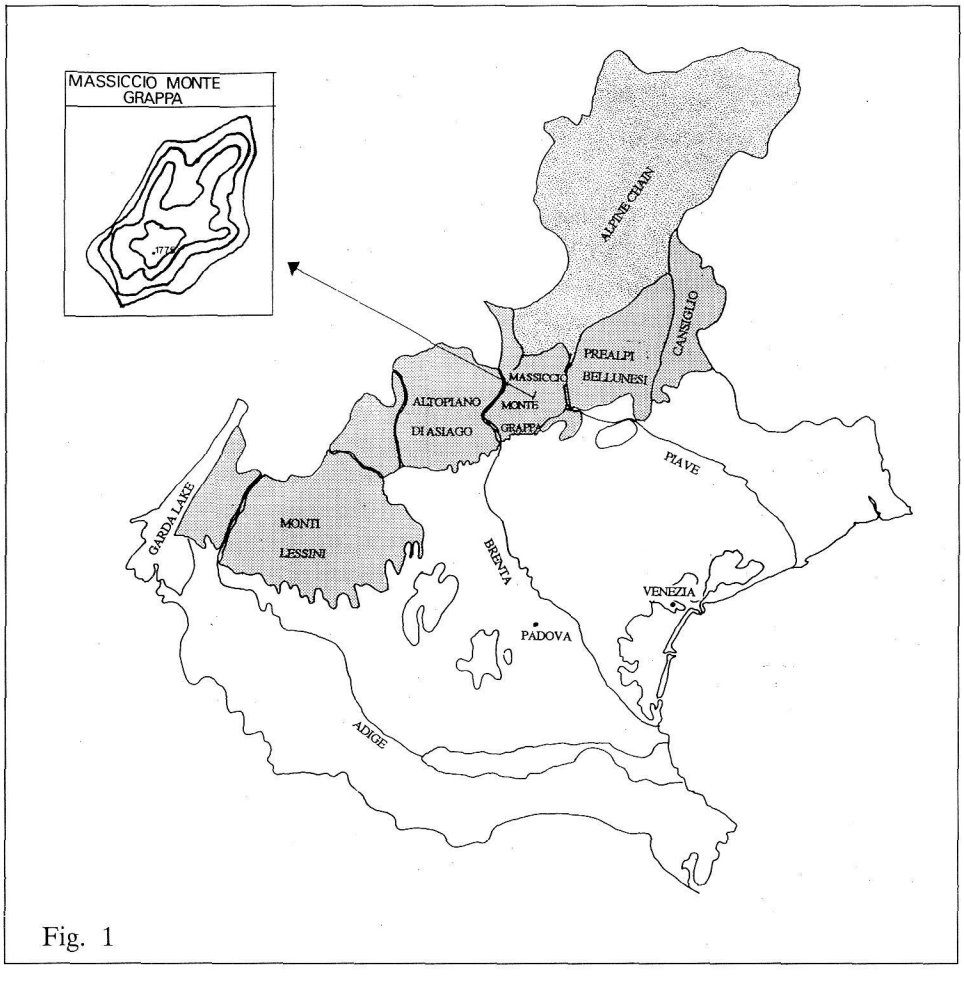

Fig. 1

MAN AND MASSICCIO OF MONTE GRAPPA

The asymmetric relief of Monte Grappa determines an assymmetric disposition of settlements, which reach medium elevations only toward the inner part of Alpine chain, or along the valleys. Differing from the other Venetian Prealps systems in Massiccio of Monte Grappa important settlements never developed. The human impact was thus limitted, but has some effect on the ecosystem.

In general the strongest forms of impact, that in past times and today have partialy degraded the ecosystem of this massif can be summed as:

deforestation and wrong reaforestation, grazing, World Wars, tourism and new settlements.

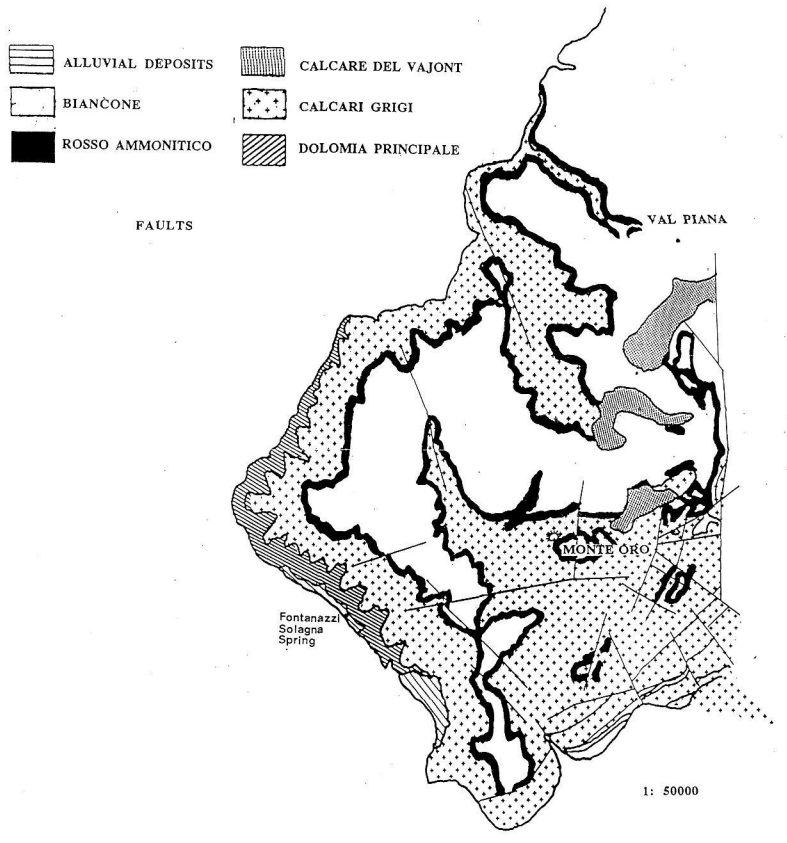

Fig. 2

Table 1
Discarge (lt/sec) of the 20 principal spring present in the Massiccio of Monte Grappa.

SPRING	Q max	Q min	Q mean *
Fener			45
Val Bicadora			26
Valle la Pila			43
Molinon			65
Tegorzo	500	300	360
Val Cauca	3	1.5	2.5
Fontana del Moro	1.5	0.5	1.2
Vallonara	3	1	2.3
Val Carbonaia	1.5	0.5	1.2
Segat			0.1
Lavazè	34	24	27.3
Molino Benvenuto			14
Vallle della Fontana	3.5	1.5	2.9
Fontanazzi Cismon	1200	600	800
Val dei Ponti			5
Rivalta			2
Carpanè			100
Fontanazzi Solagna	1800	300	800
Col Raniero			0.1

* Q mean = 1/3 Q max + 2/3 Q min

Table 2
Year discarge of Monte Grappa springs

SPRING	Q m^3/year
Fener	1419120
Val Bicadora	819936
Valle la Pila	1356048
Molinon	2049840
Tegorzo	11352960
Val Cauca	78840
Fontana del Moro	37843.2
Vallonara	72532.8
Val Carbonaia	37843.2
Segat	34.7
Lavazè	860932.8
Molino Benvenuto	441504
Vallle della Fontana	91545.4
Fontanazzi Cismon	41352960
Val dei Ponti	157680
Rivalta	523497.6
Carpanè	63072
Fontanazzi Solagna	43541952
Col Raniero	3154
TOTAL	107414804.7

Table 3
Evaluation of water balance for the Monte Grappa karstic system

	m^3/year	%
Precipitation	403187500	100
Evapotraspiration	156484000	39
Surface flow	139288696	34
Dow flow	107414804	27

- Deforestation and wrong reaforestation

The natural vegetation up to 1600 m was a beech forest and low elevation sub-Mediterranean forest, with *Abies* and *Picea*, only where the local climate situation was particularly cold. The important deforestation began in 500 A.C., when Teodorico needed wood to build 1000 ships for his fleet. The deforestation continued also during the Venetian Republic, and it was greater than in the others Prealps systems, because this site is nearest to Venice, and the Brenta and Piave rivers can be used for transport. This degraded irremediably the soil, with many problems of hydrogeological deterioration. Another important cause of deforestation was grazing animals. To create area for pasture many woods were cleared. The first World War, had many battles in the massif, transforming the upper part into a desert. Now the situation is no better. The reaforestation in this century did not good results, because instead of the beech, *Abies* and *Picea* were planted. The soil became more acid, and

many species of rare plants and flowers have disappeared. The upper part was a refuge area for many species during the glaciations and represents an important and very interesting botanic area. About the karstic areas the capacity of water corrosion is increased by greater concentration of humic acids; the soil had less humidity because of larger density of networks. Studies of the Department of Forest find in this the cause of the very common fires in the massif.

- Grazing

The grazing now is only temporary; in the upper part (about >500 m) there are no stock-farms. In past times it was more developed, and large areas with a lower density of animals were used; today only small areas, well served by roads, are used with problem of overloading. The other areas, often better for grazing, have been abandoned. So an important resource has been wasted, and there are many problems of bacterial pollution of springs due to overloading particularly during the summer time when the precipitations are less.

- The war events

The war events have completely transformed large areas in the massif, particularly near Cima Grappa, the highest summit, where the first line of the Italian army was settled. The consequences of these military actions were complex. The surface acquired different morphology. Aerial ropeways, new roads and muletracks, trench labyrinths were built . The bomb holes today are like dolinas and new fractures were created in the limestone, so the natural karstic processes find a favourable situation (Celi M., 1991). During the retreats and at the end of the wars much war equipement and ammunition was left in caves and fissures, with problems of danger and of heavy metal pollution of karstic system. During the war and at the end, many people emigrated from the valley to the plain, the consequence was the degradation of the pastures and particularly of woods. The artificial but, in that context, good equilibrium between man and the karstic ecosystem was thus irremediably broken.

- New settlements and tourism

Around the settlements in the valleys and at the foot of the massif agricultural activities developed principaly in the last three centuries, that used the mountain upper part for pasture and timber during the summer time. Many houses with stalls, named "malga", were built. Today only a few of these are still used and the others are ruined or are used as inns for tourists.

In Monte Grappa there are only two villages, but many scattered residential houses, and some hotels without infrastructures like drainage or an efficient service of waste collection and disposal. Near these new buildings there are many of the old buildings, now ruins.

The tourism is very different from that in the other Venetian Prealps systems. The winter tourism is limited by the deficiency of facilities. The ski-

lift in all the massif are only 8, in the near Altopiano di Asiago are 57. Many roads are closed for snow, and nearly all hotels are closed in winter. There is no tourist centre and so the residential tourism is restricted only to the residential houses or hotels. So particularly the tourism for the young is very limited; in the massif there are no discos, cinemas or swimming-pools or others similar facilities like in the Altopiano di Asiago. This is very important to limit the strong human impact in this ecosystem. But if the impact of the residential tourism is limited, particularly in winter, in the massif is possible to find other types of turists. During summer and autumn there are many sporting tourists: hunters, pickers of mushrooms, excursionists, cyclists with mountain bikes, speleologists, persons with off-road vehicles, pick-nickers, "commemoration" tourists and so on. A big problem is the use of off-road vehicles and mountain-bikes, that have degraded some areas, giving acoustic and chemical lead pollution. These two types of pollution have negative consequences on the fauna, particularly during the reproductive period, when the noises and the lead can disturb the acoustic and chemical signals between animals.

A very particular problem is today the "commemoration" tourism. During the summer time, especialy in August, the parking near the shrine of Cima Grappa is completely full, many cars are parked on the meadow, where the pioneer vegetation is beginning on the desert left from wars. The facilities near this important monument are totally insufficient to support the large quantity of visitors.

FINAL REMARKS

The war events and in general the historical events have been very important to define the actual state of the relation between man and karstic ecosystem of Grappa. This area is partly preserved, but a big problem will be the future. The people will have more free time, and probably also this territory will be strongly colonised. From many years many people and naturalist association work to create a protected area, a park, to defend this particular ecosystem of the Venetian Prealps, but political and economic interests see in this massif a gold quarry for the possibility to build touristic and sport centres. The possibility of having protection for the whole massif appear very remote.

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Povzetek

Pogorje Monte Grappa pripada Benečijskim predalpam in kaže podobne geomorfološke poteze, kot druge predalpske skupine: Altopiano di Asiago, Monti Lessini, itd. Grade ga apnenci z dobro razvitimi kraškimi pojavi, vključno s pomembnimi izviri v dnu dolin. Človekov vpliv je zelo raznolik in njegova dinamika je vezana na dva glavna dejavnika: na preskrbljenost z naravnimi viri in na zgodovinski razvoj oziroma dogodke. Deforestacija z napačno reforestacijo, prva svetovna vojna, pretirana paša, turizem in moderna sekundarna bivališča, so globoko spremenili naravne ekosisteme in danes je razmerje med človekom in okoljem, ki je bilo v ravnovesju od desetega stoletja dalje, neuravnoteženo. V primerjavi z drugimi deli Benečijskih predalp Monte Grappa ni tako zelo degradirana, vendar je treba njene geosisteme zavarovati, preden bodo njeni viri nepopravljivo poškodovani.