

RECENT OBSERVATIONS ON THE GRIFFON VULTURE *Gyps fulvus* IN THE PAKLENICA NATIONAL PARK (CROATIA)

Nedavna opazovanja beloglavih jastrebov *Gyps fulvus* v Narodnem parku Paklenica (Hrvaška)

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The Griffon Vulture *Gyps fulvus* colony was monitored between 1984 and 2002 in two gorges of the Paklenica National Park (Velika and Mala Paklenica) on the western slopes of Velebit mountain at the east Adriatic coast of Croatia. Nest-site location, ecological features of nesting cliffs, some aspects of breeding phenology and departure flights from colony to foraging grounds were investigated. In November 1997, 12 – 14 individuals (6 – 7 breeding pairs) vanished from the gorge Mala Paklenica. In the Velika Paklenica gorge only one pair was breeding in 1998. In the following year three pairs nested in Velika Paklenica gorge. From 2000 onwards the Griffon Vultures have not bred in Paklenica National Park. More than 60 Griffon Vultures were probably poisoned from 1997 to 2001 in Croatia, most probably including the birds which disappeared from gorges of Paklenica. An alarming and unprecedented decline of three *Gyps* vulture species in Southeast Asia suggests infectious disease.

Key words: *Gyps fulvus*, Griffon Vulture, National Park Paklenica, Croatia, nest-site, habitat, breeding phenology, declining number, poisoning, disturbance

Ključne besede: *Gyps fulvus*, beloglavi jastreb, Narodni park Paklenica, Hrvaška, gnezdišče, habitat, gnezditvena fenologija, upad številčnosti, zastrupljanje, vznemirjanje

1. Introduction

About 16,000 – 17,000 pairs of Griffon Vultures *Gyps fulvus* have recently been estimated to breed in the western Palearctic (SNOW & PERRINS 1998). Approximately 9,300 – 11,000 pairs breed in south-western and south-eastern Europe in countries bordering the Mediterranean (TUCKER & HEATH 1994). The European stronghold of Spain holds an estimated 8,074 pairs (TUCKER & HEATH 1994), over three-quarters of the total numbers in Europe. The high mortality and reduced breeding success of three *Gyps* vulture species in Southeast Asia suggests several possible explanations, including food shortage, persecution, contaminants and infectious disease (PAIN *et al.* 2003).

In Croatia, the Griffon Vultures were distributed even over flat interior lowlands (Slavonia) and throughout the whole Dalmatia (Figure 1) but, by the mid 20 century, were extinct in these areas (KRALJ 1997, LUKAČ 1998). Their recent distribution in Croatia covered several islands in the Kvarner Gulf, the island of Pag and two gorges of the Paklenica National Park at south Velebit Mountain, where this endangered vulture became extinct in the year 2000 (PERCO *et al.* 1983, SUŠIĆ 1994 & 2000, LUKAČ & STIPČEVIĆ 1997, STIPČEVIĆ 2002). The bulk of the Croatian population is now 95 – 100 pairs on four islands in the Kvarner Gulf (Cres, Krk, Prvić, Plavnik) while the whole population is estimated at 110 – 150 pairs (SUŠIĆ 1994) or 50 – 100 pairs (TUCKER & HEATH 1994). The number of breeding pairs in the

Paklenica National Park was overestimated at 20 pairs by GRIMMETT & JONES (1989), since serious counts of nests or breeding pairs had not been conducted by Croatian compilers. The main aims of this study were to assess the size of this small colony, the ecological features of last known nesting sites and habitat, breeding phenology, daily movements from the colony and possible reasons for extinction. This paper presents a clear insight into colony fluctuations prior to extinction and into the last parts of the gorges used for nesting, which are important for future conservation management of Griffon Vultures in the National Park Paklenica.

2. Study area and Methods

2.1. Study area

The Paklenica National Park (NP in the following text) covers 9600 ha area in the southern part of Velebit Mountain, which is the northern termination of the Dinaric Alps. Formed mostly of limestone and dolomite, Velebit emerges steeply 145 km along the east Adriatic coast as a 10 – 30 km wide natural barrier to the continental interior, with the highest peak, Vaganski vrh, 1757 m a.s.l. The western, sea side rocky slopes are influenced by the Mediterranean climate while montane climate prevails on the highest peaks of the eastern continental woody slopes. Confined between the Adriatic Sea coast and the central ridge of the mountain chain, NP comprises two gorges and surrounding southern karst foothills with native pinewoods. The southern arid slopes and gorges are rugged karst of bare rocks, crags, ravines, and scree, covered mainly by Mediterranean scrub, garigues, maquis and submediterranean woodlands. Half of the surface of NP is covered, mainly in the higher area and interior, by forests of Beech *Fagus sylvatica* (72%), Black Pine *Pinus nigra* (18%), Downy Oak *Quercus pubescens* (3%), Eastern Hornbeam *Carpinus orientalis* (1%) and Hop Hornbeam *Ostrya carpinifolia* (6%). The upper tree-limit of the mountain is bordered by a belt of Mountain Pine *Pinus mugo*. The upland landscape around the high boundaries of NP includes grassland and rocky ground interspersed with cliffs and stones. The coastal landscape around NP is a mosaic of typical Mediterranean woodland and scrub with small cultivated fields around villages and a rocky seacoast. The main feature of NP is the two gorges (Velika Paklenica and Mala Paklenica) 3 km apart with steep cliffs, up to 400 m high, and with relict forests of Black Pine. The two gorges penetrate, as rows of steep cliffs, about 6 km into the southern slopes of Mountain Velebit, directly from the sea coast to the deep interior in the foothills of the mountain ridge. (LUKAČ & STIPČEVIĆ 1997)

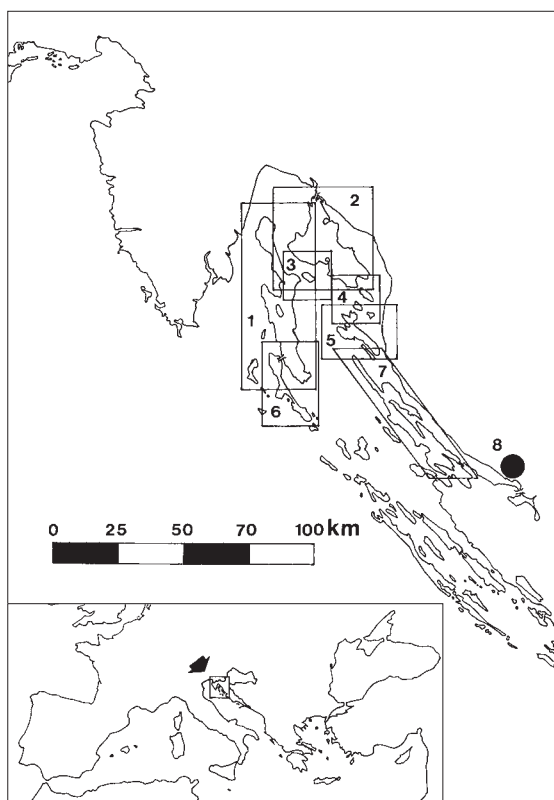


Figure 1: Recent breeding area of Griffon Vultures *Gyps fulvus* in Croatia - Kvarner Gulf Islands: 1 Cres, 2 Krk, 3 Plavnik, 4 Prvić, Sv. Grgur, Goli; 5 Rab; 6 Lošinj; 7 Pag. Velebit Mountain: 8 Paklenica (PERCO *et al.* 1983, SUŠIĆ 1994 & 2000, LUKAČ & STIPČEVIĆ 1997, STIPČEVIĆ 2002)

Slika 1: Nedavno gnezditveno območje beloglavih jastrebov *Gyps fulvus* na Hrvatskem – otoki Kvarnerskega zaliva: 1 Cres; 2 Krk; 3 Plavnik; 4 Prvić, Sv. Grgur, Goli; 5 Rab; 6 Lošinj; 7 Pag. Velebit: 8 Paklenica (PERCO *et al.* 1983, SUŠIĆ 1994 & 2000, LUKAČ & STIPČEVIĆ 1997, STIPČEVIĆ 2002)

2.2. Methods

The Griffon Vulture of the NP was investigated from 1984 to 2002 in the two main gorges (Velika and Mala Paklenica). In 1993 observations were not made due to war activity in the area. A complete census was made in the period 1996 – 2002. All cliffs in both gorges were scanned with telescopes and binoculars from the bottom of the gorges and also from the top

Table 1: Number of Griffon Vulture *Gyps fulvus* breeding pairs in gorges Mala Paklenica (MP) and Velika Paklenica (VP) (* indicates estimate based on number of pairs present at nesting cliffs in the breeding season together with nests found. A precise number of counted nests with young or egg is given for the period 1996 – 2002.)

Tabela 1: Število gnezdečih parov beloglavih jastrebov *Gyps fulvus* v soteskah Male (MP) in Velike Paklenice (VP) (* ocena narejena na osnovi števila parov, zabeleženih na gnezditvenih policah v gnezditvenem obdobju v kombinaciji z najdenimi gnezdi. Natančno število gnezd z jajci ali mladiči je podano za obdobje 1996 – 2002.)

Gorge/ soteska	1985*	1986*–89	1990*	1991–92*	1994–95*	1996	1997	1998	1999	2000	2001	2002
MP	5–10	6–10	2–4	2–4	2–4	2	6	0	0	0	0	0
VP	3–5	0	1–2	1–2	1–2	5	2	1	3	0	0	0

edges of the gorges. The nests are most easily viewed and checked from the top edge of gorges, as a side view from above or level with nests is the best option when counting cliff-nesting colonies (e.g. BIBBY *et al.* 1992). Following the top edge sides of gorges, it is possible to survey in detail all the cliffs in both gorges. Special attention was paid to the previously known nesting ledges, but all cliffs suitable for nesting were also checked several times in the breeding season (from December to June). We measured some physical features of nesting cliffs and nests: altitude, aspect, nest background colour, and shape of nesting ledge. Nest sites found in 1996 and 1997 were plotted on the figures of cliffs. Daily flights from the nesting cliffs in the colony were observed throughout the year. Flights from the colony were observed from the

vantage point most appropriate for visual tracking of Griffon Vultures when they took-off from the gorges.

3. Results

3.1. Size of colony and fluctuation of breeding pairs

The size of the Griffon Vulture colony in NP (Table 1) was estimated for years 1985, 1986 – 89, 1990 on the basis of discovered nests together with counts of adult birds repeatedly flying to and from nesting cliffs in the breeding period, adult birds carrying nesting material in the direction of nesting cliffs and adult pairs engaged in synchronized display flight close to nesting cliffs above gorges in the pre-breeding period. The estimate of breeding pairs for both gorges in 1985

Table 2: Features of Griffon Vulture *Gyps fulvus* nest sites in the Velika Paklenica (VP) and Mala Paklenica (MP) gorges (* – same ledge was used as nest site in both breeding seasons 1996 and 1997; A – flat ledge; B – hole; C – concave ledge)

Tabela 2: Značilnosti gnezdišč beloglavih jastrebov *Gyps fulvus* v soteskah Velike (VP) in Male Paklenice (MP) (* – ista polica je bila kot gnezdišče uporabljena v letih 1996 in 1997; A – ravna polica, B – luknja, C – vdolbljena polica)

Gorge/ soteska	Year/ leto	No. of nests/ št. gnezd	Ledge type/ tip police	Exposition/ ekspozicija	Background colour/ barva stene	Altitude/ nadmorska višina (m)	Cliff height/ nadmorska višina stene (m)
VP	1996/97	1*	C	SW	Red	450	500
VP	1996	2	C	SW	Red	500	600
VP	1997	3	A	S	Red	490	600
MP	1997	1	A	S	Red	350	400
MP	1997	2	C	NW	Red	380	500
MP	1997	3	B	NW	Red	400	500
MP	1997	4	A	NW	Red	390	500
MP	1997	5	C	NW	Red	380	500
MP	1997	6	C	N	Red	380	500

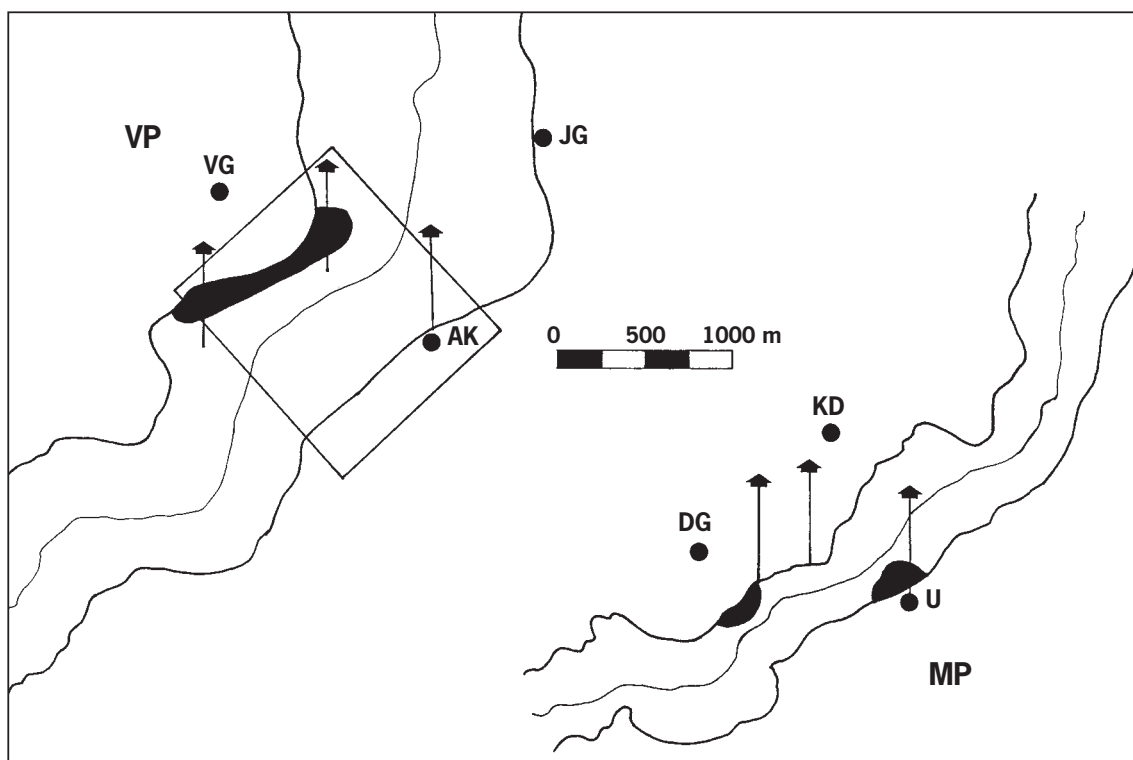


Figure 2: Horizontal distribution of Griffon Vulture *Gyps fulvus* nest sites in gorges Velika Paklenica (VP) and Mala Paklenica (MP) indicated by black patches. Arrows indicate main direction of uplifting and thermal 'catching' over nesting sites. The rectangle indicates the area of most intensive climbing activity in Velika Paklenica. Highest points above nesting cliffs, in Velika Paklenica: **VG** Visoka Glava (718 m a.s.l.), **AK** Anića Kuk (712 m a.s.l.), **JG** Jurasova Glavica (754 m a.s.l.) and in Mala Paklenica: **DG** Debela Glava (640 m a.s.l.), **KD** Kuk od Dubrave (733 m a.s.l.), **U** Umac (873 m a.s.l.).

Slika 2: Horizontalna razširjenost gnezdišč beloglavih jastreb^{ov} *Gyps fulvus* v soteskah Velike Paklenice (VP) in Male Paklenice (MP) označenih s črnimi lisami. Pravokotnik označuje območje intenzivnih plezalnih aktivnosti v soteski Velike Paklenice. Puščice označujejo glavne smeri dviganja in termičnega vzgornika nad gnezdišči v soteskah. Najvišje točke nad gnezdiščnimi pečinami v soteski Velike Paklenice so: **VG** Visoka Glava (718 m n.v.), **AK** Anića Kuk (712 m n.v.), **JG** Jurasova Glavica (754 m n.v.), v soteski Male Paklenice pa: **DG** Debela Glava (640 m n.v.), **KD** Kuk od Dubrave (733 m n.v.), **U** Umac (873 m n.v.).

ranged from 8 (minimum estimate) to 15 pairs (maximum estimate), of which only five nests were found with egg or young. In 1986, 6 (minimum estimate) to 10 breeding pairs (maximum estimate) were established in the Mala Paklenica gorge alone. In 1990 the estimate of breeding pairs for both gorges ranged from 3 (minimum estimate) to 6 pairs (maximum estimate), but no nests with egg or young were found. Afterwards, in the period 1996 – 2002, a complete census of all cliffs was made. In this period all the nests with egg or young were found, and we were able to get a precise number of breeding pairs (Table 1). The number of breeding pairs suddenly dropped in autumn 1997, and, in 1998, only one pair was found, breeding in Velika Paklenica. The last three pairs bred in Velika Paklenica in 1999.

3.2. Some features of the breeding cliffs in the gorges

The nesting sites in Velika Paklenica have been found between 3 and 5 km from the seacoast end of the gorge (Figures 2 & 3). The wall on which nests were situated has an amphitheatre-like shape with different aspects. Nests are situated in a background of red and reddish coloured rock on the right (west) gorge wall, and are exposed mainly to the south (Table 2).

Mala Paklenica, by contrast, is much more inaccessible and less visited by humans. Smaller numbers of visitors pass through the gorge, and climbing activity is completely forbidden. The vulture nests are somewhat lower in altitude than those in Velika Paklenica (Figures 2 & 3). Nests are situated

between 3 and 4 km from the seacoast end (Figures 2 & 3). The main aggregation of Griffon Vultures' nests in 1996 and 1997 was found in the interior of the gorge on the most prominent Umac cliffs, exposed to the NNW with the highest peak at 600 m a.s.l. Most nests (5) were found on the highest and most precipitous cliff on the left (east) gorge wall. All nests had a red background, four on sheltered ledges and one in a hole. All nests were exposed directly to the north. One isolated nest at the gorge entrance was, on the contrary, exposed to the south.

Horizontal air streaming (wind) and vertically rising thermals have a major role in uplifting these heavy vultures when they leave the gorges in search of carrion. The presence of scree and inclined or flat bare karst sloping from edges and sides of gorges are

important for vultures gaining height, especially in days with no wind. In sunny daylight bare stones and rocks are heated and the consequent air thermals make uplifts for Griffons to ascend from 800 to 1500 m (Figure 2). Usually the vultures use the same area at the edges of gorges for uplifting, if no wind occurs. In Velika Paklenica, the left (east) gorge edge was used for take-off and for uplifts in thermals. Uplift rising of vultures occurred mostly in the mornings between 9.00 and 10.00 h.

3.3. Daily movements from colony and flight direction

Griffon Vultures frequently overfly from one gorge to another at the time of display flights in October and

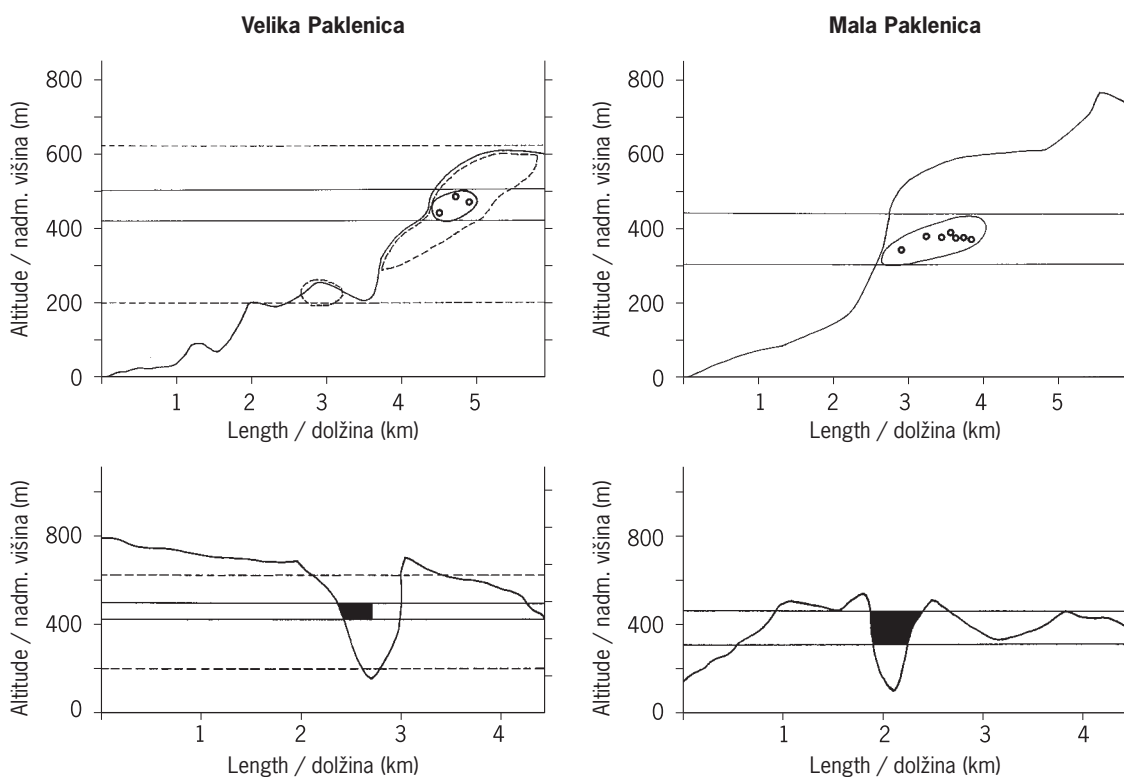


Figure 3: Vertical distribution of Griffon Vulture *Gyps fulvus* nests (dots or black patch) on longitudinal and transverse profiles of gorges Velika Paklenica and Mala Paklenica. Broken line indicates hypothetical nest sites before 1938, and nonebroken line after 1938, when climbing sport developed rapidly in NP Paklenica.

Slika 3: Vertikalna distribucija gnezd beloglavih jastrebov *Gyps fulvus* (pike ali črna lisa) na vzdolžnem in prečnem profilu soteske Velike Paklenice in Male Paklenice. Prekinjena črta ponazarja hipotetični položaj gnezdišč pred letom 1938 in neprekinjena po njem, ko se je v NP začelo razvijati športno plezanje.

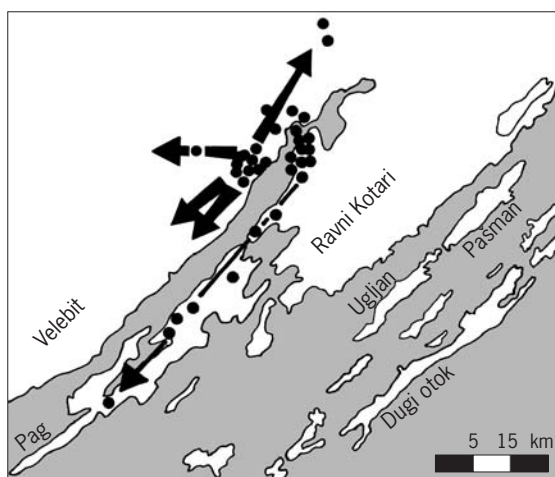


Figure 4: Flight trajectories of Griffon Vultures *Gyps fulvus* observed over several years of tracking departure flight directions from Mala Paklenica and Velika Paklenica gorges. Arrows indicate the main direction of departure flights from nesting cliffs, dots indicate repeated observation of Griffon Vultures traced after departure from Paklenica gorges (grey area indicates sea).

Slika 4: Smeri poletov beloglavih jastrebav *Gyps fulvus*, dobljene na osnovi večletnih spremljanj njihovih poletov iz sotesk Male in Velike Paklenice. Puščice označujejo glavne smeri poletov iz gnezditvenih sten, pike pa večkratna opažanja jastrebav, spremljanih po njihovem odhodu iz pakleniških sotesk (siva barva ponazarja morje).

November and also during ledge selection for nest building in December, January and February. Flights from both gorges for food searching over a wider area around the National Park departed in all directions (Figure 4). Usually, birds overfly a narrow sea strip in Velebit Channel in a southerly direction towards the village Vinjerac (hill Prkos), where they ascend again in thermal lifts, gaining some height and continuing forward overflying the hilly NE edge of north Dalmatia, eastwards toward Bukovica (river Zrmanja) or westwards toward the island of Pag. Some birds fly directly from the gorges along the western coastal slope of Velebit Mountain, without crossing Velebit Channel in the direction NW or SE. This trajectory leads towards the best areas for carrion available to Griffon Vultures, on the Mediterranean slope of Velebit Mountain and on Pag. Sometimes vultures were observed above the eastern Velebit slope and inland above Lika region.

3.4. Display flights and nest building

Synchronized display flights commenced early at the end of September (e.g. 26 Sep 1998), but were most

intensive in October. Display flights continued in November and December. Mating was recorded in November, January and February. Nest building commenced at the end of December and was most intensive in the second half of January (17 Jan 1997), continuing up to mid February. Very active nest building was recorded on 30 and 31 Jan 1997 and 2 Feb 1997. In Velika Paklenica, Griffon Vultures overfly the gorge from the right (west) nesting gorge wall to left (east) gorge wall on the most prominent cliff Anića Kuk, to collect material for nest building (grass tufts, twigs). The earliest laid egg was found at the end of December and the latest in the second half of February (18 Feb 1997) when the last nest building was recorded. Nests are made on ledges of appropriate size for vultures. Three shape types of nesting ledge were used for nest construction: flat ledge (33%), hole (11%) and concave ledge (56%; n = 9 nests).

3.5. Climbers, mountaineers and other visitors to the Paklenica National Park

The number of visitors to each gorge has been increasing steadily from 1998 onwards (Table 3). The record number of visitors exceeded 100,000 in 2002.

Table 3: Monthly number of visitors in the Paklenica National Park from 1998 to 200

Tabela 3: Mesečno število obiskovalcev Narodnega parka Paklenica med letoma 1998 in 2002

	1998	1999	2000	2001	2002
January	401	564	575	337	491
February	453	280	600	372	334
March	1000	617	863	1251	2934
April	3595	3058	8158	7746	6220
May	4974	4831	5659	8021	14853
June	4377	4198	7944	11779	12096
July	6267	7376	14014	17621	21461
August	12126	10812	18833	20671	25811
September	5219	5063	7688	11456	12099
October	2646	3762	4679	5117	5960
November	558	962	866	2114	1775
December	383	328	484	252	383
Total / skupaj	41999	41581	70363	86737	105017

4. Discussion

Some features of Velika Paklenica gorge have an advantage for Griffon Vultures over Mala Paklenica. Velika Paklenica is much longer and has many more cliffs with available ledges, also the gorge is much wider between the walls so there are more thermals developing over the inclined bare karst (scree) at the base of cliffs. Vultures mostly ascend to heights of 800 – 1000 m and overfly Velebit Channel in the direction of Pag, NE Dalmatia and the western slope of Velebit mountain.

The Griffon Vultures in Paklenica gorges commenced egg-laying from the end of December to the mid February, and young left the nests in mid to the end of July. Several immature birds (2 – 4 individuals) were present in the gorges throughout the year. The nests were scattered at heights from 350 – 500 m a.s.l. (Figure 3), mainly in the zone of Mediterranean vegetation (*Phillyrea latifolia*, Flowering Ash *Fraxinus ornus*, and Terebinth Pistache *Pistacia terebinthus*). Breeding altitudes are much higher than those on the Kvarner islands (PERCO *et al.* 1983).

Nest sites in Velika Paklenica were located on cliffs exposed southerly or south-westerly, being protected from direct wind. Nests were built on ledges with red coloured background. Such red coloured niches on open cliffs are the main situations selected for nesting sites by petrophilic birds, e.g. Rock Nuthatch *Sitta neumayer* (LUKAČ *et al.* 1992). Red colour in dominantly grey limestone rocky karst exists permanently only at particular sites sheltered from wind and not washed by rain (caves, halfcaves, overhangs, deep ledges, holes) or on recently broken rock surfaces. In Mala Paklenica, the main part of the colony was situated on cliff Umac exposed to the north, but some parts are protected microclimatically (e.g. caves, halfcaves, deep ledges). In 1997, all five nests were found on well-sheltered ledges with elevated outer ledge edges and in a red background. The cliff is mostly in shade, only in the afternoon being exposed to the sun. Griffon Vultures uplifted on the right (west) gorge wall, and also on left (east) gorge wall above cliff Umac which has scree at the base.

In the past, Griffon Vultures were much more widespread (GLUTZ VON BLOTZHEIM *et al.* 1989, CRAMP & SIMMONS 1994). The striking decline in number in NP Paklenica has been obvious in the period from 1985 to 1990 (LUKAČ & STIPČEVIĆ 1997). Decline occurred at the end of 1997 after the poisoning campaign against Golden Jackals *Canis aureus* and Red Foxes *Vulpes vulpes* conducted widely in 1997 and 1998 in the area from Pag to NE

Dalmatia. The last instance was the extermination of the whole Griffon Vulture colony on the island of Krk. During 1997 – 2001, about 60 Griffon Vultures were poisoned illegally in Croatia, including birds from the Kvarner island of Krk and from the gorges of Paklenica. Widespread poisoning alone has caused serious decline, as shown from the coincidence between the periods of poisoning and decline (NEWTON 1979, LUKAČ 2000). All kinds of poisoning are strictly prohibited by nature protection laws in Croatia (NARODNE NOVINE 2003). Today relict populations of three *Gyps* vulture species have started to decline at an alarming and unprecedented rate in Southeast Asia. Current information suggests infectious disease, possibly a genus-specific virus (PAIN *et al.* 2003).

The Kvarner islands and the western Mediterranean slope of Velebit Mountain are regular foraging areas for Griffon Vultures. Sheep are the main food source available over the region. The semi-desert bare landscapes of the Kvarner islands and the western slope of Velebit mountain in the NE Adriatic are together suitable for foraging Griffon Vultures, due to the very strong seasonal north wind and thermals which develop strongly on open rocky karst exposed to the south. The distance which Griffon Vultures cover from the Kvarner islands and Paklenica gorges in search of carcasses is not known, but it is known that they can fly daily about 60 – 80 km (GLUTZ VON BLOTZHEIM *et al.* 1989, CRAMP & SIMMONS 1994, DEL HOYO *et al.* 1994). Vultures from Paklenica leave mainly NW (Pag, Kvarner and the NW slope of mountain Velebit) and SE (SE slope of Mt. Velebit, Bukovica). In these areas, domestic animals, reared semi-wild in a karst landscape, are most abundant. Although the precise foraging grounds of vultures from Paklenica and Kvarner islands are not defined, they overlap, at least partly. Griffon Vultures from Paklenica could easily be poisoned on island Pag and on southern Velebit, or on some other Kvarner islands on a long foraging trip.

Other factors influencing Griffon Vultures in Paklenica gorges can be disturbance by visitors (mountaineers and walkers), and especially climbers. The steep cliffs in Velika Paklenica are popular destinations for climbers throughout the year, mainly from March to October (Table 4). The number of climbers doubled in short period from 1998 to 2002 (Table 3). About 500 climbing routes have been set up over the cliffs in Velika Paklenica (ČUJIĆ 2001). Permitted routes pass over all the cliff walls and at all levels from the entrance to the interior of the gorges (ČUJIĆ 1997 & 2001), where all the cliffs suitable for

breeding Griffon Vultures are available. Climbing routes are set officially at both sides of gorge and over all great cliffs in the gorge. Although levels of disturbance have not been measured, vultures on the nesting ledges are disturbed by the presence of large numbers of climbers (in tens or hundreds) in close proximity to nests, on the opposite gorge wall, on the base of breeding cliffs and on the tops of breeding cliffs. Disturbance is possible, since the gorge is narrow and the walls close together, so that climbers on one wall would disturb vultures on the opposite wall of the gorge. Climbing activities are concentrated from the entrance to the interior of the gorge, where all the Griffon Vultures' nests have been found. Also, climbing is not restricted temporally and climbers occupy the cliffs at all seasons. Climbers are most active in spring months (Table 4), the most sensitive period for breeding Griffon Vultures. All the nests were found only on cliffs over which minimal climbing activities took place (the amphitheatre Klanci in Velika Paklenica) or on cliffs distant enough from climbing activities (cliff Umac in Mala Paklenica). In 1998, climbing was forbidden on 13 routes between 1 Jan and 1 Jun and in 1999, 9 routes over 200 m a.s.l. on the right site of gorge, during the whole year.

It is difficult to distinguish between the effects of poisoning and disturbance by climbers and other visitors to the gorge. Disturbance by visitors and climbers is unlikely to be the sole factor responsible for the loss of Griffon Vultures from NP Paklenica. One possible explanation for the rapid decline of Vultures in NP is the shortage of accessible food over the whole Velebit Mountain area. Vultures bred successfully in Velika Paklenica in a period of increasing activity and huge disturbance pressure by climbers in 1998 and 1999, while breeding in the undisturbed gorge Mala Paklenica did not take place in the same period. Mala Paklenica, in which climbing is completely forbidden, is much more inaccessible and less visited than Velika Paklenica. In the years of precise count of all nests (1996 – 2002), numbers of breeding pairs and their distribution in the two gorges varied strongly (Table 1). Displacement of breeding pairs from one gorge to another may be the result of instability due to colony size, or due to decreasing number of breeding pairs, greater disturbance or unbalanced age ratio in the colony, leading to a mortality rate greater than recruitment of new members in colony.

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5. Povzetek

Kolonija beloglavih jastrebov *Gyps fulvus* v Narodnem parku Paklenica na južni strani Velebita na Hrvaškemu je bila spremljana od leta 1984 do leta 2002. Gnezdišča jastrebov so bila odkrita v pečinah sotesk Velike in Male Paklenice. Število gnezdečih parov za obe soteski je bilo za leto 1985 ocenjeno na 8 – 15 parov, leta 1986 na 6 – 10 parov in 1990 na 3 – 6 parov. Po natančnem štetju gnezd je v letu 1996 gnezdilo 7 parov, v 1997 8 parov, v 1998 1 par in v 1999 3 pari. Štetje je razkrilo naglo upadanje števila te majhne izolirane kolonije na celinskem delu Hrvaške. Od leta 2000 beloglavi jastrebi ne gnezdiijo več v pakleniških soteskah, od leta 2002 pa ni bilo zabeleženo niti zadrževanje teh ptic na območju Narodnega parka. Svatbeni leti beloglavih jastrebov iz Paklenice so se začeli konec septembra, najintenzivnejši so bili oktobra, zabeleženi pa so bili tudi novembra in decembra. Parjenje je bilo zabeleženo v novembru, januarju in februarju. Gnezda so začeli graditi konec decembra, najintenzivneje v drugi polovici januarja, in vse do sredine februarja. Najzgodnejše jajce je bilo najdeno konec decembra, najpoznejše pa v drugi polovici februarja. Mladi poletenci so zapuščali gnezda sredi ali konec julija. Zadnja gnezda beloglavih jastrebov so bila najdena v stenah, prek katerih potekajo redko uporabljane plezalne smeri (v Veliki Paklenici izpostavljene proti jugu), ali v pečinah, v katerih je plezanje prepovedano (v Mali Paklenici izpostavljene proti severu). Sicer pa so bila vsa gnezda zgrajena v dobro zaščitenih vdolbinah ali na policah z rdečkasto obarvanim ozadjem. Jastrebi so iz pakleniških sotesk poletavali proti golim kamnitim krajem z drobnico, tradicionalno gojeno na odprtih prostorih (otok Pag, zahodni del Velebita, Bukovica, severovzhodna Dalmacija). Število gnezdečih parov, tako kot tudi njihova razširjenost v soteskah Velike in Male Paklenice, se je v obdobju 1996 – 1999 zelo spreminjalo. Po letu 1999 beloglavi jastrebi na območju Narodnega parka Paklenica niso gnezdili več. Naglo upadanje številčnosti in izginjanje beloglavih jastrebov iz pakleniških sotesk se časovno ujema z intenzivno ilegalno kampanjo zastrupljanja

lisic *Vulpes vulpes* in šakalov *Canis aureus* na območju Dalmacije, Hrvaškega primorja in Kvarnerskih otokov. V zadnjih dvajsetih letih je bilo opaziti tudi upadanje števila drobnice in vse slabšo dostopnost hrane za beloglave jastrebe na celotnem Velebitu. Posredno bi na izginjanje jastrebv lahko vplivalo tudi naglo naraščanje števila plezalcev v Narodnem parku v istem obdobju. Uradna uredba, kar zadeva plezanje v soteski Velike Paklenice, ni zadostna za uspešno zaščito jastrebv v narodnem parku. Za tako nagli upad številčnosti in izumiranje pakleniških jastrebv pa ne bi mogli izključiti niti možnosti širjenja infekcijskih bolezni, kar je glede na zadnje ugotovitve glavni razlog za hitri upad številčnosti jasterbov v jugovzhodni Aziji.

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