

Regular Long-distance Migration of Eurasian Griffon *Gyps fulvus*

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ABSTRACT

The Eurasian Griffon in Croatia breeds on island cliffs at the northernmost border of the species' distribution.

In 1990 a programme of ringing and wing marking started, and during eight years (1990-1997) 195 birds have been marked, 108 individuals were recovered or found dead (recovery rate of 55.4%) with the total of 315 re-sightings/recoveries.

All juvenile birds left their breeding colonies by the end of September of their first year, and there are no juvenile, immature or subadult Griffons on the Island. They came back when mature. Their migrational routes, when using two main directions - NW (to the Austrian and Italian Alps, then Spain?) and SE (to southern Italy, Balkans, Greece, Israel and as far south as Chad in central Africa and then, maybe, also to Spain) - are repeated every year, with the same timing.

The flight of 3.750 km made by a wing-tagged Eurasian Griffon *Ledni Zlajo*, who travelled from Croatia to Chad, is the furthest-known distance travelled by any griffon on migration.

So, although their circular movements are very complex, the conclusion could be that this is definitely not dispersal or irregular nomadism but some kind of regular migration taken by juvenile, immature and subadult birds until maturity. As a species the Eurasian Griffon should no longer be considered a sedentary or partially migrant bird, but a long distance migrant, where only non-breeding birds migrate, and their migration is complex, still not clear enough and lasts five or six years.

INTRODUCTION

The Eurasian Griffon *Gyps fulvus* is considered a sedentary and migrant ("young individuals") species (Gensbøl 1989), or as mentioned by Mundy *et al.* (1992) it is "partially migratory, that is, only a part of its population migrates annually ... into Africa." If this is true, is it known which part of its population migrates annually?

According to Bernis (1983) Spanish griffons regularly migrate, but only juvenile birds, while their aestivation in the Alps (Croatian griffon population) he called "nomadism". Various other hypotheses have been formulated to explain the phenomenon of the Eurasian Griffon's aestivation in the Alps (the critical analysis was made by Genero 1988).

The Eurasian Griffon in Croatia breeds on island cliffs above the sea, at Quarner Archipelago, northern Adriatic, at the northernmost border of the species' distribution, at 45°10'N. There was an increase of population during a period of 15 years: the number of breeding pairs has more than doubled. Extensive monitoring of the population on the Island of Cres has been conducted for nine years, and all nests are observed once or twice per month. A protected area with two Ornithological

Reserves ("Kruna" and "Podokladi"), the Island of Cres holds one of the last nesting colonies in Croatia as well as in this part of Europe. At the beginning of the 1980's there were 25-30 pairs in the colony (Perco *et al.* 1983), ten years ago 40-50 (Susic 1994), and today there are 72-75 breeding pairs. Such an increase is the best proof that wing-tagging is not negatively influencing the survival rate of marked birds.

METHODS

In 1990 the programme of ringing and wing-tagging started (Susic 1994). During eight years (1990-1997) altogether 195 juvenile Eurasian Griffons were marked, mainly as nestlings. All of these wing-tagged juveniles were additionally ringed with metal rings. From 1993 on we used a wing-tag slightly modified from the one described before (Susic 1994). During the first three years (1990-1992) vinyl wing-tags had dimensions of 155x95 mm (letters 95x60 mm), but then smaller and more rounded tags were used, with dimension (during the last five years) of 140x87 mm (number/letter 70x60 mm). The tags are of similar size as used for the Californian Condor, which are 150x80 mm ventral side, 130x80 mm dorsal side (Wallace 1994), and not "much larger" as mentioned by Frey & Niebuhr (1994).

At the beginning of the programme nestlings were tagged when 70-80 days old, but the best period is when they are 75-85 days old, to allow sufficient feather development for adequate marker retention. The eight years of experience have shown that there are no harmful effects on the nestlings apart from a single short period of disturbance, and if the marker is properly attached there is no injury to the bird. Selective mobbing of marked griffons, as mentioned by Frey & Niebuhr (1994), has never been observed on the Island of Cres.

The main objective of the programme is to solve why all juvenile, immature and subadult birds migrate, i.e. why all of them disappear from the colony immediately after the fledgling (dependence) period during August and September. A second aim is to discover the annual mortality rate of these griffons.

RESULTS

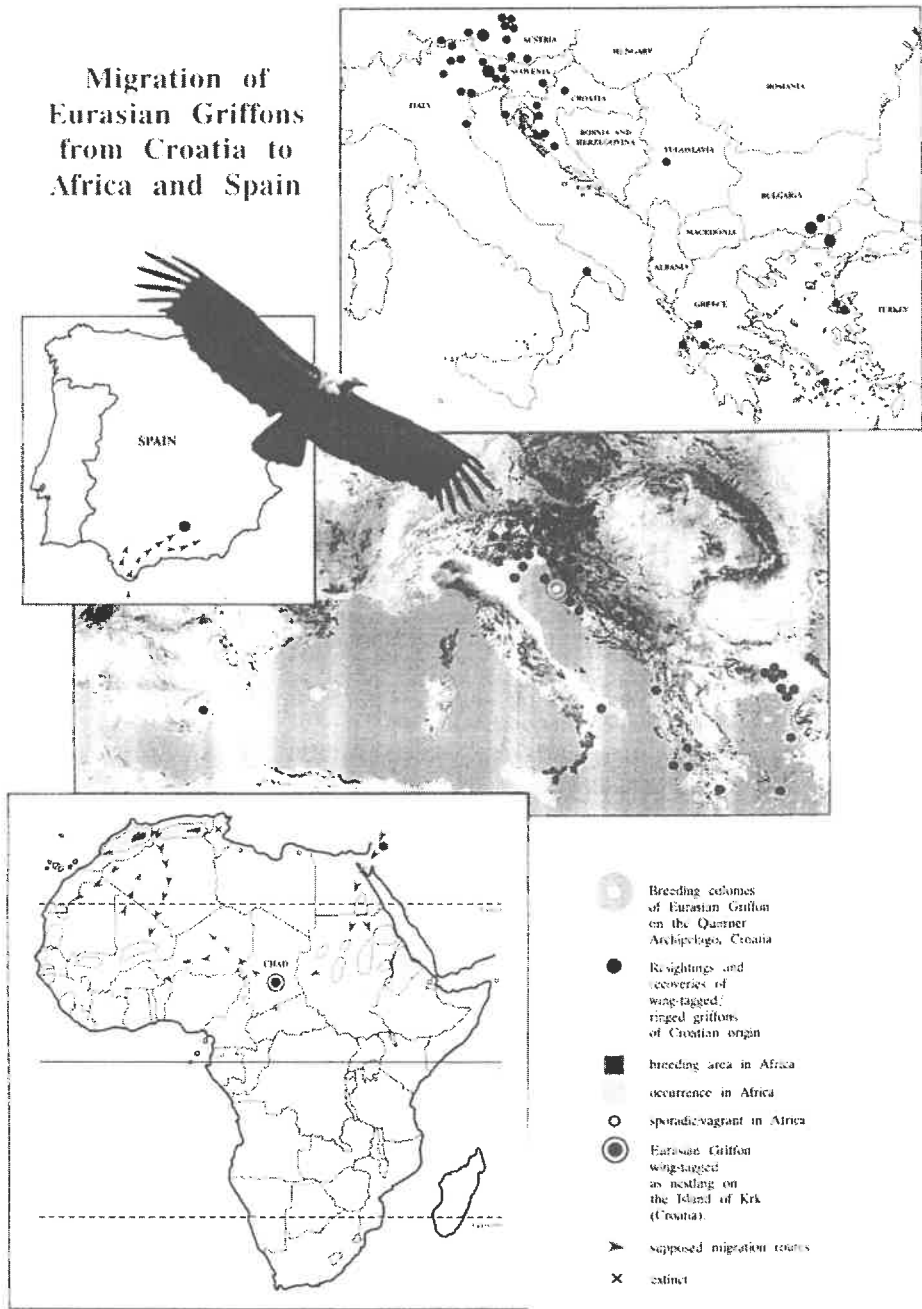
Out of 195 wing-tagged Croatian Griffons, 108 individual specimens were re-sighted or found dead (recovery rate of 55.4%) with a total of 315 re-sightings/recoveries (Table 1.). This number is in reality much bigger, because some birds stay in Italy or Greece near the vulture "restaurant" for months, or even for a whole year. In such a case we counted them as if they were on that location once only in a month. Wing-tagging is much more efficient compared with ringing, which has a useful recovery rate of 5% (Piper 1990) or 10% overall (Oatley *et al.* 1998) for the Cape Griffon *G. coprotheres*.

Table 1. Number of Eurasian Griffons *Gyps fulvus* ringed/wing-tagged on the Island of Cres (Croatia) and re-sighted or recovered dead during eight years (1990-1997).

Year	Number ringed/ wing-tagged	Number of different specimens re-sighted or found dead *	Number of re-sightings *
1990	16	11	56
1991	31	19	57
1992	29	17	39
1993	25	17	57
1994	29	18	45
1995	9	4	5
1996	26	11	28
1997	30	11	28
	195	108 (55.4%)	315

* Local re-sightings are not included.

Figure 1. Locations of Eurasian Griffions migrating from Croatia. Black spots are re-sighting locations of migrating juvenile, immature and subadult griffions wing-tagged/ringed in Croatia during eight years (1990-1997). The griffions' distribution in Africa is taken from Mundy *et al.* (1992)



There were 22 recoveries of dead wing-tagged birds (11.3% of all marked). More than 95% of them died during the first two years of their life (13 in the first, eight in the second year).

More than 10 different specimens have been re-sighted in Italy, in Austria and in Greece (see larger black spots on Fig. 1), and some birds visit the same vulture restaurant in Italy (Forgaria nel Friuli) or in Greece (Dadia Forest Reserve) every year at the same time.

One good example is griffon *Jelena* which has been visiting the vulture restaurant in Italy for eight years. The first year "she" arrived on 23 July, next year on 25 May, third year on 28 May, fourth year on 11 May, and fifth year on 11 May. After "she" became adult "she" visited the vulture restaurant only a few times in May, and for one day or two in June and/or in July.

A typical example for a type of migration pattern is that of the griffon *Maks Ubojica*. "He" was during his first year on 30 August at the breeding colony, fifteen days later "he" was in Italy (north), and one month later (middle October) in Greece (south). Next spring, on 12 May, "he" was in northern Italy again, and on 21 October again in Greece. Almost the same pattern is that of the griffon *Kizil Akbaba*, which during "his" first year was in August at the breeding colony on Cres, during September in northern Italy, and the next spring, during March, in Greece (probably on "his" way back to aestivation in the Alps).

The griffon *Laci* was during August 1998 on Cres, but on 14 October of the same year (and "his" first autumn) in the western Negev in Israel, 2.350 km to the south (O. Hatzofe *in litt.*).

The griffon *Stavros* was at the beginning of August on Cres, on 29 August near Venice (Italy) and on 12 September on the Island of Lesbos (Greece). It travelled 1.500 km in 14 days, or 110 km per day! A Spanish bird travelled no more than 80 km per day (Berthold *et al.* 1991).

The griffon *Ledni Zlajo*, wing-tagged as a nestling at the beginning of June 1992 on the Island of Krk (near the Island of Cres) had left the breeding colony at the end of August, and was found dead in Chad (central Africa) during November of the same year. During two months it flew more than 3.750 km to the south (daily migration rate not less than 65 km). At the latitude of 11°27'N, on the south side of the Sahara, it was at the southern limit of the Eurasian Griffon's distribution in Africa. Mundy *et al.* (1992) mentioned that the longest flights were made by two first-year Eurasian Griffons ringed in Spain which travelled 2.800 km to Senegal, but the recovery near Abgue, Salamat, in Chad is now the furthest-known distance travelled by a griffon on migration.

Table 2. Number of Eurasian Griffons wing-tagged in Croatia and re-sighted or recovered dead in other countries during the year.

Country	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
Austria					1	4	8	13	8	3		
Italy	1	1	1	1	5	10	7	7	6	3	2	2
Slovenia									1			
Greece	1	3	2	1			7	3	4	7	2	2
Bulgaria			3	1				1			1	2
Yugoslavia								1				
Israel										1		
Chad											1	
Spain											1	

But it is possible that an even much longer flight was made by the griffon *Marta*. Wing-tagged as a nestling in May 1996 (Island of Cres) it was recovered dead on 8 November 1997 near Jaén, in Spain. The bird was found about 300 km NE from the Straits of Gibraltar. This griffon died in its ("her") second year at the beginning of November, when almost all juvenile Spanish griffons have

left their breeding areas in northern Spain, crossing the Straits of Gibraltar to Africa (Griesinger 1996). What was the direction this griffon used? Did it travel along the Mediterranean coast, through France and northern Spain, or just the opposite – did it come to Spain from Chad?

There are no other sightings or recoveries of Croatian griffons west of Austria. There are many birdwatchers (see for example Orel 1988!) as well as vulture “restaurants” monitored in France and northern Spain, so one would expect that griffons migrating west of Austria would have been sighted during the last eight years if they had used that route.

The largest numbers of Croatian griffons are seen to the north (Austria, Italy and Slovenia) during the summer months of May to October (Table 2). During early autumn, griffons are migrating to the south (Yugoslavia, Bulgaria, Greece and Israel), until they reach Africa, for example Chad.

DISCUSSION

At the Island of Cres all juvenile birds (100%) leave their breeding areas at the end of August or first half of September. There are no juvenile, immature or subadult griffons on the island in winter (except for a small number of birds for a day or two when passing from the south to the north or vice versa during the spring or autumn migration). They come back to their natal colony when mature, i.e. five or six years old.

For a long time the common opinion was that after their sojourn in the Alps, Croatian griffons went back to the Adriatic islands to spend the winter in their breeding areas, because of the arrival of the cold season and snow in the Alps (Frey & Walter 1981, Perco *et al.* 1983, Dentesani *et al.* 1989). Wing-tagging proved that Croatian griffons do not spend the winter in their breeding areas, but in Africa!

So, although their circular movements are very complex, we could assume that it is not just dispersal, or irregular nomadism but some kind of regular migration taken by juvenile, immature and subadult birds until maturity. Griesinger (1996) gives similar conclusions for Spanish griffons. His results demonstrate that from northern Spain juvenile griffons are migratory birds, assembling in southern Spain and crossing over to Africa in major numbers. But Griesinger found that approximately only 30% of the juvenile griffon population in Spain crossed the Straits of Gibraltar on autumn migration to Africa, while all 100% of the juvenile griffon population leaves Croatian islands every year. Some of them spend the few summer months in Austria and northern Italy, but mainly not later than the end of October. During the late autumn they are in Greece, Bulgaria and Israel as well as in Chad and Spain! We could expect that some of them may spend the whole winter in Greece or in the Middle East, but many of them most probably continue and spend the winter months in Africa.

During the first few months (February - April) of the next spring they are again in Greece; they then pass their native island in the Adriatic in a few days only. During April and May they come to Austria and Italy again, some of them at the same feeding or roosting place, almost on the same day as the year before.

Eurasian Griffons from Croatia migrate using two main directions: NW to the Austrian and Italian Alps (and then to Spain?), and SE to southern Italy, Balkans, Greece and over the Middle East as far to the south as Chad in central Africa (and then, maybe, to western Africa and to Spain?). If griffons from Croatia regularly visit central Africa, it is possible that they travel to western Africa, where they could find Spanish griffons. Croatian griffons could then continue with Spanish griffons and travel to the north to Spain!

The migration routes are repeated every year, with the same timing. Considering their daily migration rates and the regularity of their autumn migration Griesinger (1996) calls Eurasian Griffons “medium distant migrants”. Results presented in this paper show that one should call them “long distance migrants”. To be more precise: Eurasian Griffons should not be considered a sedentary or partially migrant species any more, but a long distance migrant, and where only non-breeding birds are migrating, their migration is complex, still not understood, and lasts for five or six years.

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