PRESENT STATUS OF THE GRIFFON VULTURE ON THE NORTHERN SLOPES OF THE WESTERN PYRENEES

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ABSTRACT

Analysis of population trends among breeding groups of Griffon Vultures on the northern face of the western Pyrenees (number of pairs, breeding success, composition and size of groups) between 1976 and 1982 suggests that the measures now being taken to protect the species (artificial feeding, protection of breeding sites) have contributed towards an increase in the number of breeding pairs. In the longer term, however, the maintenance of pastoralism is necessary in order to ensure the continuance of a vulture population in the region.

RESUME

L'analyse des tendances démographiques actuelles des groupes de reproducteurs du versant nord des Pyrénées occidentales (nombre de couples, fécondité, structure et taille des groupes), de 1976 à 1982, suggère que les mesures actuelles de protection de l'espèce (mise en place de charniers, protection des sites de reproduction), ont contribué à augmenter les effectifs reproducteurs.

Cependant, à plus long terme, le maintient d'un équilibre dynamique entre vautours et pastoralisme est necessaire.

INTRODUCTION

This paper summarizes six years of counts of the different breeding groups of Griffon Vulture (*Gyps fulvus*) on the northern slopes of the mid-western Pyrenees, i.e. at the northernmost limit of the species' range in Western Europe (*Figure 1*). The total Pyrenean population, of which this nucleus forms a part, is estimated at 750 pairs (S.E.O. 1981) and represents one of the most important breeding centres of the species.

STUDY AREA

The area in question is contained between the northern and southern slopes of the Pyrenees. The two mountain faces afford suitable nesting sites and a supply of

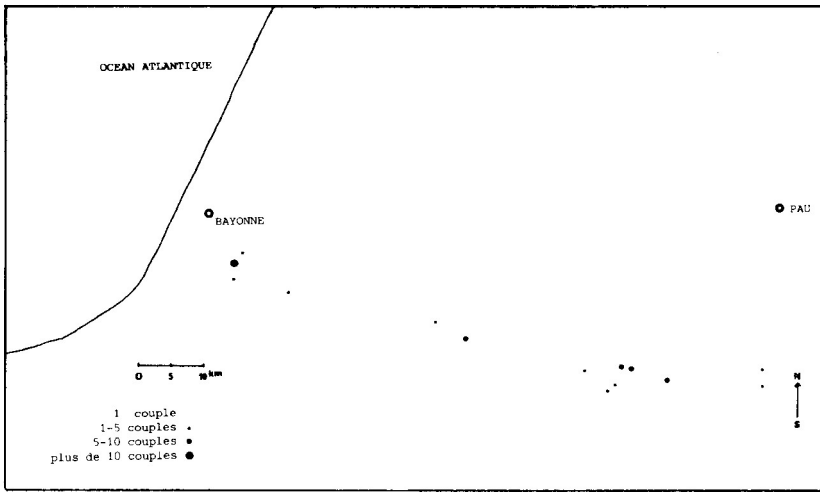

Figure 1: The geographical distribution of breeding groups of *Gyps fulvus* on the northern slopes of the Western Pyrenees.

food (carcasses of domestic animals) drawn mainly from the pastoralism (150,000 head, of which 80 percent are sheep in the western Pyrenees) still practised on these vast pasture and moorland uplands above the tree-line.

The nest sites are situated between valley and mountain-top, on rocky promontories at altitudes varying between 600m and 1000m, usually coinciding with topo-climatically drier and warmer areas in contrast to the prevailing Atlantico-montane conditions (1500–1800mm of rainfall in an average year).

COUNTING METHODS

The species is gregarious and traditionally faithful to long-established sites, which greatly facilitates census work. The most effective method is to keep the sites under observation from a fixed point, at a sufficient distance to maintain an overall view and roughly level with the nesting ledges.

We made observations by telescope from distances of 300–900m according to the situation. We preferred to keep watch on days of strong light and plenty of sunshine; under these conditions the birds were at no time disturbed by the observer.

The total number of vultures perched at a given nesting place formed the basic data (*Figure 2*). More than 50 percent of the eyries were not directly in view, however, and the birds were often unobtrusive and not always visible (especially during incubation). Also, in order to increase the validity of our counts, we preferred to make at least four checks throughout the breeding cycle: before egg-laying, during incubation, after hatching and before fledging. Notes were also taken of behaviour patterns as they subsequently helped to distinguish breeders from non-breeders.

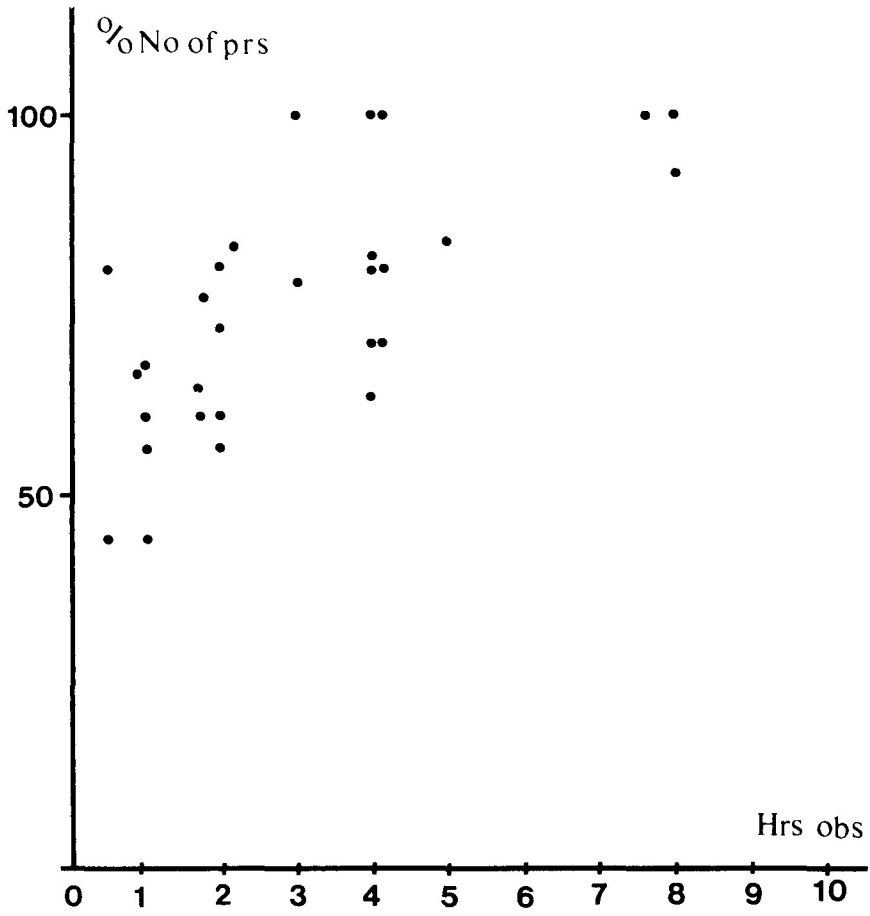

Figure 2: Returns of counts made during the incubation period, without checks in the pre-laying period. (Number of pairs counted (%), plotted against number of hours of observation.)

The first check, at a time when the birds were very demonstrative, enabled us to count all the birds already mated or paired (potential breeders). In addition, we were also able on this occasion to ascertain which ledges would later serve as nest sites. This greatly facilitated our second check, made at a time when the shyness of the incubating birds made counting difficult and time-consuming.

Table 1 gives the behavioural signs used to define breeding status, together with those which would later enable us to check breeding results. The dates on which checks were made are given for a typical breeding pair.

Some pairs started nesting activities up to a month earlier than others. The earliest egg-laying was recorded at the end of December, and the latest at the beginning of March (discounting replacement eggs).

Table 1: Behavioural signs used to define breeding status and check nesting results. Status: 1 = pair segregated; 2 = pair mated; 3 = pair segregated and mated (potential breeders); 4 = pair actively breeding; 5 = pair fertile (or infertile).

Date	Biological phase	Signs used	Usefulness	Status	Degree
15/10 to 30/12	Pre-laying	Prostration of 2 adults face to face Mutual preening Expulsion of intruders Bringing nest material Copulation	Pairs very demonstrative	1, 2, 3	84%
15/12 to 15/02	Laying Incubation (56 ± 2)	Brooding position Relief of brooder (0.2R./h of obs./pair) Rising of brooder (M = 30 mn) Egg visible (or not)	Difficulty of observing brooding birds Bad weather conditions	4	97%
15/03 to 15/04	Hatching Nestling growth (120 ± 7)	'Seated' position of brooder Young visible Feeding of young (1–2/j)	Young not always visible Position of individual pairs Intrusion of infertile or stray individuals or pairs	5	
15/07 to 15/08	Fledging				
15/08		100–80% young perched on nest sites		5	
15/09		70–30 young perched on nest sites			
15/10		30–10 young perched on nest sites			
15/11		20–10 young perched on nest sites			
15/12		5–0 young perched on nest sites			

Table 2: Breeding analysis of *Gyps fulvus* at 11 sites on the northern slopes of the western Pyrenees.

Year \ Sites	A3	B3	E2	D2	C2	B2	A2	A1	B1	C1	F2	Total	Fertility rate	M.R./A/S
1976	7/1	4/4	—	1/1	3/3	4/4	5/5	5/0	2/1	3/3	—	34/23	0.68	3.8
1977	3/3	3/3	1/1	2/1	3/3	8/7	10/5	1/0	4/2	5/4	—	40/31	0.78	4.0
1978	1/1	1/1	2/2	3/2	3/1	10/5	8/5	1/0	3/3	6/3	0	38/23	0.61	3.8
1979	5/4	2/1	2/2	3/2	2/0	8/2	14/7	1/1	6/5	4/4	0	47/28	0.60	4.7
1980	?/4	?/3	?	3/3	0	4/4	11/10	2/2	7/7	4/4	?/3	(41/40)		
1981	5/4	2/1	1/0	2/2	0	6/3	19/13	3/3	9/8	5/5	4/3	56/42	0.75	5.6
1982	5/4	2/2	1/1	4/2	3/0	3/2	20/13	3/3	8/7	7/6	5/4	61/44	0.72	5.5
M.R./S.	4.3	2.3	1.4	2.6	2.8	6.1	12.6	2.3	5.3	5.0	4.5	49.2		
T.f./S.	0.65	0.86	0.72	0.72	0.50	0.63	0.63	0.56	0.85	0.83	0.78	0.69		
N.A./S.	9	4	3	4	5	10	24	6	12	9	7	93		
T.R. (%)	48	58	47	65	56	60	53	38	44	56	64	53		

Notes: Fertility rate = number of young/pair/year.
M.R./A/S = Average number of breeding pairs/year/site.
M.R./S = Average number of breeding pairs per site.
T.f./S = Average rate of fertility per site.
N.A./S = Number of nests per site used during the study period.
T.R. = Average rate of occupation per site (%).
( ) = Data not completely assembled and therefore excluded.
— = No information acquired.
? = No, or only partial knowledge.

VALIDITY OF THE SIGNS

In the pre-laying phase, the signs noted referred to birds in potential breeding condition. Their behaviour was studied on the actual sites where breeding would later take place.

To confirm incubation, relief-of-partner was of little use (0.2 reliefs per hour of watching per pair studied). The standing up of the incubating bird, on the other hand, was more frequent (every half-hour on average), when the pattern of behaviour was as follows: the bird would rise to its feet, keeping its back horizontal, with head and beak pointing to the centre of the nest, the body hunched and neck withdrawn into the collar. Before settling back on the egg, the bird would adopt the same pose, whilst slowly performing a sideways shuffling movement.

After hatching, the parent's adoption of the 'sitting' position (with the tarsus resting on the ground) betrayed the presence of the chick. This brooding attitude was never observed during incubation.

RESULTS

Table 2 shows an analysis of the data collected. Given consecutively are the years of censusing (1976–82) and the breeding records for each nest site. The figures indicate the number of breeding pairs associated with the number of chicks present at the site on fledging.

General analysis

From 1976 to 1982, the total breeding numbers increased by a factor of 1.7 (*Figure 3*). (This could not be due to any human error in counting.) The average breeding success (number of young per pair per year) calculated over six years was 0.69 (n = 276). This rate varied between 0.60 and 0.75 from year to year, probably depending on the weather in March–April. Thus 1978 and 1979 had springs with twice as much rain as the other years. Adverse weather conditions may have made the search for food more difficult. In addition, 72 percent of all breeding failures (n = 91) occurred at the close of incubation and during the first three weeks of the nestling period.

Breeding analysis

The 11 sites analysed in *Table 2* each correspond tocircumstances (altitude, exposure, height of cliff) and to a particular and markedly different topo-climatic aspect, although the biological significance (if any) for the birds was difficult to assess. *Figure 4* summarizes for each site the development of the breeding population over the study period. There was great variability between one site and another.

Size of breeding groups

During 1976–82 the average size of the groups increased (*Table 2*), appearing to stabilize around a mean of 5.5 pairs per site in 1982.

By comparison, the figures for the Iberian Peninsula are given in *Table 3*. It would seem that the average number of pairs per site correlated to the overall total of pairs in each geographical region. The larger the overall total, the larger the average number of pairs per site.

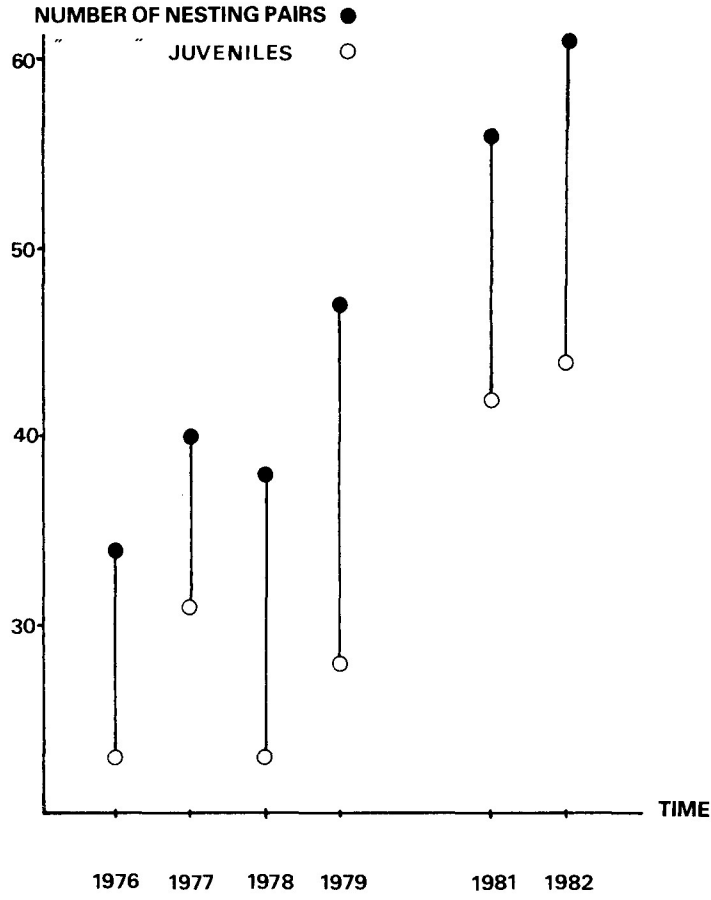

Figure 3: Total number of breeding pairs (solid circles) and juveniles (open circles) recorded each year from 1976 to 1982.

Table 3: Size of breeding groups of Griffon Vultures in different areas (S.E.O. 1981).

Geographical sector		Av. number of pairs per site	Total number of pairs	Number of sites
Pyrenees	Navarra	11.96	359	30
	Aragon	10.05	201	20
Andalusia		14.63	483	33
Salamanca		3.52	74	21

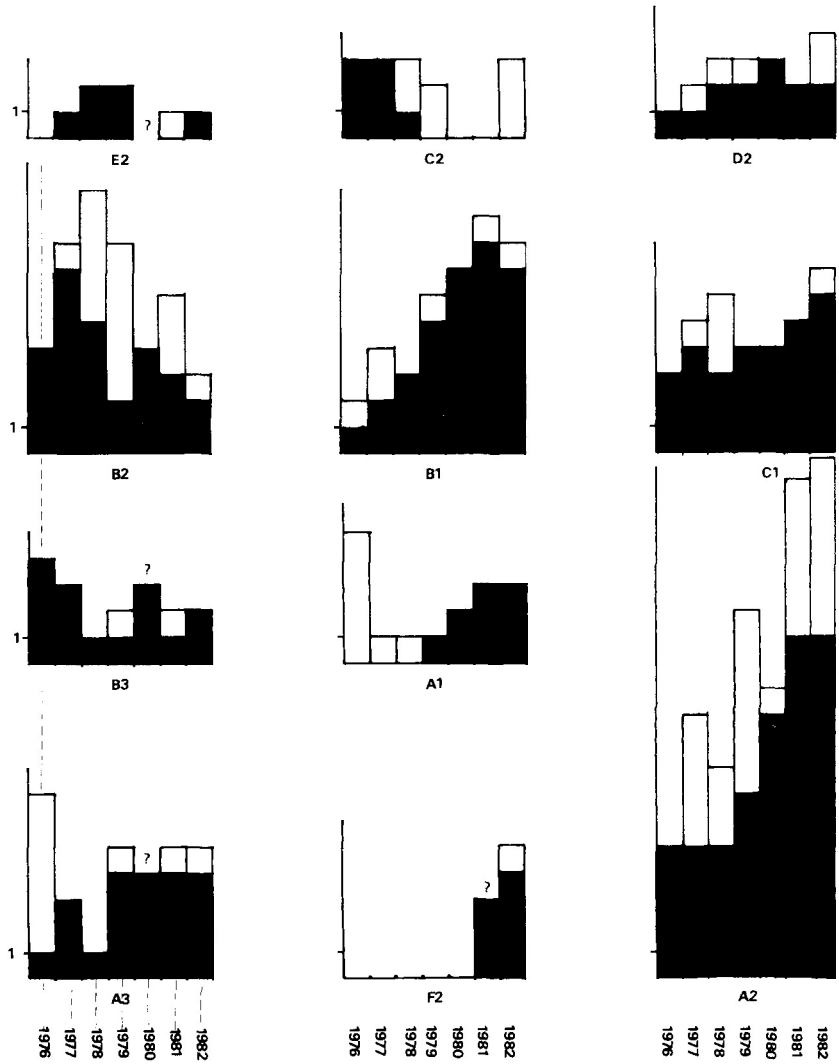

Figure 4: Occupancy of the eleven nest sites listed in *Table 2*. Open bars indicate number of breeding pairs; solid bars indicate number of juveniles.

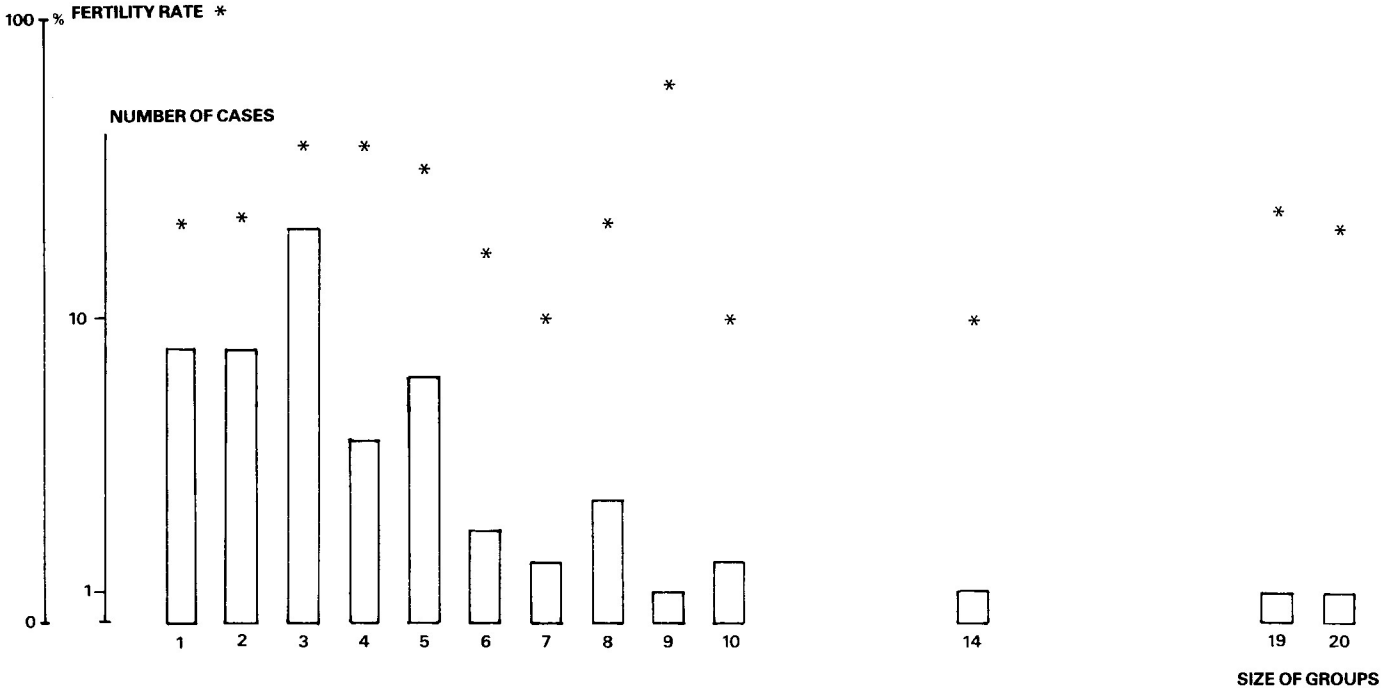

Figure 5: Fertility rate (breeding success) (indicated by *) and number of cases (indicated by bar graph), plotted against size of breeding group (in number of pairs).

Table 4: Breeding success in relation to size of breeding group.

Number of pairs in group	Number of cases	Number of young per pair/year
1	9	0.66
2	9	0.67
3	13	0.79
4	6	0.79
5	8	0.75
6	3	0.61
7	2	0.50
8	4	0.66
9	1	0.89
10	2	0.50
14	1	0.50
19	1	0.68
20	1	0.65

Frequency of site occupation

The proportion of nests occupied varied between 38 percent and 65 percent (M = 53 percent) in a total of 93 eyries counted during the study period (see *Figure 4*). Clearly, the number of potential nest sites was not a factor limiting the number of breeding pairs.

Comparison between breeding success and size of breeding groups

No correlation was apparent between breeding success and size of breeding group (*Figure 5, Table 4*). Put another way, the large colonies did not possess a breeding rate significantly higher than the small ones.

As a further check, we counted by the same methods in 1981 and 1982 at a site on the southern face totalling over 30 pairs. The mean reproduction was 0.80 young per pair in 1981, and 0.74 in 1982. Although situated in a more climatically suitable region (southern face of the Pyrenees in the Mediterranean sector), the birds at this site did not breed significantly better than those on the northern face. This lack of correlation between breeding rate and size of breeding group is perhaps unexpected for a gregarious species. The inference is that group life offers no advantage for the species from the reproductive point of view, or at least that large groups are no better in this respect than small ones.

Fidelity to nest sites

Since there was no marking of individuals, it was not possible to tell whether or not the mated birds were faithful to each other, and to their nest sites. However, reproduction was continuous, and in successful pairs the eyries were frequented daily. Moreover, pre-breeding behaviour was in evidence immediately after the previous year's young had left the nest (*Table 1*), and expulsion of intruders (a sign of a mated pair) was observed in every month of the year. There was therefore little possibility for a new pair to take over an already occupied nest site. In addition, no copulation or other behavioural sign of pairing was ever observed, to my knowledge, away from the roosting or nesting sites. Thus a new pair could be involved only in the event of unsuccessful breeding or or of a hitherto unoccupied eyrie being taken over.

Taking this into account, the pattern of successive vacancies and occupations of eyries was studied throughout the seven years of census work, and *Table 5* shows the breeding success in relation to frequency of nest occupation. Fidelity to the nest site tended to be associated with a higher mean rate of productivity. The more

Table 5: Breeding success in relation to frequency of nest occupation.

Number of times eyries occupied	Number of cases (*x*)	Number of young per pair/year
1	31	0.45
2	28	0.74
3	15	0.73
4	10	0.83
5	4	0.80
6	6	0.75
7	6	0.90

frequently used sites were probably those which were better protected from weather.

CONCLUSIONS

Does the population level conform with the availability of food offered by the present-day character of Pyrenean pastoralism? It is difficult to appreciate the present population dynamics without more precise information on the age classes of the breeding birds, their capacities for replacement of numbers, and the survival rates of individuals. Nevertheless, development of the conservation measures from which the species has benefited during the last decade; namely (a) protection and wardening of sites and (b) the setting up of 'restaurants' (feeding stations) through the region, has, by augmenting the food supply and ensuring greater quiet at the breeding sites, contributed towards improving breeding success, even though the relationship between population size and the amount of available food is difficult to assess.

What measures should be adopted to maintain a dynamic equilibrium between pastoralism and the vulture population? The Griffon Vulture does best in vast, undisturbed open areas. It now depends for food on the presence of domestic flocks (unlike its African equivalent *Gyps ruppellii*; Houston 1978) and its geographical distribution reflects that of pastoral systems which still survive on the periphery of the Mediterranean basin (cf. Bonte 1975):

(a) nomadism of the montane type (shifting flocks), almost extinct or abandoned in the Mediterranean–Balkanic, or Maugrabin, sector;
(b) Middle-East steppe nomadism, fast disappearing.

Thus in the long term it is on the nature of pastoralism that we should concentrate, since the survival of the vulture depends on it. This calls for the preservation of its extensive and nomadic character, the maintenance of grazing flocks in the mountains in summer, and the encouragement of wintering them in the foothills, so as to ensure a good food supply in space and time.

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