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APPARENT INCREASE IN A GRIFFON VULTURE (*Gyps fulvus*) POPULATION IN SPAIN

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Little is currently known about the population dynamics of large carrion-eating raptors. These species maintain fairly constant numbers which are limited by the capacity of their environment (Wilson 1975; Mundy 1982), since populations have a low capacity to expand (Mertz 1971).

The Griffon Vulture (*Gyps fulvus*) is a large carrion-eating raptor weighing 6–11 kg. This article presents data on possible causes of a substantial increase in a Griffon Vulture population in the northern part of the Iberian Peninsula.

The study area extends 11 000 km^2 and includes the province of Navarre and the northern part of the province of Zaragoza in the western zone of the Spanish Pyrenees. The first census of Griffon Vultures in the area was conducted by the Spanish Ornithological Society in 1979, and a second was carried out privately in 1984. Elósegui (1974) provided detailed information on the distribution of the vultures. Every rock site capable of harbouring vultures (94 cliffs) was visited in both censuses. Ten personnel participated in the 1979 census working 38 d. In 1984 nine personnel participated working 54 d. The number of days worked/vulture colony was 1.3 in 1979 and 1.4 in 1984 Each observer was responsible for a series of colonies A drawing of each colony indicating front elevation and position of each nest was accomplished in 1979. In the 1984 census each experienced observer counted the same colonies he had counted five yr earlier. Five of nine observers were experienced and evaluated 73.6% of the nests in 1984. Unexperienced observers used the drawings showing the position of nests found in 1979. Both censuses occurred basically between February and April, the 1979 census being conducted later (March–April) than in 1984 (February–March) due to climatological difficulties encountered during February 1979. All colonies were counted during acceptable light conditions on days with no rain. Counting method consisted of observations with telescopes at a distance that would not cause disturbance. Most nests were placed in canyons, and observations were made from sites located on opposite canyon walls. Inactive pairs (identified by the continuous presence of two adults in possible nesting localities and/or by the presence of an empty nest) as well as incubating pairs were counted. Each colony was visited until virtually all nests were counted, including those partially concealed by vegetation which were detected by the behaviour of the incubating adults (incubation relief and position changes; see also Leconte 1985). Nevertheless, a fraction of the population may have gone unnoticed. Census coverage was calculated to be 85–90% in 1979 and 95–100% in 1984. The differences are due mainly to the fact that the dates of the 1979 census may have resulted in pairs without eggs and with abandoned nests not being detected.

Census results are listed in Table 1. Twenty-nine colonies were detected in 1979 and 39 in 1984. A marked population increase (51.8%) appears to have occurred between 1979 and 1984. Based on the number of nests each colony contained in 1979, there was an increase of 22.3% in colonies that had one to ten nests, 30.8% in those that had 11–20 nests and 64.7% in those of >20 nests. Twelve new colonies with one to five nests were counted in 1984, and two previous colonies with one and two nests, respectively, were no longer in existence. It must be pointed out that in only two colonies (No. 5 and No. 12) an increase of 90.1% (91 nests) was produced (Table 1). The annual population increase (8.7%) exceeds any predicted increase under even optimum conditions for similar carrion-eating raptors (Piper et al. 1984). These results are not due to the census methods. In both years the dates of the field work, the number of observers, climatology and the effort spent in each colony were very similar. The increase in the total number of work days in 1984 is a logical result of the greater volume of colonies and nests. The fact that the same personnel that worked in 1979 also counted the greater part of the nests in 1984 helped to insure valid results. Such was the case with the largest colonies (No. 5 and No. 12) that were counted in both years by J. Elósegui and the author. In both colonies new nests were occupied in parts of cliffs that were formerly unoccupied by vultures and were thus easily detected. On the other hand, in the years between the censuses we realized through occasional visits that these and other colonies were progressively increasing, a trend which seems to have continued since 1984.

The increase of Griffon Vulture populations is a recent event in the Iberian Peninsula and is not restricted to the study area; recent increases have been well documented in the French and Catalonian Pyrenees (C.R.P.R. 1984; Leconte 1985). Further, there is evidence of increases in the Arragonian Pyrenees and Cantabrian Mountains (R. Heredia, pers. comm.), in Rioja (Lopo and Ceballos 1985) and in Vascongadas (Alvarez et al. 1985). Determing the causes of the increase is very complicated. There is no data to indicate a recent increase in reproduction in my study area. The only data available is the reproductive success in 1984 which ranged between 0.52 and 0.88 fledgling/egg for some colonies. Also, it could be that in 1984 previously non-reproductive adults and/or subadults were nesting, but such was rare in the study area (J. Elósegui, unpubl. data). Immigration from other Iberian colonies would be possible, but such is very rare in the rest of

Table 1. Census data for 1979 and 1984 of a Griffon Vulture population in the northern Iberian Peninsula.

Colony Number	Censused Pairs	
	1979	1984
1	10	10
2	0	3
3	10	20
4	2	1
5	46	89
6	3	3
7	7	8
8	12	19
9	6	2
10	13	11
11	0	1
12	52	103
13	0	1
14	0	1
15	1	1
16	0	2
17	2	2
18	7	8
19	0	1
20	0	1
21	20	31
22	3	3
23	5	6
24	34	47
25	6	9
26	17	24
27	5	9
28	32	38
29	0	1
30	16	17
31	23	31
32	7	9
33	3	2
34	5	7
35	0	1
36	2	0
37	9	15
38	0	2
39	1	0
40	0	1
41	0	5
Totals	359	545

Europe and north of Africa where *Gyps fulvus* populations are very scarce (Cramp and Simmons 1980). Currently, there is no information (ringing recoveries) to support this possibility.

A decline in mortality could have occurred in recent decades. Between 1956 and 1961, 968 vulture deaths were recorded in only six Spanish provinces (Anon. 1962), which could explain the parallel decrease in vulture numbers (Elósegui 1974; S.E.O. 1981). In the last few decades hunting pressure has virtually disappeared since raptors are now protected by law. With an adult mortality of near 0%, a subadult mortality of around 30% would be necessary to obtain an 8% population increase (see Mertz 1971), assuming, optimistically, that all females reproduce at age five and produce one hatchling. However, these percentages do not fit with those for other large carrion-eating species (Hiraldo et al. 1979; Piper et al. 1981)

In conclusion it is difficult to explain the rapid increase in the effective number of *Gyps fulvus* in the northern part of Spain given the current level of knowledge on the biology of carrion-eating raptors. There may not, in fact, be a single reason for the increase. In any case the need for new data on the status of the Griffon Vulture in the Iberian Peninsula and for in-depth research into population dynamics of the species is one way to begin to answer such questions.

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NORTHERN PYGMY-OWL NESTS IN NORTHEASTERN OREGON

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Little is known about the Northern Pygmy-Owl (*Glaucidium gnoma*) and nests have been reported infrequently (Bendire 1883; Calderwood 1889; Holman 1926; Braly 1930; Norton and Holt 1982; Holt and Norton 1986). Because so little is known of the pygmy-owl in North America, we are reporting our findings for two nest sites in Union County in northeastern Oregon.

On 17 April 1981 a pygmy-owl nest was found in an old Northern Flicker (*Colaptes auratus*) cavity 10 m off the ground in a dead Douglas fir (*Pseudotsuga menziesii*). The nest tree was 39 cm dbh (diameter at breast height) and had a broken top. The tree was on the edge of a meadow at the base of a 63% slope in a mature, unlogged stand of Douglas fir with a canopy closure of 81%. The stand was 100–200 m wide, 2 km long, and surrounded by meadows; adjacent forest stands were within 150 m. The nest tree was 110 m from a stream. The outcome of this nesting attempt was unknown.

On 21 April 1986 a second pygmy-owl nest was found 12 m above the ground in a 52 cm dbh live grand fir (*Abies grandis*). The nest cavity was probably excavated by a Williamson's Sapsucker (*Sphyrapicus thyroideus*) originally, based on general appearances (Bull 1980). The tree was broken off at 15 m height.

The second nest failed sometime before 15 May, although fresh pellets were found regularly through 7 May. We climbed the tree on 15 May and found three or four eggs in the cavity; at least one was cracked. The cavity opening was 4.8 cm high × 4 cm wide. The cavity was 18 cm deep × 32 cm wide with five cm of wood between the outside of the tree and the inside of the cavity. The tree was 41 cm dia at the cavity entrance, and the tree was hollow with a shell of sapwood surrounding the cavity.

The nest tree was located 15 m from a stream on an east-facing 58% slope. The surrounding stand within 100 m was unlogged, old-growth grand fir with 87% canopy closure and three canopy layers, the highest at 40 m. Outside the immediate stand but within a 500 m rad of the nest, 86% of the forested land had been recently logged (partial removal).

Pellets and prey remains were found under eight trees, which we called roosts. We assumed that these pellets were deposited by the female because the female keeps the nest hole clean of old prey remains (Mikkola 1970; Schonn 1980). The roosts were 10–17 m uphill from the nest tree. Five of the roosts were grand fir (four live trees and one dead tree), and three were live Douglas fir. The dbh of these roosts were 22–50 cm ($\bar{x}$ = 35 cm).

We found 44 pellets and prey remains under the roosts between 21 April–7 May. The length and width of pellets averaged 27 × 11 mm, respectively. Skulls, jaws, or other remains of four voles (*Microtus* spp.), four shrews (*Sorex* spp.), one Heather Vole (*Phenacomys intermedius*), two Deer Mice (*Peromyscus maniculatus*), 10 insects, and 12 sparrows were found. Many pellets contained no identifiable skulls. Males frequently eat the forepart of the body of a small animal and take the posterior part to the nest (Mikkola 1970), thus few remains of skulls were found in the female's pellets.

Our observations are similar to those reported for *G. passerinum* (Scherzinger 1974; Schonn 1980). More information is needed on nest site characteristics of the Northern Pygmy-Owl to understand habitat requirements and potential impacts of land management activities on the species.

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