Meyburg, B.-U. & R. D. Chancellor eds. 1989
Raptors in the Modern World
WWGBP: Berlin, London & Paris

Census and Observations on the Biology of the Bearded Vulture *Gypaetus barbatus* on the Island of Corsica

Paolo Fasce, Laura Fasce & José Torre

For a long time the situation of the Bearded Vulture in Corsica was little known for lack of detailed study, perhaps due to the geomorphology of the island, with its complex chains of precipitous mountains and valleys which are often difficult of access.

J.-M. Thiollay (1968a) first estimated the presence of 6 nesting pairs in 1968; this was increased to 7-10 pairs by J. C. Thibault in 1977, whilst in 1981, F. Bouvet put forward the hypothesis that the population was between 13 and 18 nesting pairs.

Our survey was begun in 1976, and in 1983, together with José Torre, we were charged by the "Parc Naturel Régional de Corse" with making an official census of the species, combined with a study of its biology. To date, we have confirmed the presence of 9 pairs, while the existence of a tenth is probable, although its nests have not yet been located.

The Bearded Vulture of Corsica should belong to the form *Gypaetus barbatus aureus*, which inhabits Europe and Eurasia, but no specimen from the Corsican population is preserved in any museum, so that no studies exist of its plumage. However, Thiollay (1968b) had already noted the whiteness of the head and breast in the Corsican birds, as is also characteristic for the populations in Sardinia and (formerly) in the Alps.

Most of the adults we observed in Corsica showed the typical white colouration, but two individuals with rufous marks on the breast are also known, both of them females paired with white males. It is worth noting that the plumage of one of these looks as if it had bleached over the years. The same is true of a male bird which, in 1979, joined a pair (see below) from which it could at that time be easily distinguished by the rusty colour of its breast which to-day has completely disappeared. Such observations could strengthen the doubts expressed in 1968 by P. A. Clancey over Berthold's interpretation (1967) as to how this particular colour adheres to the feathers.

The territory of each pair is difficult to assess with any reliability since the territories of neighbouring pairs overlap to a considerable degree.

Given the amount of habitat suitable for the species on the island (*ca.* 2,400 km^2) and the presence of 10 pairs, each pair would have 240 km^2 at its disposal. In point of fact, the Bearded Vulture occurs in greater density in the northern part of the island (Fig. 1), where the terrain is more suitable and cattle and mouflon are more abundant. This area in fact holds 7 pairs, with a mean distance between occupied nest sites of 10.5 km. Here, too, is found the shortest distance between nests - 4.5 km - whilst the greatest is 21 km. On the other hand, only 2-3 pairs inhabit southern Corsica, where the terrain is less mountainous and rugged.

At present, 27 nests are known, belonging to 9 pairs. Each pair has between 1 and 5 nests, the mean per pair being 3 (Fig. 2). All these nests are in caves or rocky hollows, at heights ranging from

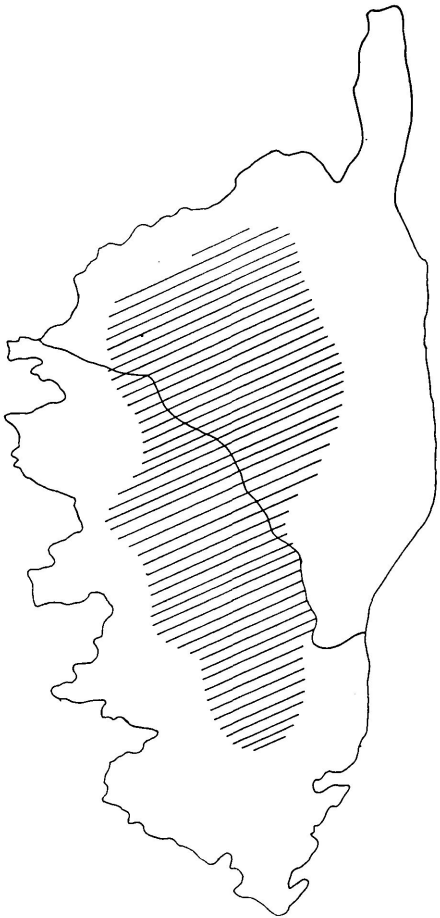

Fig. 1. The Bearded Vulture's distribution in Corsica.

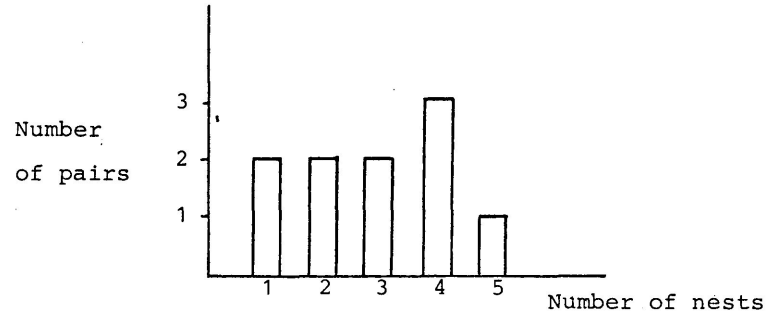

Fig. 2. Nests per pair of Bearded Vulture in Corsica.

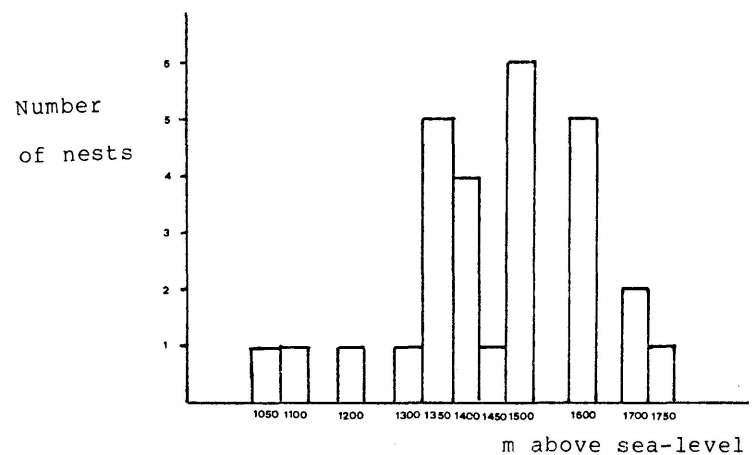

Fig. 3. Heights of Bearded Vulture's nests in Corsica.

1,050m to 1,750m above sea level (mean height 1,450m). Most of them are at *ca.* 1,500m (Fig. 3).

Breeding data have been collected since 1976, and since 1983 almost the whole population has been checked. From 1976 to 1982 22 pairs in all were monitored; this figure was increased to 32 pairs between 1983 and 1986 - a total of 54 pairs which raised 21 young (mean fledged young/checked pair/year: 0.39) (see Table 1 for summary of data). Although the data from the first seven years have little intrinsic value, given so small a sampling, they are included in the totals and in the mean.

Table 1: Reproduction and breeding success for 54 breeding attempts by Bearded Vulture in Corsica, 1976-86.

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	Total
Checked pairs	2	2	2	3	3	6	4	6	8	10	8	54
Fledged young	1	1	1	1	0	2	0	5	5	1	4	21
Breeding success	0.5	0.5	0.5	0.33	0	0.3	0	0.83	0.62	0.1	0.5	0.39

In 1980 and 1982 no breeding occurred in the territories monitored; in 1984, as many as 9 pairs laid eggs and incubated, but only one young reached the stage of fledging. Conversely, in 1983, 5 out of the 6 pairs monitored succeeded in raising their young.

The highest productivity rate was found in a pair which had 7 successful breeding attempts in 11 years, making an average of 0.64 young per year.

The mean productivity (fledged young/checked pair/year: 0.39) seems to be lower than the rates known for other populations (J.-F. Terrasse 1981; M. Clouet 1984; J. Canut *et al.* 1987), but probably reflects the particular features of the Corsican population. Indeed, insularity may well result in more limited dispersal and also a lower degree of mortality among juveniles, as occurs with other species (J. C. Thibault 1977). In addition, the Bearded Vulture in Corsica is not subjected to persecution; nor are there any overhead power lines such as cause many deaths in the Pyrenees (Clouet 1984).

It is also true that this reproductive rate is negatively biased by the fact that one pair has not bred since 1976 at least, due probably to sterility in the female. The territory of this pair has been longest known; in 1979 a third adult joined the pair, being at first driven off but in the following days being made increasingly welcome by both partners, leading to the formation of a "trio" which still occupies the territory to this day.

In December 1980 this third adult proved to be a male, mating with the female a few moments after the "legitimate" male, and subsequently this behaviour was repeated regularly.

In 1985 the female laid two eggs which were incubated by all three adults for at least 69 days, after which they were abandoned. Both these eggs, analysed at Vienna University, were sterile and their pesticide content was practically nil (Table 2). They were significantly smaller than the 71 "European" eggs whose sizes are given by Glutz (1971), measuring 62 x 48 mm and 67 x 50 mm respectively, as opposed to the 75 x 56 mm of the smallest of the eggs list by Glutz.

Table 2: Concentration in parts per million of organochloride residues in two Bearded Vulture's eggs from Corsica.

	Clophen A60	HCB	pp-DDE
Egg No. 1	3.5	0.04	0.42
Egg No. 2	2.68	0.16	0.61

It would be desirable to obtain further egg-shell measurements in order to verify whether this smallness is a distinctive feature of the Corsican birds or merely due to chance. We have, in fact, tried to collect the eggs from other abandoned clutches shortly after desertion, but in each case the nest was already empty, possibly robbed by Ravens.

Observations made during the incubation of the "trio" enabled us to identify slight differences in their plumage, detectable only from a short distance, by means of which it was possible to record individual behaviour. For example, the female accepted indifferently both males taking over the incubation, but one of the latter was dominant, violently chasing the other off when it attempted to take its turn; the dominant male spent at least two consecutive nights brooding the eggs; and the female mated with one male shortly after a changeover at the nest and whilst the other male was brooding.

Further interesting observations on the species' behaviour and biology were also made on the pair noted for its high productivity. Always laying sufficiently early, this pair bred successfully every year from 1983 onwards.

In 1983 their young fledged on 4th June, indicating that laying took place between 15th and 20th December 1982. This fledging date is, so far as we know, the earliest recorded, at least for Europe.

In 1984, the same pair was already incubating on 2nd January. In 1985 the young fledged between 15th and 20th June (eggs laid end of December 1984) whilst in the following season the female may well have already been incubating on 11th December 1985.

The young hatched in 1986 had a tarsus bent backwards, probably due to some congenital defect, so that it could not stand or feed itself normally. It was therefore decided to remove it for treatment and cure; alternatively, if this proved impossible, it would be donated as a future parent to the Project for Reintroduction of the Bearded Vulture in the Alps. Unfortunately it died during transportation, perhaps due to a heart defect.

As regards the diet, this is based in Corsica chiefly on domestic animals (cattle, sheep, goats, pigs), mostly semi-feral, and on mouflons, which are to-day the only large wild mammal still living on the island, and even so present in only some of the vultures' breeding territories.

Food remains have been collected from the nests in which young were raised, in order to ascertain the incidence of each species in the diet. Data are also being assembled on domestic cattle and their seasonal displacements, to ascertain the number of head present at different times in the various territories of nesting pairs. In fact, there are no reliable official data on this, nor on cattle mortality, which must be rather high, given the method of breeding them. It is therefore not possible, at least for the time being, to establish a relation between food supply and breeding success of the vultures. However, whereas stock-raising and the number of mouflons have considerably declined during recent decades, the number of breeding pairs of Bearded Vultures was certainly no greater in the past. Indeed, we know of only one territory, to-day unoccupied, which contains at least one former vulture eyrie.

We can therefore assert that this wonderful bird is, in Corsica, dependent on preservation of the traditional method of stock-raising, which must be maintained and promoted by all possible means, in order to prevent a further decline jeopardising the Bearded Vulture's survival.

REFERENCES

BERTHOLD, P. 1967. Über Haftfarben bei Vögeln: Rostfärbung durch Eisenoxid beim Bartgeier (*Gypaetus barbatus*) und bei anderen Arten. *Zool. Jb. Bd.* 93: 507-595.
BOUVET, F. 1981. The status of the Bearded Vulture in Corsica. ICBP Technical Publication No. 5: 129-130.
CANUT, J. D. GARCIA, R. HEREDIA & J. MARCO 1987. Status, caracteristicas ecologicas, recursos alimenticios y evolucion del Quebrantahuesos *Gypaetus barbatus* en la vertiente sur de los Pirineos. *Acta Biol. Montana* VII: 83-99.
CLANCEY, P. A. 1968. The ventral colouring of the Lammergeier. *Bokmakierie* 20(2): 36-37.
CLOUET M. 1984. Données récentes sur le statut, la démographie et les ressources des territoires du Gypaète barbu (*Gypaetus barbatus*) dans la moitié orientale des Pyrénées. *Rapinyaires Mediterranis* II, C.R.P.R. Barcelona: 17-25.
TERRASSE, J. F. 1981. Recensement, succès de reproduction et alimentation du Gypaète (*Gypaetus barbatus*) dans les Pyrénées françaises. *Rapaces Méditerranéens*, Annales du C.R.O.P. No. 1: 76-78
THIBAULT, J. C. 1977. *Le statut des rapaces de Corse.* P.N.R.C. Ajaccio.
THIOLLAY, J. M. 1968a. Notes sur les rapaces diurnes de Corse. *O.R.F.O.* 38: 187-208.
THIOLLAY, J. M. 1968b. Particularité de plumage chez les Gypaètes corses (*Gypaetus barbatus aureus*). *Alauda* 36: 211.

Paolo & Laura Fasce
Via di Brera 2/25
16121 Genova
Italy

José Torre
Parc Naturel Régional Corse
Moltifao, Corsica
France