

THE BROWN BEAR IN THE FRENCH PYRENEES: DISTRIBUTION, SIZE, AND DYNAMICS OF THE POPULATION FROM 1988 TO 1992

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Abstract: Since the middle ages the brown bear (*Ursus arctos*) has occurred throughout the Pyrenees Mountains. In the mid-eastern portion of the Pyrenees, brown bears may already have been eliminated. A small relict population occupies a very restricted range in the area of the Pyrénées Atlantiques. This population has been monitored since 1978, and since 1983, the population has been counted annually. The last detailed status report was published in 1989.

On the French side of the Pyrenees, the species still exists in the Ossau, Aspe, and Barétous valleys. This population is believed to inhabit approximately 50,000 ha and is believed to be comprised of 6–8 individuals, plus 2 more bears that frequent the Spanish side. From 1988 to 1992, these numbers appear to have remained stable. The birth of a cub in the Ossau valley in 1989 indicates that some reproduction is occurring.

Although a few measures have been enacted to protect this population, it remains extremely vulnerable. If the population is not augmented and bear conservation objectives are not included in current land-use programs, the population may go extinct.

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Several accounts report the presence of the brown bear throughout the Pyrenees during the last century (Bourdelle 1937, Couturier 1954). The size of individual ranges recently reported for brown bears in western Europe (Clevenger and Purroy 1991) suggest that the size of this population may have been overestimated. On the other hand, accounts of the spatial distribution of brown bears may provide better evidence regarding the status of the brown bear within its historical range.

Until 1988, a few individuals survived in the central part of the Pyrenees (Camarra and Parde 1990). Today, the few bears that survive in the Pyrenees are confined to the westernmost part of the range. This nucleus has been monitored since 1967, when the Pyrenees National Park began to reimburse shepherds for bear kills of livestock. Since 1983, the Brown Bear Network, coordinated by the Office National de la Chasse, has intensively monitored this population on the French side. A similar system was created a few years later on the Spanish side.

Some specific and innovative field techniques based on bear sign were first used in the core area of the bear range and then applied to potential bear habitat. This paper summarizes these results.

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STUDY AREA

The last brown bears in the Pyrenees survive in rugged mountainous terrain with very little human access. The species can be found in a wide altitudinal range between 300 and 2,600 m. Several forested slopes on the study area exhibit an elevation range of 1,200 m from base to treeline. Livestock trails are often used by bears in spring, but little data has been collected in summer when livestock and tourist activity in the high mountains is heaviest. The study area covers 3 valleys of the Haut Béarn totalling 80,000 ha of mountainous country. The study area is the same as that described by Camarra and Dubarry (1989).

METHODS

Although basic quantitative information on population size and structure was essential, no trapping or handling of bears occurred for reasons of bear safety and due to the ethics of studying a very small population. Population monitoring was directed toward several parameters: bear distribution, population size and structure, and reproductive and mortality rates. Data pertaining to these parameters was gathered with the use of non-intrusive techniques such as collecting verbal accounts (i.e., testimonies), recording accounts of bear attacks on livestock, searching for and interpreting sign, and visiting lure stations and analysing individual differences in sign. Testimonies consisted of oral interviews of local people and tourists. At the periphery of the range, observational data were scarce and isolated. For this reason, we collated

data for the 5-year period of 1988–92. Testimonies were entered into the database only after rigorous verification.

Field investigations took place in spring. Methods used were consistent throughout the range and over the time of data collection.

DISTRIBUTION

From 1988 through 1992, the Brown Bear Network collected 194 testimonies and attendant bear sign on the French slope of the range (Table 1). The Rangers of the Parc National des Pyrénées registered 215 livestock depredation cases during this same time period.

The unusually high level of depredation in 1991 and 1992 was related to the presence of a problem bear. In 1991, this single bear committed at least 58 attacks on livestock, nearly triple the annual number recorded over the range for all bears. High rates of reimbursement to shepherds for bear damage may also have led to overestimation of predation. The excessive familiarity with the problem bear also increased the sample size of sign collected in the field during 1991–92.

Testimonies were used to estimate population distribution, and an area of about 50 km east to west and 27 km north to south was delineated (Fig. 1). On the western edge, testimonials obtained from hikers were confirmed by a scat collected immediately afterwards by a member of the Brown Bear Network. The area inhabited by bears (Fig. 2) was calculated using a sample of reliable data. If the distance between data points exceeded 5 km, they were classified as separate data locations.

Total occupied bear range may be represented by a square of approximately 30 km × 30 km. In France, this area covers the Ossau and Aspe valleys and totals about 525 km². On the Spanish side, the occupied bear range covers 590 km² (Caussimont and Herrero 1997).

On the French side, the distribution area can be classified in 2 types: an area of 350 km² which is regularly frequented by bears (>1 reliable testimony or attack on livestock with kill/unit/year) and an area of 150 km² with occasional bear presence (<1 reliable testimony or attack on livestock with kill/unit/year). If we exclude the data related to the problem bear, the area regularly frequented decreases to 300 km².

Most sightings of bear sign was recorded east of the Aspe River (Fig. 1), with the greatest number occurring on the west side of the upper Ossau Valley. On the west side of the Ossau River, bear observations drop to very low levels. In contrast to observations from the last few decades, the bottoms of the main valleys now seem to be rarely crossed by bears. In the Pyrenees, the species is diffusely distributed over 1,115 km², with observations declining in the westernmost part of the Aspe valley.

POPULATION SIZE

Census operations were carried out over the study area for 10 years, from 1979–88 (Camarra and Dubarry 1989, Camarra 1990). Bear sign was catalogued, and footprints were measured and cross referenced with the database to help identify individuals in the population.

Field investigations, organized each year during 4 consecutive days in early May, consisted of a simultaneous search (average transect of 10 km on trails/1,000 ha unit/day) to collect data on fresh tracks from the previous night. The “Operation de Recherche Simultanée d’Ours (ORSO)” was conducted each year when snow still covered the ground and bears were highly active. During these operations, field personnel usually collected 30–40 bear tracks. In total, from 1988 to 1992, the Brown Bear Network membership measured foot prints ($n = 1-10/\text{track}$) on 456 tracks. Statistical analysis used 183 tracks characterized by interdigital width and sometimes

Table 1. Sample size of field data used to monitor the brown bear population in the French Pyrenees, 1988–92.

| Year | Testimonies ^a | Attack ^b | Activity Sign ^c | | tracks measured ^e | problem bear activity sign ^f | Total |
|-------|--------------------------|---------------------|----------------------------|------------------------------|------------------------------|---|-------|
| | | | west Aspe River | east Aspe River ^d | | | |
| Total | 194 | 215 | 106 | 487 | 456 | 87 | 1,099 |

^a Reliable (controlled by the Brown Bear Network)

^b On livestock

^c Collected during specific field operations by the Brown Bear Network members

^d Excluded problem bear data for 1992 only

^e Included in activity sign

^f Included in testimonies, attacks, and activity sign

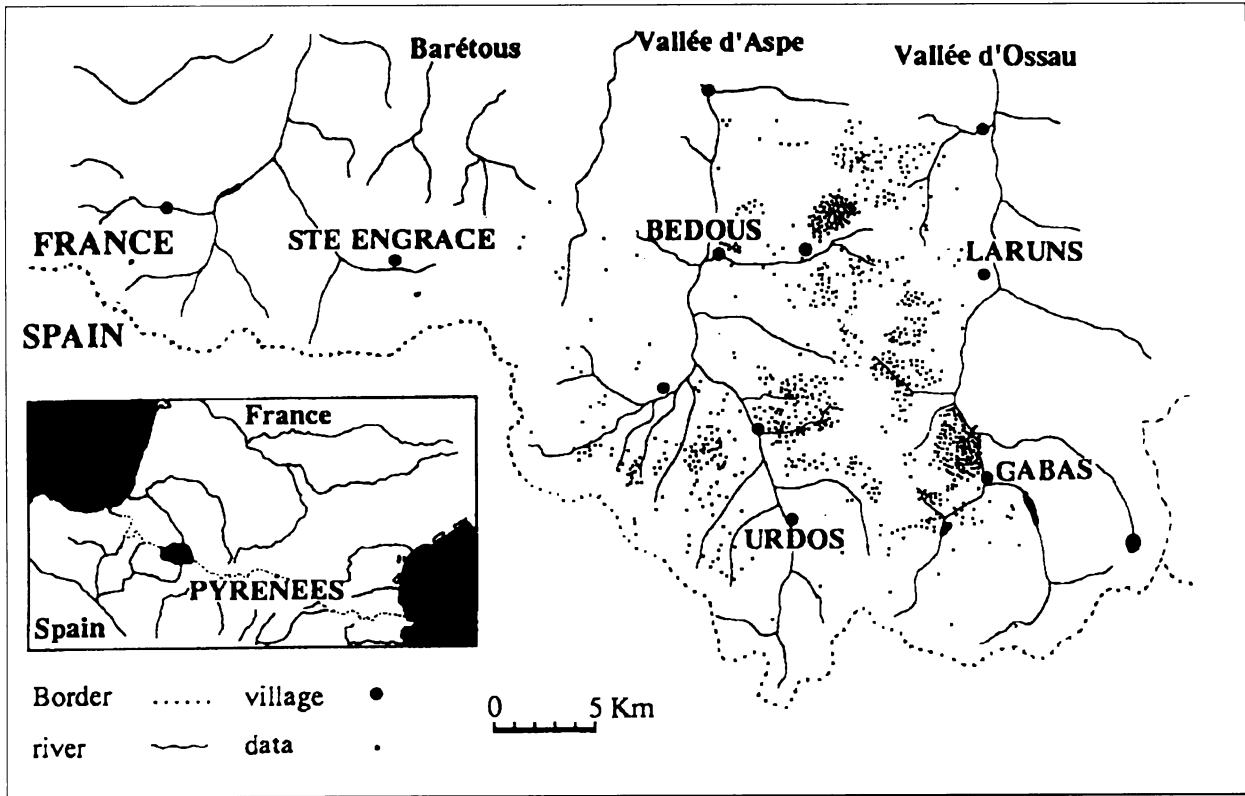


Fig. 1. Distribution of evidence and signs of brown bear presence in the Western French Pyrenees, 1988–92.

paw width and length of the fore footprints (Camarra 1992). The variability threshold from which we can be statistically confident of different bears depends on several factors, of which the substratum has the greatest in-

fluence. The major portion of the data ($n = 163$) was collected between the Ossau and Aspe rivers. In 1989, after an extremely warm winter, sample size was very small.

For analysis, data was also classified in different footprint size classes. A class was based on the average standard deviation (2.5%) of the interdigital width (basic measurement). Some classes were stable over the study (adult), while others changed (young increasing in body size). The average values of footprint width ranged from 79–127 mm. On the east side of the Aspe river, 4–5 distinct footprint size classes could be identified, while only 2 classes were recorded for the west side.

Cross-referencing dates (approximate date and hour of bear presence on the site) with foot sizes allowed us to approximate number of individuals/size class, and by extension to estimate population size. The latter ranged from 8–10 animals, 4–6 of which were resident to the east side of the Aspe River. No significant population size change was noted during the study (Fig. 3, Table 2).

Footprint measurements collected on 3 individual well known bears likely confirmed some shrinkage in 2 sub-

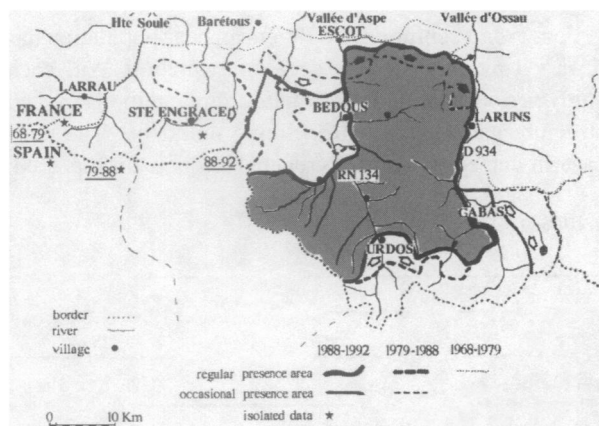


Fig. 2. Variations in the brown bear distribution area in the Western French Pyrenees, 1979–92.

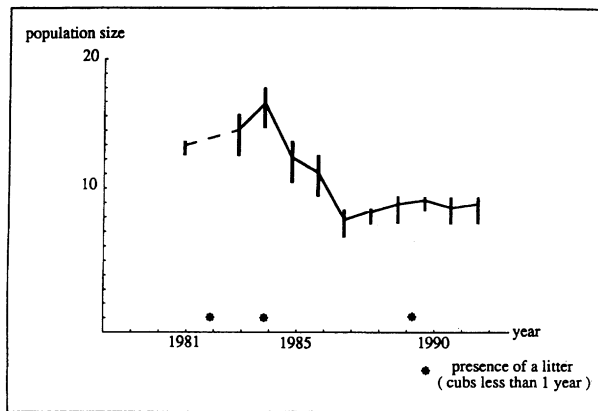


Fig. 3. Annual variations of the brown bear population size in the Western French Pyrenees, 1979–92.

populations. Only one animal whose footprint sizes have been located on both sides of the valley is thought to link these small subpopulations.

Footprint measurements of the problem bear (1991–92) allowed us to identify this animal as a young animal, perhaps the last cub born in the area (1989).

DEMOGRAPHIC TREND

Transect ($n = 14$) surveys were performed during 4 weeks in spring. Each year, 600 km of trails were sampled and 30–50 fresh tracks registered. The index of track occurrence (ITO) was based on the number of different tracks (different animal, same animal but in a different direction or at different dates) registered on each transect, but calculated by segment of 1.6 km. This index exhibited a sharp decline before and at the beginning of the study period in 1985, 1986, 1987, and 1988 (Camarra 1990). It remained the same during our study, at an average of 0.07 track/1.6-km segment. The values ranged from 0.04 in 1992 to 0.22 in 1988.

In 1989, on areas with historically high values, the ITO suddenly exhibited low values. The values related to 1

well-known individual also declined (n tracks of a single large bear encountered were 26 in 1988 and 11 in 1989). In some areas the value of this index dropped or suddenly increased, suggesting some displacement of animals. The snowless winter may have caused increased food competition with wild boars (*Sus scrofa*) forcing bears to seek new ways to exploit food resources. The extreme shyness of a female with a cub, who were not detected until the end of the year, might also explain this low value.

POPULATION PARAMETERS

Population density may be more a theoretical value rather than a realistic one in this heterogeneous range. The average value for the population area ranges between 1 bear/62 and 1/84 km², and in the core area, density was 1 bear/44–58 km². We documented the presence of a sow with cub (1989) and the survival for 11 years of a well known male. Based on the low level of reproduction we documented during the last 10 years, we suspect an old age structure in this population except for 1 sub-adult and 1 young adult.

The previous analysis periods (1979–84) showed an unusually low reproductive rate (12.4%) for a western Europe population of brown bears (Camarra 1990). Over this study period, only 1 cub was born (1989) and it was probably the problem bear we described.

Such a reproductive rate cannot balance mortality. Since 1979, 7 bear carcasses of different age classes were found in the area (Camarra 1990), but causes of death remain unclear.

CONCLUSIONS

For several centuries, the Pyrenean bear population has declined and is now on the verge of extinction. With each study period since 1979, estimates of population size and structure have suggested declining numbers. The mid-eastern nucleus (Central Pyrenees) has now disappeared.

Table 2. Results of annual bear counts in the Western Pyrenees, 1988–1992.

| Location | Year | | | | | | | | | |
|------------------------------|------|------|------|------|------|------|------|------|------|------|
| | 1988 | | 1989 | | 1990 | | 1991 | | 1992 | |
| | min. | max. | min. | max. | min. | max. | min. | max. | min. | max. |
| West Aspe River ^a | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| East Aspe River | 5 | 5 | 4 | 6 | 5 | 6 | 4 | 6 | 4 | 6 |
| Western Pyrenees | 8 | 9 | 8 | 10 | 9 | 10 | 8 | 10 | 8 | 10 |

^a Includes Spanish side

The western population has shrunk to 2 or 3 poorly connected sub-populations in spite of habitat management efforts. We conclude that the population is now less than the minimum viable population size.

For the last 13 years, we have known that we were monitoring the final stages of survival of the Pyrenean bear. Without population augmentation and significant habitat management, the species could vanish within the next 20 years.

The brown bear occurs in similar situations in other parts of Western Europe. Thus, it is important to coordinate our scientific research and management efforts for bears and their habitat, at least, in the greater ecosystem of the Pyrenees–Cantabrian Mountains.

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