

# THE BROWN BEAR IN THE SPANISH PYRENEES: PRESENT STATUS AND RECOMMENDATIONS FOR PROTECTION

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**Abstract:** The brown bear (*Ursus arctos* L.) from the western Pyrenees of Spain is a very endangered species, with only 2–3 individuals living in a 590 km<sup>2</sup> area. These individuals are part of a small population in the south-western Pyrenees composed of approximately 10 animals in a 1,390 km<sup>2</sup> area. Mainly adapted to a herbivorous diet, these brown bears sometimes attack livestock in the area, on average 3.7 attacks/year are reported. Protection measures include population reinforcement and control of human activities affecting brown bear behavior and habitat (hunting, timber harvest, recreational activities).

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**Key words:** augmentation, brown bear, distribution, endangered species, human activities, Spanish Western Pyrenees, *Ursus arctos*.

Between the 17th and 19th centuries, the Pyrenean bear population was part of the Cantabrian ecological community (Nores 1988). In the middle of 19th century, Madoz published his *Diccionario Geográfico-estadístico-Histórico de España* (1846–50) which listed the municipalities in the Spanish western Pyrenees where brown bears occurred (Fig. 1). At this time brown bears were living throughout the Pyrenees. However, this population has progressively declined since. This decline has been more important and occurred earlier on the southern slope of the Pyrenees than on the French slope of the Pyrenees. Today the remaining population lives on both slopes of the Pyrenees: about 12 brown bears live in 1,390 km<sup>2</sup> (Caussimont 1992).

Brown bears have been strictly protected in the Spanish territory since 1973. In 1986 Spain ratified the Bern Convention Act for natural areas and European wildlife conservation, signifying an intention to take legal measures to preserve the brown bear's habitat.

Studies on the Pyrenean brown bear started on the French slope with Couturier (1954). In the late 1970s studies were intensified with the first population studies (Röben 1980; J.J. Camarra and C. Dendaletche, *The Pyrenean Brown Bear*, Nat. Soc. Nat. Conserv., Pau, France, 1978), followed by studies of diet (Berducou et al. 1982), winter dens (Camorra 1986a), livestock damages (Camorra 1986b) and population numbers (C. Dendaletche and G. Caussimont, *L'ours Brun des Pyrenees: Biologie, Ecologie, Conservation*, French Minister of Enviro., France, 1985; National Hunting Organization [NHO] 1981 to 1991).

On the Spanish side studies investigated population parameters (Caussimont and Fillat 1986), biology (Caussimont et al. 1993) and preservation measures (García-Serrano, A. J. Herrero, and G. Caussimont, *Determinacion del estado de la poblacion de oso pardo (*Ursus arctos* L.) en el Alto Aragon y establecimiento de*



**Fig. 1.** Brown bears population decreasing in Spanish Western Pyrenees (1856–92).

las bases para su proteccion, Diputación General de Aragon [DGA], 1989). This work is the result of investigations in the field by G. Caussimont and collaborators from 1980 to 1992. The goal of this study was to learn about distribution, estimate the population, describe the bears' biology, and investigate methods for bear preservation in the Spanish Pyrenees.

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## STUDY AREA

Our study area was the 4 western upper valleys along 40 kilometers of the south-western slope of the Pyrenees. The study area included the National Hunting Reserve "Los Valles" in Huesca province (28,757 ha of the hunting area administrated by the [RGA] and 23,000 ha in the brown bear area), the Natural Reserve of Larra Belagoa in Navarra district (2,353 ha), and hunting areas owned by hunting societies.

Topography is rugged with high summits from 900 to 2,438 m and very steep slopes. The climate is influenced by the Atlantic ocean with short springs, mild autumns, temperate summers, and long and snowy winters. The average annual precipitation is about 120 cm. Snow falls over 150 days per year above 1,400 m in elevation.

Intensive use by humans has changed the landscape into a vegetative mosaic composed of high mountain pastures, agricultural cultivation, scrub, and forest. In decreasing order we found Scots pine (*Pinus sylvestris*), European beech (*Fagus sylvatica*), white oak (*Quercus humilis*), mountain pine (*P. uncinata*) and holm oak (*Q. ilex*). Usually the vegetation is composed of 2 or 3 species.

There is a large population (>1,000) of Pyrenean chamois (*Rupicapra pyrenaica*, García-González and Hidalgo 1989). Boar (*Sus scrofa*) density is about 3.8/km<sup>2</sup> (Herrero et al. 1995), and roe deer (*Capreolus capreolus*) also occur. The main human economic activities are tourism, timber harvest, and cattle breeding. Farming is of less importance. The valley's human population is <2,000 people and the villages are situated at the southern limit of the brown bears' range.

## METHODS

Caussimont (1981) first defined a study area based on brown bear presence from a preliminary survey of human inhabitants, livestock damage reports, and reports of sightings of bear activity from local archives and papers. The study also included systematic routes to document presence of brown bear in the area, the tracks were measured to differentiate each animal (Camarra 1983). The routes were covered on the same day as surveys on the French slope of the Pyrenees chain. Sampling intensity was 2–3 times during spring (May–Jun) and autumn (Oct–Nov), and more selectively during summer or along the frontier. Livestock damage reports were also investigated.

## RESULTS

Between 1979 and 1991, 316 pieces of sign or tracks were found and 48 instances of livestock damages were documented. These data were the basis for the present survey map (Fig. 2). A point may represent a number of pieces of bear sign, but all were clustered no farther than 100 meters apart. The map (Fig. 2) represents >550 actual pieces of sign, 80% collected since 1983. With these data a seasonal brown bear distribution map was made to help reduce human conflicts with brown bears (Caussimont 1992).

### Distribution

As in France, all results have been transcribed on a map (1:50,000) divided into 10 km<sup>2</sup> units defined with geographic limits (Fig. 2). Zones were identified as follows: occasional presence zone—sectors where <10 data points were found for 10 years, an area of 360 km<sup>2</sup>; regular presence zone—sectors where ≥10 data points were found for 10 years. This core area is usually occupied by brown bears and has an area of 230 km<sup>2</sup>.

### Population Dynamics

In 1976 the estimate of the number of bears in the Spanish western Pyrenees was approximately 6. Between 1976 and 1980, 4 bears were shot. In 1984, using the same methods on both slopes of the Western Pyrenean chain the French "Réseau Ours Brun" (NHO, FIEP, Pyrenees National Park in France [PNP] National Forestry Organization [NFO], and Spanish (FIEP, RGA, RGN) estimated the number of bears at 15 (2 in Spain). In 1991, we estimate that only 10 individuals remained (8 in France, 2 in Spain). Since 1983, only 3 litters occurred totalling 5 cubs, all on the French slope. The last litter known in Spain occurred in 1980. Since then only 1 subadult track has been recorded; all other tracks were of adult bears. Only 1 to 3 bears were found here between 1983 and 1991.

The livestock damage analysis and field observations in France, Navarre, and Aragon during the last decade indicates that, between 1977 and 1979, bear migration occurred from Sainte Engrace Forest (Soule, France) to Roncal, Hecho, and Ansó valleys (Spain) and to Aspe Valley (Fig. 2). These movements were documented by livestock attacks and tracks in the border zone. According to Camarra (J. Camarra, Research and Protection of the Brown Bear in the Western Pyrenees, NHO, Pau, France, 1984) and Dendaletche and Caussimont (1985 unpubl. rep.), these displacements were probably the re-



sult of a large project to construct a forest trail system in Saint Engrace Forest. This project caused the death of at least 2 bears, possibly 3. The decrease of sign and livestock damage incidents in the Roncal, Ansó and Hecho valleys since 1980 confirmed the testimonies of poaching and dead bears discovered in these sectors.

### Mountain Passes

From 1968 to 1990, >300 data points were recorded from 1 to 1.5 km around the frontier crest at an altitude of 1,300–2,500 m (i.e., tracks, livestock damage, sightings, etc.). Specific research at mountain passes occurred in 1989 and 1990. The results showed the same population living on both slopes of the Pyrenean chain. Until the mid-1980s mountain passes were utilized more frequently and the crossing zone decreased from the west and the east (Caussimont et al. 1991). The crossings occurred mainly during spring and autumn on the shortest trails, closer to the forests (Caussimont 1991).

### Habitat Use

Data were recorded in the forest 68%, and in pastures 32% (Caussimont et al. 1993). During springtime, 83% of the data were found between an altitude of 900 (valley bottom) to 1,600 m. The valley passes, where bears use some trails at an altitude of 1,600–2,000 m, represent 17% of the data. These data substantiate the importance of bear travelways.

During summer, the area between 1,450–1,600 m is most commonly used, comprising 35% of the data. This is the highest part of the forest, and it is composed of pine, beech and a variety of fruits, such as raspberry (*Rubus idaeus*), strawberry (*Fragaria vesca*) and blueberry (*Vaccinium myrtillus*) which colonize some pastures with box tree (*Boxus sempervirens*) and juniper (*Juniperus communis*). Twenty seven percent of the presence data corresponds to supraforestal pastures situated between 1,850–2,300 m.

In autumn, bears live in the heart of the beech forest and beech conifer community (55% of the data), similar to spring. Brown bears also use and live in the white oak forest. They eat fruits from bushes growing in clearings or abandoned pastures such as hawthorn (*Crataegus monogyna*), sloe (*Prunus spinosa*) or rose bush (*Rosa* sp.).

### Foods

Methodology was based on research on feeding sign and droppings analysis (macro and microscopic). Researchers analyzed 66 feeding sites and 22 droppings (Caussimont and Fillat 1986, Caussimont et al. 1993).

Results showed that the brown bears' diet is the same on both slopes of the Pyrenees (Berduco et al. 1982).

In spring, bears eat xylophagus insects and larvae living in dead trees. Bears also destroy anthills and consume the nests. They also turn over stones, ant nests, bite oak tree trunks, and peel otherwise sound looking pine trees that contain insects under their bark. Vegetative foods include tubers, beechnuts from the previous autumn, grass or weeds, and leaves from *Salix caprea*. During summer brown bears forage on ant eggs, blueberries, strawberries, raspberries (*Rubus* sp.) and underground wasp nests. In autumn bears rely primarily on beechnuts, but they also eat blueberries, hawthorn fruits, sloes and acorns.

## MANAGEMENT IMPLICATIONS AND RECOMMENDATIONS

Brown bear preservation depends on regulation of human activities that undermine the brown bears' habitat and biology. Public education must accompany regulation to change attitudes concerning this endangered animal. To this end, the creation of an indemnity for livestock damage attributed to brown bears is a primary measure in preservation efforts.

The FIEP concentrated its action on improving this indemnity, studying the bear population, public education, and providing management advice to concerned government agencies. The management recommendations below were presented in Aragon in 1989 (A. Garcia-Serrano, J. Herrero, and G. Caussimont, Brown Bear [*Ursus arctos*] Status In High Aragon And Establishment Of Its Protection Measures, Reg. Gov. Aragon, Zaragoza, Spain, 1989).

### Hunting

Boar hunting with hounds is the major hunting related problem for brown bears in this area. According to Allen (1984), when a bear is disturbed by dogs, it will circle an area until the dogs are gone. Thus, boar hunting causes bears to move about more, increasing energy consumption during prehibernation and hibernation preparation (Nelson 1984).

Utilizing the work of other researchers and specialist groups (J.J. Camara, Technical Propositions For Brown Bear Area Management In The Atlantic Pyrenees Department, NHO, Pau, France 1990; Clevenger and Purroy 1988, 1991; NHO, Synthetic Report On The Conservation problem Of Brown Bear [*Ursus arctos*] Of The Western Pyrenees, NHO, Pau, France 1981) the following recommendations to avoid disturbing bears were devel-

oped and implemented: (1) limit the total number of beats in feeding zones during autumn, (2) in the case of boar damage restrict boar hunting or shooting to evenings and use guards to monitor for bears during boar hunts, and (4) hunt for boars only between 1 January and 15 March. These recommendations will help avoid denning zones and the pre-and post-hibernating periods. Because of the abundance of boar in this sector, regulations other than beats should be tested and checked (Tate 1984, Herrero et al. 1995).

### Livestock

Most of the 48 livestock attacks occurred on sheep. The seasonal occurrence of attacks coincided with the presence of cattle in high mountain or middle forest pastures. High topographic relief and lack of vigilance (the shepherds do not guard their flocks all the time) contributed to the high number of animals killed by bears. The average number of attacks/year was 3.7 (1971–91). Farmers that lose livestock to bears are reimbursed within 2 months at the upper range of market price, plus 20% for the loss of lambs, plus a \$100 (U.S) subsidy for disturbance. Meetings with stockbreeders affected by bear attacks occurred regularly to prevent carion poisoning and poaching, which occurred in years past.

### Timber Harvest

Brown bears live primarily in the forest and thus are directly affected by forestry activities. We recommended the following: (1) extend the nonharvesting period, (2) avoid harvesting oak forests and forests growing on 60% slopes, (3) search for alternative timber transport methods which require only short trails like cabling or helicopter, (4) prohibit harvesting in areas vital to bears and during feeding (autumn) and breeding periods, (5) leave equal amounts of trees unharvested for bears in the same clump of trees as were harvested, (6) study indemnity measures to prevent the exploitation of vital areas, (7) coordinate timber harvest with other activities to decrease human presence, (8) regulate timber harvest, foresters, and public activities in these zones. Only the last recommendation has been effective. The management proposals for the regular presence zone were supported by several other reports from the scientific literature (NFO, Timber Management In Western Pyrenees Bear Area, NFO, Pau, France, 1980; FIEP 1985, Camarra 1986a, Caussimont 1986, LeFranc et al. 1987, Peek et al. 1987).

### Recreational Activities

Recreational activities disturb bears through noise and increased human presence. Building shelters, camping, and related activities also disrupt bears. We recommend the following: study the impact of every new tourist struc-

ture constructed in the bear zone (Resolution of European Parliament 13/7/90); create tourist areas and education programs to teach appreciation for natural tranquility of fauna including bears; and exclude military exercises in these zones. None of these propositions have been implemented thus far.

### Environmental Education

Local human residents consider bears to be pests that eat resources such as cattle (Caussimont 1981). This problem was mitigated by setting up the indemnity system. The FIEP also developed an information campaign about bear biology by giving programs in schools and public places with supporting folders, posters and a book. Exhibitions and programs were coordinated with local and national governments and institutions.

### Recovery Plan

Measures were suggested to protect the remaining Pyrenean brown bear population and create necessary conditions for its survival. The necessary legal instrument to restore brown bear populations is a law concerning natural places and the wild flora and fauna (Spanish law 4/1989 enacted 27 March 1989). After the causes of bear endangerment are controlled, a bear population recovery plan must be established for both the French and Spanish slopes of the Pyrenees.

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