Brown bear behavior and human activities inside and outside protected areas

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The endangered Cantabrian brown bear population, NW Spain, is divided into two subpopulations separated ~ 50-70 km by human infrastructures and development. Much of bear range is inside protected areas (e.g. Natural Parks), but other areas with bear reproduction that may reduce that distance are not officially protected.

Our ongoing project compares bear behavior in protected and non protected areas. It has been argued that bears are more diurnal in areas with little human activity areas and more nocturnal in areas with much activity.

May such differences also occur at local scale, perhaps depending on the amount of human activities and/or the degree of protection of the area?

We are analyzing: 1. Bear behavior and the distribution of human activities inside / outside protected areas; 2. The historical distribution of observations of females with cubs-of-the-year (hereafter, FWC) since 1982 over the network of protected and non protected areas.

Methods

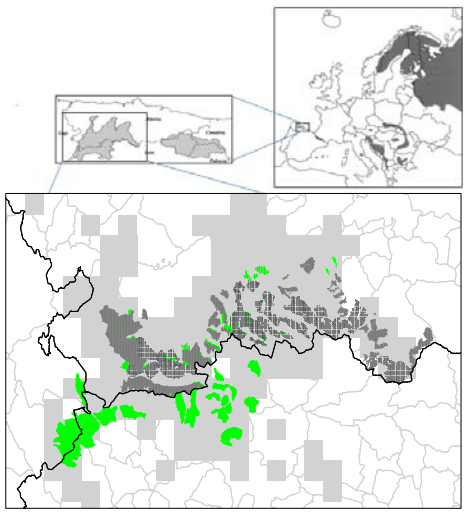
1. In 2010-2011 we are doing fieldwork in 4 areas that have different degree of protection (2 areas inside Natural Parks). We perform sitting and waiting sessions (150 minutes in avg.) weekly in every area, recording the behavior of observed bears (e.g. time allocated to feeding, walking, playing, resting, vigilance, running away) and human activities (e.g. hunting, livestock handling, hiking, etc).

We use generalized linear regression models to analyze the effect of potential predictors on several response variables (see Table below). We select among candidate models based on AIC. Identified bears, when possible, and specific watching spots are included as random factors.

2. We analyzed the annual % of observations that lay within territories covered by figures of protection (Figures below), after plotting both the observations and the figures of protection on GIS layers.

Besides (not included in this poster), we develop analyses on hormones that reflect levels of stress, using samples from Cantabrian and Scandinavian bears, in cooperation with the SBBRP and the Leibniz Institute for Zoo and Wildlife Research.

The Cantabrian Mountains study area is a mix of deciduous forest (only 25%, the lowest within European brown bear range), grasslands and shrubs. Human activity includes heavily subsidized cattle farming, mining, tourism and mountain sports, hunting, agriculture and timber harvesting. These are two of the spots where we are searching for bears and human activities.



The study area within the context of the Cantabrian range, Spain and Europe.

Grey cells show bear distribution

Green: "critic areas" established by Bear Recovery Plans

Dashed black : restricted areas for some human activities inside Natural Parks.

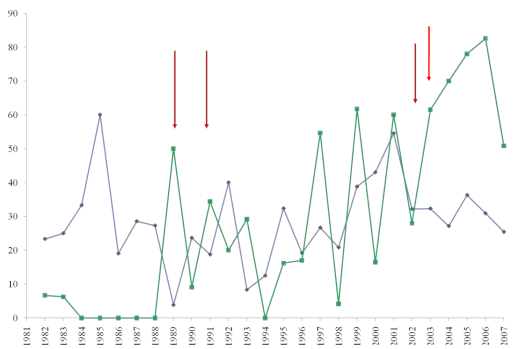
Results and Discussion - Preliminary

Sitting and waiting: 538 sessions done in April 2010 - May 2011; > 1255 sampling hours. We had 163 contacts with single bears and FWC. Mean duration of the observations was 46 min (range 1-280); ~ 25% of the sessions were positive, inside and outside Parks.

The table shows the best models for three response variables, and the set of predictors that were included. The positive (+) and negative (-) effects that remained in the best models are shown. We are still working on the analyses and these results are preliminary.

	Response variables		
Predictors	Duration (min) of the observation	Time (min) from dawn / dusk to the start of the observation of a bear	Bear behavior: calm(1)/run (0)
Month			
Weather	-	+	
Am/pm	+	+	
Weekday / Holiday	-	+	
FWC	-	-	
Restricted area			
Sniff-look at specific directions	+	-	-
Livestock presence		-	
Human activity			
Bear behavior (calm/run)		+	
Am/pm*Holiday	+	-	
FWC*Sniff-look at	+	+	
Time from dawn / dusk			+
Restricted area*Human presence			-

It seems that bears were less calm when there was human activity in restricted areas. Also, the duration of the observations in the evenings was shorter in holidays (when there is more people in the countryside) that in week days, and bears were less diurnal when there was livestock in the area (which usually occurs from late spring and may be interpreted as a surrogate of human activity).



Annual % of observations of FWC within restricted areas of Natural Parks and critic areas (green). Red arrows show the year of implementation of protection figures (4 main events).

Annual % of observations of FWC that would have been inside protected areas if they had existed since 1982 (blue).

Connecting Cantabrian bear subpopulations is a need for the viability of the population and a goal established in the recovery plans. Stronger application of the law in protected areas is likely needed for them to play a more clear role on bear conservation (e.g. it is common to see hikers, bikers and/or vehicles in areas where they are theoretically forbidden). Providing specific areas with effective protection may help shorten the distance between the subpopulations.

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